

**COLLEGE OF MARIN
INDIAN VALLEY CAMPUS
BUILDING 11 RENOVATION
100% CD/BID SET PROJECT MANUAL**

PROJECT ADDRESS

COLLEGE OF MARIN INDIAN VALLEY CAMPUS
1800 IGNACIO AVENUE
NOVATO, CA 94949

OWNER

MARIN COMMUNITY COLLEGE DISTRICT
835 COLLEGE AVENUE
KENTFIELD, CA 94904

DATE

MARCH 10, 2017

ARCHITECT

BRICK INC.
PROJECT NO. 16-148.01

DOCUMENT 00 01 01

TITLE PAGE

PROJECT MANUAL

MARIN COMMUNITY COLLEGE DISTRICT

COLLEGE OF MARIN

INDIAN VALLEY CAMPUS

BUILDING 11 RENOVATION

MARCH 10, 2017

BID DOCUMENTS

DOCUMENT 00 01 07

SEALS PAGE

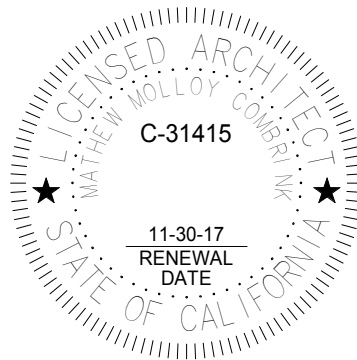
ARCHITECT:

Brick, Inc.
Matt Combrink
1266 66th Street, Suite 1
Emeryville, CA 94608

LICENSE NUMBER:

C-31415

Seal



A handwritten signature in black ink, appearing to read "M. Combrink".

03.10.2017

Signature

Date

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DOCUMENT 00 01 07

SEALS PAGE

CIVIL ENGINEER:

CSW | ST2.
Kirk Bovitz
45 Leveroni Ct.
Novato, CA 94949

LICENSE NUMBER:

RCE-74631

Seal



Kirk Bovitz

Signature

3/10/17

Date

END OF DOCUMENT

DOCUMENT 00 01 07

SEALS PAGE

STRUCTURAL ENGINEER:

IDA Structural Engineers, Inc.
Stephen DeJesse
1629 Telegraph Ave, Suite 300
Oakland, CA 94612

LICENSE NUMBER:

S-3527

Seal



Signature

2/27/17

Date

END OF DOCUMENT

DOCUMENT 00 01 07

SEALS PAGE


MEP Engineers:

PAE
Christian Agulles
425 California St, Suite 1200
San Francisco, CA 94104

LICENSE NUMBER:

E-18943 Harjot Sidhu, PE

Seal


Signature

03-09-17
Date



DOCUMENT 00 01 07

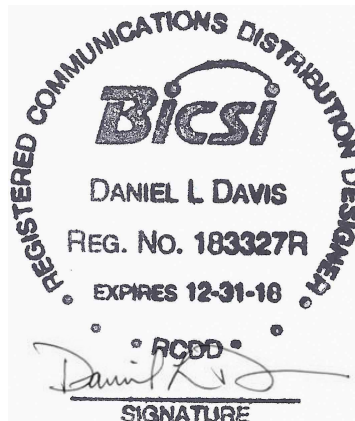
SEALS PAGE

Telcom/Data, Audio/Video,
CCTV, Access Control

Dan Davis Communications.
Daniel Davis
101 Golf Course Drive Suite D2
Rohnert Park, Ca 94928

DESIGNATION NUMBER:

183327R



 02/20/2017

Signature

Date

END OF DOCUMENT

DOCUMENT 00 01 07

SEALS PAGE

MEP Engineers:

PAE
Christian Agulles
425 California, Suite 1200
San Francisco, CA 94104

LICENSE NUMBER:

M-33075 **Marco Alves, PE**

Seal


Signature _____ Date 3/3/2017



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END OF DOCUMENT

NOTICE TO BIDDERS

1. Notice is hereby given that the governing board ("Board") of the Marin Community College District ("District") will receive sealed bids for the following project, Bid No. _____, Bid Package _____ ("Project" or "Contract"):

_____ **[PROJECT NAME]**

2. The Project consists of:

[GENERAL DESCRIPTION OF WORK]

3. To bid on this Project, the Bidder is required to possess one or more of the following State of California Contractor Licenses: **[LIST AS MANY AS DISTRICT CHOOSES]**

A, B, and/or C-__

The Bidder's license(s) must remain active and in good standing throughout the term of the Contract.

4. To bid on this Project, the Bidder is required to be registered as a public works contractor with the Department of Industrial Relations. The Bidder's registration must remain active throughout the term of the Contract.

5. Contract Documents are available on _____, 20__, for review at the District Facilities Office. In addition, Contract Documents are available for bidders' review at the following builders' exchanges:

- A. Builder's Exchange of _____ County (____) _____ - _____
- B. **[ADD OR REMOVE EXCHANGES AND/OR STATE THE FOLLOWING:]**
A list of these builders' exchanges is available at the District's Facilities Office.

6. Contract Documents are also available for purchase for _____ dollars (\$_____) at the District Facilities Office. This fee is refundable if the Contract Documents are returned in clean condition back to the District Facilities Office no later than ten (10) calendar days after the date of the bid opening.

7. Sealed Bids will be received until _____ a.m./p.m., _____, 20__, at the District Office, 835 College Avenue, Kentfield, California, at or after which time the bids will be opened and publicly read aloud. Any bid that is submitted after this time shall be non-responsive and returned to the bidder. Any claim by a bidder of error in its bid must be made in compliance with section 5100 et seq. of the Public Contract Code.

8. **[IF DISTRICT PREQUALIFIED CONTRACTORS, INCLUDE THE FOLLOWING]**
Pursuant to Public Contract Code section 20651.5 only prequalified bidders will be eligible to submit a bid for this Project. Any bid submitted by a bidder who is not prequalified shall be non-responsive and returned unopened to the bidder.

9. All bids shall be on the form provided by the District. Each bid must conform and be responsive to all pertinent Contract Documents, including, but not limited to, the Instructions to Bidders.
10. A bid bond by an admitted surety insurer on the form provided by the District, cash, or a cashier's check or a certified check, drawn to the order of the _____ District, in the amount of ten percent (10%) of the total bid price, shall accompany the Bid Form and Proposal, as a guarantee that the Bidder will, within seven (7) calendar days after the date of the Notice of Award, enter into a contract with the District for the performance of the services as stipulated in the bid.
11. A mandatory/voluntary **[CHOOSE ONE]** pre-bid conference and site visit will be held on _____, 20____, at ____m. at _____, California. All participants are required to sign in front of the _____ Building, _____, California. The Site Visit is expected to take approximately _____. **[IF MANDATORY, INCLUDE THE FOLLOWING]** Failure to attend or tardiness will render bid ineligible.
12. The successful Bidder shall be required to furnish a 100% Performance Bond and a 100% Payment Bond if it is awarded the contract for the Work.
13. **[IF DISTRICT PROVIDES OCIP, INCLUDE THE FOLLOWING]** The District has elected to provide an owner-controlled or wrap-up insurance program (OCIP). The successful Bidder and its subcontractor shall be required to participate in and comply with the OCIP.
14. The successful Bidder may substitute securities for any monies withheld by the District to ensure performance under the Contract, in accordance with the provisions of section 22300 of the Public Contract Code.
15. **[IF THIS PROJECT USES OR MAY USE STATE OF CALIFORNIA SCHOOL FACILITY PROGRAM FUNDS, DISTRICT SHOULD INCLUDE THE FOLLOWING]** The successful bidder will be required to either meet the DVBE goal of three percent (3%) participation or demonstrate its good faith effort to solicit DVBE participation in this Contract if it is awarded the contract for the Work.
16. The Contractor and all Subcontractors under the Contractor shall pay all workers on all work performed pursuant to this Contract not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the District, pursuant to sections 1770 et seq. of the California Labor Code. Prevailing wage rates are also available from the District or on the Internet at: <<http://www.dir.ca.gov>>.
17. This Project is subject to labor compliance monitoring and enforcement by the Department of Industrial Relations pursuant to Labor Code section 1771.4 and subject to the requirements of Title 8 of the California Code of Regulations. The Contractor and all Subcontractors under the Contractor shall furnish electronic certified payroll records directly to the Labor Commissioner weekly or within ten (10) days of any request by the District or the Labor Commissioner. The successful Bidder shall comply with all requirements of Division 2, Part 7, Chapter 1, of the Labor Code.

18. **[IF A PROJECT LABOR AGREEMENT APPLIES TO THIS PROJECT, INCLUDE THE FOLLOWING]** The District has entered into a Project Labor Agreement that is applicable to this Project. For questions or assistance concerning the Project Labor Agreement, contact _____, (____) ____-____, _____, California _____.

19. **[IF DISTRICT SPECIFIES A BRAND OR TRADE NAME (I.E. "DISTRICT STANDARD" OR "NO EQUAL") FOR THIS PROJECT, INCLUDE THE FOLLOWING]** The District's Board has found and determined that the following item(s) shall be used on this Project based on the purpose(s) indicated. (Public Contract Code section 3400(c)): A particular material, product, thing, or service is designated by specific brand or trade name for the following purpose(s):

- (1) In order that a field test or experiment may be made to determine the product's suitability for future use: **[LIST ITEM(S)]**.
- (2) In order to match other products in use on a particular public improvement either completed or in the course of completion: **[LIST ITEM(S)]**.
- (3) In order to obtain a necessary item that is only available from one source: **[LIST ITEM(S)]**.
- (4) In order to respond to an emergency declared by a local agency: **[LIST ITEM(S)]**.

20. **[IF THIS PROJECT USES FEDERAL FUNDS, DISTRICT SHOULD INCLUDE THE FOLLOWING]** This Project is funded in whole or in part with federal funds, and therefore the Contractor shall comply with the Davis-Bacon Act, applicable reporting requirements, and any other applicable requirements for federal funding. **[IF THIS PROJECT USES FEDERAL FUNDS, DISTRICT MAY ALSO INCLUDE THE FOLLOWING]** This Project is also subject to Buy American requirements.

21. The District shall award the Contract, if it awards it at all, to the lowest responsive responsible bidder based on: **[CHOOSE ONE AND ADD DETAIL AS NEEDED]**

A. The base bid amount only.

[OR]

B. The base bid amount plus the following alternates:

[AS EXAMPLES ONLY: "additive alternate no. 1; deductive alternate no. 3, additive alternate no. 2."]

[OR]

- C. Up to a total Project fund amount [of \$_____] **[OR]** [to be stated before bids are opened], **[THIS AMOUNT NEED NOT BE STATED HERE BUT MUST BE STATED PRIOR TO OPENING ANY BIDS]** including the additive alternates or deductive alternates needed, in the stated order, to be equal to or less than that amount:
[AS EXAMPLES ONLY]: "additive alternate no. 1; and deductive alternate no. 3."
- [OR]**
- D. Based on a process that conceals the identity of bidders from the District until the bids have been ranked.
22. The Board reserves the right to reject any and all bids and/or waive any irregularity in any bid received. If the District awards the Contract, the security of unsuccessful bidder(s) shall be returned within sixty (60) days from the time the award is made. Unless otherwise required by law, no bidder may withdraw its bid for ninety (90) days after the date of the bid opening.

END OF DOCUMENT

INSTRUCTIONS TO BIDDERS

Contractors shall follow the instructions in this document, and shall submit all documents, forms, and information required for consideration of a Bid.

Marin Community College District ("District") will evaluate information submitted by the apparent low Bidder and, if incomplete or unsatisfactory to District, Bidder's bid may be rejected at the sole discretion of District.

1. Bids are requested for a general construction contract, or work described in general, for the following project ("Project" or "Contract"):

_____ (Project Name)

2. District will receive sealed Bids from Bidders as stipulated in the Notice to Bidders.
3. **[IF DISTRICT PREQUALIFIED CONTRACTORS, INCLUDE THE FOLLOWING]**
The District has prequalified bidders pursuant to Public Contract Code section 20651.5. Only prequalified bidders will be eligible to submit a bid for this Project. Any bid submitted by a bidder who is not prequalified shall be deemed non-responsive and will not be considered.
4. Bidders must submit Bids on the Bid Form and Proposal and all other required District forms. Bids not submitted on the District's required forms shall be deemed non-responsive and shall not be considered. Additional sheets required to fully respond to requested information are permissible.
5. Bidders must supply all information required by each Bid Document. Bids must be full and complete. District reserves the right in its sole discretion to reject any Bid as non-responsive as a result of any error or omission in the Bid. Bidders must complete and submit all of the following documents with the Bid Form and Proposal:
 - a. Bid Bond on the District's form or other security.
 - b. Designated Subcontractors List.
 - c. Site-Visit Certification, if a site visit was required.
 - d. Noncollusion Declaration.
 - e. Iran Contracting Act Certification, if contract value is \$1,000,000 or more.
6. Bidders must submit with their Bids cash, a cashier's check or a certified check payable to District, or a bid bond by an admitted surety insurer of not less than ten percent (10%) of amount of base Bid, plus all additive alternates. If Bidder chooses to provide a Bid Bond as security, Bidder must use the required form of corporate surety provided by District. The Surety on Bidder's Bid Bond must be an insurer admitted in the State of California and authorized to issue surety bonds in the State of California. Bids submitted without necessary bid security will be deemed non-responsive and will not be considered.
7. If Bidder to whom Contract is awarded fails or neglects to enter into Contract and submit required bonds, insurance certificates, and all other required documents,

within **SEVEN (7)** calendar days after the date of the Notice of Award, District may deposit Bid Bond, cash, cashier's check, or certified check for collection, and proceeds thereof may be retained by District as liquidated damages for failure of Bidder to enter into Contract, in the sole discretion of District. It is agreed that calculation of damages District may suffer as a result of Bidder's failure to enter into the Contract would be extremely difficult and impractical to determine and that the amount of the Bidder's required bid security shall be the agreed and conclusively presumed amount of damages.

8. Bidders must submit with the Bid the Designated Subcontractors List for those subcontractors who will perform any portion of Work, including labor, rendering of service, or specially fabricating and installing a portion of the Work or improvement according to detailed drawings contained in the plans and specifications, in excess of one half of one percent (0.5%) of total Bid. All of the listed subcontractors are required to be registered as a public works contractor with the Department of Industrial Relations. The subcontractor's registration must remain active throughout the term of the Contract. Failure to submit this list when required by law shall result in Bid being deemed non-responsive and the Bid will not be considered.
 - a. An inadvertent error in listing the California contractor license number on the Designated Subcontractors List shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive if the correct contractor's license number is submitted to the District within 24 hours after the bid opening and the corrected number corresponds with the submitted name and location for that subcontractor.
 - b. An inadvertent error listing an unregistered subcontractor shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive provided that any of the following apply:
 - (1) The subcontractor is registered prior to the bid opening.
 - (2) The subcontractor is registered and has paid the penalty registration fee within 24 hours after the bid opening.
 - (3) The subcontractor is replaced by another registered subcontractor pursuant to Public Contract Code section 4107.
9. If a mandatory pre-bid conference and site visit ("Site Visit") is requested as referenced in the Notice to Bidders, then Bidders must submit the Site-Visit Certification with their Bid. District will transmit to all prospective Bidders of record such Addenda as District in its discretion considers necessary in response to questions arising at the Site Visit. Oral statements shall not be relied upon and will not be binding or legally effective. Addenda issued by the District as a result of the Site Visit, if any, shall constitute the sole and exclusive record and statement of the results of the Site Visit.
10. Bidders shall submit the Noncollusion Declaration with their Bids. Bids submitted without the Noncollusion Declaration shall be deemed non-responsive and will not be considered.

11. Bids shall be clearly written without erasure or deletions. District reserves the right to reject any Bid containing erasures or deletions.
12. Bidders shall not modify the Bid Form and Proposal or qualify their Bids. Bidders shall not submit to the District a scanned, re-typed, word-processed, or otherwise recreated version of the Bid Form and Proposal or other District-provided document.
13. The Bidder and all Subcontractors under the Contractor shall pay all workers on all work performed pursuant to this Contract not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the District, pursuant to sections 1770 et seq. of the California Labor Code. Copies of the general prevailing rates of per diem wages for each craft, classification, or type of worker needed to execute the Contract, as determined by Director of the State of California Department of Industrial Relations, are available upon request at the District's principal office. Prevailing wage rates are also available on the internet at <http://www.dir.ca.gov>.

[IF THIS PROJECT USES FEDERAL FUNDS, INCLUDE THE FOLLOWING] Since Project is funded in whole or in part with federal funds, the Contractor and all Subcontractors under the Contractor shall comply with the Davis-Bacon Act, applicable reporting requirements, and any other applicable requirements for federal funding. If a conflict exists with a state requirement, the more stringent provision shall control over this Agreement.

14. **[IF DISTRICT PROVIDES OCIP, INCLUDE THE FOLLOWING]** The District has elected to provide an owner-controlled or wrap-up insurance program (OCIP). The policy limits, known exclusions, and the length of time the policy is intended to remain in effect provided by the OCIP are described in the OCIP Manual. The District will require all bidders at a minimum to **[have no serious and willful violations of Labor Code section 6300 et seq., have a workers' compensation experience modification factor of 1.00 or less, and have an injury prevention program instituted pursuant to Labor Code section 3201.5 or 6401.7 (DISTRICT DETERMINES THE MINIMUM SAFETY REQUIREMENTS)]**.

15. **[IF THIS PROJECT USES OR MAY USE STATE OF CALIFORNIA SCHOOL FACILITY PROGRAM FUNDS, INCLUDE THE FOLLOWING]** Section 71028 of the Education Code and Public Contract Code section 10115 require community college districts using funds allocated pursuant to the State of California School Facility Program for the construction and/or modernization of school building(s) to have a participation goal for disabled veteran business enterprises ("DVBE") of at least three percent (3%) per year of the overall dollar amount expended on projects that receive state funding or demonstrate its good faith effort to solicit DVBE participation in this Contract. In order to meet this requirement by demonstrating a good faith effort, Bidder must advertise for DVBE-certified subcontractors and suppliers before submitting its Bid. For any project that is at least partially state-funded, the lowest responsive responsible Bidder awarded the Contract must submit certification of compliance with the procedures for implementation of DVBE contracting goals with its signed Agreement. DVBE Certification Participation Forms are attached. Do not submit these forms with your Bid.

16. **[IF THIS PROJECT USES FEDERAL FUNDS, MAY INCLUDE THE FOLLOWING]**
Federal law may require that all of the iron, steel, and manufactured goods used in projects for the construction, installation, repair, renovation, modernization or maintenance of a public building or public work funded in part or in whole by certain federal funds be produced in the United States of America, unless a federal department waives this requirement because (1) it is inconsistent with the public interest, (2) the goods are not produced in sufficient quantities or of satisfactory quality in the United States, or (3) the requirement would increase the cost of the Project overall by more than twenty-five percent (25%). For any project that is subject to this requirement the low Bidder must submit certification of compliance with this requirement with its signed Agreement. Bidder should not submit this form with its Bid.
17. Submission of Bid signifies careful examination of Contract Documents and complete understanding of the nature, extent, and location of Work to be performed. Bidders must complete the tasks listed below as a condition to bidding, and submission of a Bid shall constitute the Bidder's express representation to District that Bidder has fully completed the following:
- a. Bidder has visited the Site, if required, and has examined thoroughly and understood the nature and extent of the Contract Documents, Work, Site, locality, actual conditions, as-built conditions, and all local conditions and federal, state and local laws, and regulations that in any manner may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto;
 - b. Bidder has conducted or obtained and has understood all examinations, investigations, explorations, tests, reports, and studies that pertain to the subsurface conditions, as-built conditions, underground facilities, and all other physical conditions at or contiguous to the Site or otherwise that may affect the cost, progress, performance, or furnishing of Work, as Bidder considers necessary for the performance or furnishing of Work at the Contract Sum, within the Contract Time, and in accordance with the other terms and conditions of Contract Documents, including specifically the provisions of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, studies, or similar information or data are or will be required by Bidder for such purposes;
 - c. Bidder has correlated its knowledge and the results of all such observations, examinations, investigations, explorations, tests, reports, and studies with the terms and conditions of the Contract Documents;
 - d. Bidder has given the District prompt written notice of all conflicts, errors, ambiguities, or discrepancies that it has discovered in or among the Contract Documents and the actual conditions, and the written resolution thereof by the District is acceptable to Bidder;
 - e. Bidder has made a complete disclosure in writing to the District of all facts bearing upon any possible interest, direct or indirect, that Bidder believes any representative of the District or other officer or employee of the District

presently has or will have in this Contract or in the performance thereof or in any portion of the profits thereof;

- f. Bidder must, prior to bidding, perform the work, investigations, research, and analysis required by this document and that Bidder represented in its Bid Form and Proposal and the Agreement that it performed prior to bidding. Contractor under this Contract is charged with all information and knowledge that a reasonable bidder would ascertain from having performed this required work, investigation, research, and analysis. Bid prices must include entire cost of all work "incidental" to completion of the Work.
- g. Conditions Shown on the Contract Documents: Information as to underground conditions, as-built conditions, or other conditions or obstructions, indicated in the Contract Documents, e.g., on Drawings or in Specifications, has been obtained with reasonable care, and has been recorded in good faith. However, District only warrants, and Contractor may only rely, on the accuracy of limited types of information.
 - (1) As to above-ground conditions or as-built conditions shown or indicated in the Contract Documents, there is no warranty, express or implied, or any representation express or implied, that such information is correctly shown or indicated. This information is verifiable by independent investigation and Contractor is required to make such verification as a condition to bidding. In submitting its Bid, Contractor shall rely on the results of its own independent investigation. In submitting its Bid, Contractor shall not rely on District-supplied information regarding above-ground conditions or as-built conditions.
 - (2) As to any subsurface condition shown or indicated in the Contract Documents, Contractor may rely only upon the general accuracy of actual reported depths, actual reported character of materials, actual reported soil types, actual reported water conditions, or actual obstructions shown or indicated. District is not responsible for the completeness of such information for bidding or construction; nor is District responsible in any way for any conclusions or opinions of Contractor drawn from such information; nor is the District responsible for subsurface conditions that are not specifically shown (for example, District is not responsible for soil conditions in areas contiguous to areas where a subsurface condition is shown).
- h. Conditions Shown in Reports and Drawings Supplied for Informational Purposes: Reference is made to the document entitled Geotechnical Data, and the document entitled Existing Conditions, for identification of:
 - (1) Subsurface Conditions: Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by Architect in preparing the Contract Documents; and
 - (2) Physical Conditions: Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to

the Site that has been utilized by Architect in preparing the Contract Documents.

- (3) These reports and drawings are **not** Contract Documents and, except for any "technical" data regarding subsurface conditions specifically identified in Geotechnical Data and Existing Conditions, and underground facilities data, Contractor may not in any manner rely on the information in these reports and drawings. Subject to the foregoing, Contractor must make its own independent investigation of all conditions affecting the Work and must not rely on information provided by District.
18. Bidders may examine any available "as-built" drawings of previous work by giving District reasonable advance notice. District will not be responsible for accuracy of "as-built" drawings. The document entitled Existing Conditions applies to all supplied "as-built" drawings.
19. All questions about the meaning or intent of the Contract Documents are to be directed in writing to the District. Interpretations or clarifications considered necessary by the District in response to such questions will be issued in writing by Addenda emailed, faxed, mailed, or delivered to all parties recorded by the District as having received the Contract Documents. Questions received less than **SEVEN (7)** calendar days prior to the date for opening Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
20. Addenda may also be issued to modify other parts of the Contract Documents as deemed advisable by the District.
21. Each Bidder must acknowledge each Addendum in its Bid Form and Proposal by number or its Bid shall be considered non-responsive. Each Addendum shall be part of the Contract Documents. A complete listing of Addenda may be secured from the District.
22. Bids shall be based on products and systems specified in Contract Documents or listed by name in Addenda. Whenever in the Specifications any materials, process, or article is indicated or specified by grade, patent, or proprietary name, or by name of manufacturer, that Specification shall be deemed to be followed by the words "or equal." Bidder may, unless otherwise stated, offer any material, process, or article that shall be substantially equal or better in every respect to that so indicated or specified. The District is not responsible and/or liable in any way for a Contractor's damages and/or claims related, in any way, to that Contractor's basing its bid on any requested substitution that the District has not approved. Contractors and materials suppliers who submit requests for substitutions prior to the award of the Contract must do so in writing and in compliance with Public Contract Code section 3400. All requests must comply with the following:
 - a. District must receive any request for substitution a minimum of **TEN (10)** calendar days prior to bid opening.
 - b. Within 35 days after the date of the Notice of Award, the Successful Bidder shall submit data substantiating a request for substitution containing

sufficient information to assess acceptability of product or system and impact on Project, including, without limitation, the requirements specified in the Special Conditions and the Specifications. Insufficient information shall be grounds for rejection of substitution.

- c. Approved substitutions, if any, shall be listed in Addenda. District reserves the right not to act upon submittals of substitutions until after bid opening.
 - d. Substitutions may be requested after Contract has been awarded only if indicated in and in accordance with requirements specified in the Special Conditions and the Specifications.
23. All Bids must be sealed, and marked with name and address of the Bidder and the Project Number, Bid number, Bid package, and time of bid opening. Bids will be received as indicated in the Notice to Bidders.
- a. Mark envelopes with the name of the Project.
 - b. Bids must be submitted to the **[District Facilities Office]** by date and time shown in the Notice to Bidders.
 - c. Bids must contain all documents as required herein.
24. Bids will be opened at or after the time indicated for receipt of bids.
25. This Contract may include alternates. Alternates are defined as alternate products, materials, equipment, systems, methods, or major elements of the construction that may, at the District's option and under terms established in the Contract and pursuant to section 20103.8 of the Public Contract Code, be selected for the Work.
26. The District shall award the Contract, if it awards it at all, to the lowest responsive responsible bidder based on the criteria as indicated in the Notice to Bidders. In the event two or more responsible bidders submit identical bids, the District shall select the Bidder to whom to award the Contract by lot.
27. Time for Completion: District may issue a Notice to Proceed within **THREE (3)** months from the date of the Notice of Award. Once Contractor has received the Notice to Proceed, Contractor shall complete the Work within the period of time indicated in the Contract Documents.
- a. In the event that the District desires to postpone issuing the Notice to Proceed beyond this 3-month period, it is expressly understood that with reasonable notice to the Contractor, the District may postpone issuing the Notice to Proceed.
 - b. It is further expressly understood by Contractor that Contractor shall not be entitled to any claim of additional compensation as a result of the postponement of the issuance of the Notice to Proceed beyond a 3-month period. If the Contractor believes that a postponement of issuance of the Notice to Proceed will cause a hardship to the Contractor, the Contractor may terminate the Contract. Contractor's termination due to a postponement beyond this 3-month period shall be by written notice to District within **TEN**

(10) calendar days after receipt by Contractor of District's notice of postponement.

- c. It is further understood by the Contractor that in the event that Contractor terminates the Contract as a result of postponement by the District, the District shall only be obligated to pay Contractor for the Work that Contractor had performed at the time of notification of postponement and which the District had in writing authorized Contractor to perform prior to issuing a Notice to Proceed.
 - d. Should the Contractor terminate the Contract as a result of a notice of postponement, District shall have the authority to award the Contract to the next lowest responsive responsible bidder.
28. The Bidder to whom Contract is awarded shall execute and submit the following documents by 5:00 p.m. of the **SEVENTH (7th)** calendar day following the date of the Notice of Award. Failure to properly and timely submit these documents entitles District to reject the bid as non-responsive.
- a. Agreement: To be executed by successful Bidder. Submit four (4) copies, each bearing an original signature.
 - b. Escrow of Bid Documentation: This must include all required documentation. See the document Escrow of Bid Documentation for more information.
 - c. Performance Bond (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.
 - d. Payment Bond (100%) (Contractor's Labor and Material Bond): On the form provided in the Contract Documents and fully executed as indicated on the form.
 - e. Insurance Certificates and Endorsements as required.
 - f. Workers' Compensation Certification.
 - g. Prevailing Wage and Related Labor Requirements Certification.
 - h. Disabled Veterans' Business Enterprise Participation Certification. **[IF APPLICABLE]**
 - i. Drug-Free Workplace Certification. **[IF APPLICABLE]**
 - j. Tobacco-Free Environment Certification. **[IF APPLICABLE]**
 - k. Hazardous Materials Certification. **[IF APPLICABLE]**
 - l. Lead-Based Paint Certification. **[IF APPLICABLE]**
 - m. Imported Materials Certification. **[IF APPLICABLE]**
 - n. Buy American Certification. **[IF APPLICABLE]**

- o. Roofing Project Certification: from Contractor, Material Manufacturer and/or Vendor. **[IF APPLICABLE]**
29. Any bid protest by any Bidder regarding any other bid must be submitted in writing to the District, before 5:00 p.m. of the **THIRD (3rd)** business day following bid opening.
- a. Only a Bidder who has actually submitted a bid, and who could be awarded the Contract if the bid protest is upheld, is eligible to submit a bid protest. Subcontractors are not eligible to submit bid protests. A Bidder may not rely on the bid protest submitted by another Bidder.
 - b. A bid protest must contain a complete statement of any and all bases for the protest and all supporting documentation. Materials submitted after the bid protest deadline will not be considered.
 - c. The protest must refer to the specific portions of all documents that form the basis for the protest.
 - (1) Without limitation to other bases for protest, an inadvertent error in listing the California contractor license number on the Designated Subcontractors List shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive if the correct contractor's license number is submitted to the District within 24 hours after the bid opening and the corrected number corresponds with the submitted name and location for that subcontractor.
 - (2) Without limitation to other bases for protest, an inadvertent error listing an unregistered subcontractor shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive provided that any of the following apply:
 - (i) The subcontractor is registered prior to the bid opening.
 - (ii) The subcontractor is registered and has paid the penalty registration fee within 24 hours after the bid opening.
 - (iii) The subcontractor is replaced by another registered subcontractor pursuant to Public Contract Code section 4107.
 - d. The protest must include the name, address and telephone number of the person representing the protesting party.
 - e. The party filing the protest must concurrently transmit a copy of the protest and any attached documentation to all other parties with a direct financial interest that may be adversely affected by the outcome of the protest. Such parties shall include all other bidders or proposers who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.

- f. The procedure and time limits set forth in this paragraph are mandatory and are each bidder's sole and exclusive remedy in the event of bid protest. Failure to comply with these procedures shall constitute a waiver of any right to further pursue the bid protest, including filing a Government Code Claim or legal proceedings.
30. District reserves the right to reject any or all bids, including without limitation the right to reject any or all nonconforming, non-responsive, unbalanced, or conditional bids, to re-bid, and to reject the bid of any bidder if District believes that it would not be in the best interest of the District to make an award to that bidder, whether because the bid is not responsive or the bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by District. District also reserves the right to waive inconsequential deviations not involving price, time, or changes in the Work. For purposes of this paragraph, an "unbalanced bid" is one having nominal prices for some work items and/or enhanced prices for other work items.
31. Discrepancies between written words and figures, or words and numerals, will be resolved in favor of numerals or figures.
32. Prior to the award of Contract, District reserves the right to consider the responsibility of the Bidder. District may conduct investigations as District deems necessary to assist in the evaluation of any bid and to establish the responsibility, including, without limitation, qualifications and financial ability of Bidders, proposed subcontractors, suppliers, and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to District's satisfaction within the prescribed time.

END OF DOCUMENT

DOCUMENT 00 21 13.1

BIDDER INFORMATION AND FORMS

**[INTENTIONALLY LEFT BLANK UNLESS PROVIDED IN SPECIAL CONDITIONS
– SEPARATE PREQUALIFICATION PROCESS RECOMMENDED]**

END OF DOCUMENT

EXISTING CONDITIONS

1. Summary

This document describes existing conditions at or near the Project, and use of information available regarding existing conditions. This document is **not** part of the Contract Documents. See General Conditions for definition(s) of terms used herein.

2. Reports and Information on Existing Conditions

- a. Documents providing a general description of the Site and conditions of the Work may have been collected by Marin Community College District ("District"), its consultants, contractors, and tenants. These documents may include previous contracts, contract specifications, tenant improvement contracts, as-built drawings, utility drawings, and information regarding underground facilities.
- b. Information regarding existing conditions may be inspected at the District offices or the Construction Manager's offices, if any, and copies may be obtained at cost of reproduction and handling upon Bidder's agreement to pay for such copies. These reports, documents, and other information are **not** part of the Contract Documents.
- c. Information regarding existing conditions may also be included in the Project Manual, but shall **not** be considered part of the Contract Documents.
- d. Prior to commencing this Work, Contractor and the District's representative shall survey the Site to document the condition of the Site. Contractor will record the survey in digital videotape format and provide an electronic copy to the District within fourteen (14) days of the survey.
- e. Contractor may also document any pre-existing conditions in writing, provided that both the Contractor and the District's representative agree on said conditions and sign a memorandum documenting the same.
- f. The reports and other data or information regarding existing conditions and underground facilities at or contiguous to the Project are the following:

[LIST ALL EXISTING CONDITIONS INFORMATION HERE]

- (1) Original Construction Drawings.
- (2) Survey of Site.
- (3) Hazardous Material Reports
- (4) Videotaped Survey

3. Use of Information

- a. Information regarding existing conditions was obtained only for use of District and its consultants, contractors, and tenants for planning and design and is **not** part of the Contract Documents.

- b. District does not warrant, and makes no representation regarding, the accuracy or thoroughness of any information regarding existing conditions. Bidder represents and agrees that in submitting a bid it is not relying on any information regarding existing conditions supplied by District.
- c. Under no circumstances shall District be deemed to warrant or represent existing above-ground conditions, as-built conditions, or other actual conditions, verifiable by independent investigation. These conditions are verifiable by Contractor by the performance of its own independent investigation that Contractor must perform as a condition to bidding and Contractor should not and shall not rely on this information or any other information supplied by District regarding existing conditions.
- d. Any information shown or indicated in the reports and other data supplied herein with respect to existing underground facilities at or contiguous to the Project may be based upon information and data furnished to District by the District's employees and/or consultants or builders of such underground facilities or others. District does not assume responsibility for the completeness of this information, and Bidder is solely responsible for any interpretation or conclusion drawn from this information.
- e. District shall be responsible only for the general accuracy of information regarding underground facilities, and only for those underground facilities that are owned by District, and only where Bidder has conducted the independent investigation required of it pursuant to the Instructions to Bidders, and discrepancies are not apparent.

4. Investigations/Site Examinations

- a. Before submitting a Bid, each Bidder is responsible for conducting or obtaining any additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground facilities) at or contiguous to the Site or otherwise, that may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or that Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of Contract Documents.
- b. On request, District will provide each Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies, as each Bidder deems necessary for submission of a Bid. Bidders must fill all holes and clean up and restore the Site to its former condition upon completion of its explorations, investigations, tests, and studies. Such investigations and Site examinations may be performed during any and all Site visits indicated in the Notice to Bidders and only under the provisions of the Contract Documents, including, but not limited to, proof of insurance and obligation to indemnify against claims arising from such work, and District's prior approval.

END OF DOCUMENT

GEOTECHNICAL DATA

1. Summary

This document describes geotechnical data at or near the Project that is in the District's possession available for Contractor's review, and use of data resulting from various investigations. This document is **not** part of the Contract Documents. See General Conditions for definition(s) of terms used herein.

2. Geotechnical Reports

- a. Geotechnical reports may have been prepared for and around the Site by soil investigation engineers hired by Marin Community College District ("District"), and its consultants, contractors, and tenants.
- b. Geotechnical reports may be inspected at the District offices or the Construction Manager's offices, if any, and copies may be obtained at cost of reproduction and handling upon Bidder's agreement to pay for such copies. These reports are **not** part of the Contract Documents.
- c. The reports and drawings of physical conditions that may relate to the Project are the following:

[LIST ALL GEOTECHNICAL REPORTS HERE]

3. Use of Data

- a. Geotechnical data were obtained only for use of District and its consultants, contractors, and tenants for planning and design and are **not** a part of Contract Documents.
- b. Except as expressly set forth below, District does not warrant, and makes no representation regarding, the accuracy or thoroughness of any geotechnical data. Bidder represents and agrees that in submitting a Bid it is not relying on any geotechnical data supplied by District, except as specifically allowed below.
- c. Under no circumstances shall District be deemed to make a warranty or representation of existing above ground conditions, as-built conditions, or other actual conditions verifiable by independent investigation. These conditions are verifiable by Contractor by the performance of its own independent investigation that Contractor should perform as a condition to bidding and Contractor must not and shall not rely on information supplied by District.

4. Limited Reliance Permitted on Certain Information

- a. Reference is made herein for identification of:

Reports of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by District in preparation of the Contract Documents.

Drawings of physical conditions in or relating to existing subsurface structures (except underground facilities) that are at or contiguous to the Site and have been utilized by District in preparation of the Contract Documents.

- b. Bidder may rely upon the general accuracy of the "technical data" contained in the reports and drawings identified above, but only insofar as it relates to subsurface conditions, provided Bidder has conducted the independent investigation required pursuant to Instructions to Bidders, and discrepancies are not apparent. The term "technical data" in the referenced reports and drawings shall be limited as follows:
 - (1) The term "technical data" shall include actual reported depths, reported quantities, reported soil types, reported soil conditions, and reported material, equipment or structures that were encountered during subsurface exploration. The term "technical data" does not include, and Bidder may not rely upon, any other data, interpretations, opinions or information shown or indicated in such drawings or reports that otherwise relate to subsurface conditions or described structures.
 - (2) The term "technical data" shall not include the location of underground facilities.
 - (3) Bidder may not rely on the completeness of reports and drawings for the purposes of bidding or construction. Bidder may rely upon the general accuracy of the "technical data" contained in such reports or drawings.
 - (4) Bidder is solely responsible for any interpretation or conclusion drawn from any "technical data" or any other data, interpretations, opinions, or information provided in the identified reports and drawings.

5. Investigations/Site Examinations

- a. Before submitting a Bid, each Bidder is responsible for conducting or obtaining any additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground facilities) at or contiguous to the Site or otherwise, that may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or that Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of Contract Documents.
- b. On request, District will provide each Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies, as each Bidder deems necessary for submission of a Bid. Bidders must fill all holes

and clean up and restore the Site to its former condition upon completion of its explorations, investigations, tests, and studies. Such investigations and Site examinations may be performed during any and all Site visits indicated in the Notice to Bidders and only under the provisions of the Contract Documents, including, but not limited to, proof of insurance and obligation to indemnify against claims arising from such work, and District's prior approval.

END OF DOCUMENT

BID FORM AND PROPOSAL

To: Governing Board of Marin Community College District ("District" or "Owner")

From: _____
(Proper Name of Bidder)

The undersigned declares that the Contract Documents including, without limitation, the Notice to Bidders and the Instructions to Bidders have been read and agrees and proposes to furnish all necessary labor, materials, and equipment to perform and furnish all work in accordance with the terms and conditions of the Contract Documents, including, without limitation, the Drawings and Specifications of Bid No. _____.

PROJECT: _____

("Project" or "Contract") and will accept in full payment for that Work the following total lump sum amount, all taxes included:

_____ dollars	\$ _____
BASE BID	

[IF APPLICABLE] Additive/Deductive Alternates:

Alternate #1

_____ dollars	\$ _____
Additive/Deductive	
[DESCRIBE SCOPE OF WORK HERE]	

Descriptions of alternates are primarily scope definitions and do not necessarily detail the full range of materials and processes needed to complete the construction.

- [IF APPLICABLE] Unit Prices.** The Bidder's Base Bid includes the following unit prices, which the Bidder must provide and the District may, at its discretion, utilize in valuing additive and/or deductive change orders:

[LIST HERE]

2. **[IF APPLICABLE] Allowance.** The Bidder's Base Bid and each alternate shall include a ten percent (10%) allowance for unforeseen items.

The above allowance shall only be allocated for unforeseen items relating to the Work. Contractor shall not bill for or be due any portion of this allowance unless the District has identified specific work, Contractor has submitted a price for that work or the District has proposed a price for that work, the District has accepted the cost for that work, and the District has prepared a change order incorporating that work. Contractor hereby authorizes the District to execute a unilateral deductive change order at or near the end of the Project for all or any portion of the allowance not allocated.

3. The undersigned has reviewed the Work outlined in the Contract Documents and fully understands the scope of Work required in this Proposal, understands the construction and project management function(s) is described in the Contract Documents, and that each Bidder who is awarded a contract shall be in fact a prime contractor, not a subcontractor, to the District, and agrees that its Proposal, if accepted by the District, will be the basis for the Bidder to enter into a contract with the District in accordance with the intent of the Contract Documents.
4. The undersigned has notified the District in writing of any discrepancies or omissions or of any doubt, questions, or ambiguities about the meaning of any of the Contract Documents, and has contacted the Construction Manager before bid date to verify the issuance of any clarifying Addenda.
5. The undersigned agrees to commence work under this Contract on the date established in the Contract Documents and to complete all work within the time specified in the Contract Documents.
6. The liquidated damages clause of the General Conditions and Agreement is hereby acknowledged.
7. It is understood that the District reserves the right to reject this bid and that the bid shall remain open to acceptance and is irrevocable for a period of ninety (90) days.
8. The following documents are attached hereto:
 - Bid Bond on the District's form or other security
 - Designated Subcontractors List
 - Site-Visit Certification **[IF A SITE VISIT WAS REQUIRED]**
 - Noncollusion Declaration
 - Iran Contracting Act Certification **[IF CONTRACT VALUE IS \$1,000,000 OR MORE]**

9. Receipt and acceptance of the following addenda is hereby acknowledged:

No.____, Dated _____	No.____, Dated _____
No.____, Dated _____	No.____, Dated _____
No.____, Dated _____	No.____, Dated _____

10. Bidder acknowledges that the license required for performance of the Work is a _____ license.
11. The undersigned hereby certifies that Bidder is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Work.
12. Bidder specifically acknowledges and understands that if it is awarded the Contract, that it shall perform the Work of the Project while complying with all requirements of the Department of Industrial Relations [and with all requirements of the Project Labor Agreement].
13. **[INCLUDE THIS PROVISION IF THIS PROJECT USES FEDERAL FUNDS]** Bidder specifically acknowledges and understands that if it is awarded the Contract, that it shall perform the Work of the Project while complying with the Davis Bacon Act, applicable reporting requirements, and any and all other applicable requirements for federal funding. If a conflict exists, the more stringent requirement shall control.
14. **[INCLUDE THIS PROVISION IF DISTRICT PROVIDES OCIP]** Bidder specifically acknowledges and understands that if it is awarded the Contract, that it and its subcontractors shall participate in and comply with the owner-controlled or wrap-up insurance program (OCIP).
15. The Bidder represents that it is competent, knowledgeable, and has special skills with respect to the nature, extent, and inherent conditions of the Work to be performed. Bidder further acknowledges that there are certain peculiar and inherent conditions existent in the construction of the Work that may create, during the Work, unusual or peculiar unsafe conditions hazardous to persons and property.
16. Bidder expressly acknowledges that it is aware of such peculiar risks and that it has the skill and experience to foresee and to adopt protective measures to adequately and safely perform the Work with respect to such hazards.
17. Bidder expressly acknowledges that it is aware that if a false claim is knowingly submitted (as the terms "claim" and "knowingly" are defined in the California False Claims Act, Cal. Gov. Code, §12650 et seq.), the District will be entitled to civil remedies set forth in the California False Claim Act. It may also be considered fraud and the Contractor may be subject to criminal prosecution.
18. The undersigned Bidder certifies that it is, at the time of bidding, and shall be throughout the period of the contract, licensed by the State of California to do the

type of work required under the terms of the Contract Documents and registered as a public works contractor with the Department of Industrial Relations. Bidder further certifies that it is regularly engaged in the general class and type of work called for in the Contract Documents.

Furthermore, Bidder hereby certifies to the District that all representations, certifications, and statements made by Bidder, as set forth in this bid form, are true and correct and are made under penalty of perjury.

Dated this _____ day of _____ 20 ____

Name of Bidder _____

Type of Organization _____

Signed by _____

Title of Signer _____

Address of Bidder _____

Taxpayer's Identification No. of Bidder _____

Telephone Number _____

Fax Number _____

E-mail _____ Web page _____

Contractor's License No(s): No.: _____ Class: _____ Expiration Date: _____

No.: _____ Class: _____ Expiration Date: _____

No.: _____ Class: _____ Expiration Date: _____

Public Works Contractor Registration No.: _____

If Bidder is a corporation, affix corporate seal.

Name of Corporation: _____

President: _____

Secretary: _____

Treasurer: _____

Manager: _____

END OF DOCUMENT

BID BOND

(Note: If Bidder is providing a bid bond as its bid security, Bidder must use this form, NOT a surety company form.)

KNOW ALL PERSONS BY THESE PRESENTS:

That the undersigned, as _____ as Principal ("Principal"),
and _____ as Surety ("Surety"),
a corporation organized and existing under and by virtue of the laws of the State of
California and authorized to do business as a surety in the State of California, are held and
firmly bound unto the Marin Community College District ("District") of _____ County, State of
California as Obligee, in the sum of

_____ Dollars (\$ _____)

lawful money of the United States of America, for the payment of which sum well and truly
to be made, we, and each of us, bind ourselves, our heirs, executors, administrators,
successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted a
bid to the District for all Work specifically described in the accompanying bid;

NOW, THEREFORE, if the Principal is awarded the Contract and, within the time and manner
required under the Contract Documents, after the prescribed forms are presented to
Principal for signature, enters into a written contract, in the prescribed form in accordance
with the bid, and files two bonds, one guaranteeing faithful performance and the other
guaranteeing payment for labor and materials as required by law, and meets all other
conditions to the contract between the Principal and the Obligee becoming effective, or if
the Principal shall fully reimburse and save harmless the Obligee from any damage
sustained by the Obligee through failure of the Principal to enter into the written contract
and to file the required performance and labor and material bonds, and to meet all other
conditions to the Contract between the Principal and the Obligee becoming effective, then
this obligation shall be null and void; otherwise, it shall be and remain in full force and
effect. The full payment of the sum stated above shall be due immediately if Principal fails
to execute the Contract within seven (7) days of the date of the District's Notice of Award to
Principal.

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 to the work to be
performed thereunder, or the specifications accompanying the same, shall in any way 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 the Contract or the call for bids, or
to the work, or to the specifications.

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

If the District awards the bid, the security of unsuccessful bidder(s) shall be returned within sixty (60) days from the time the award is made. Unless otherwise required by law, no bidder may withdraw its bid for ninety (90) days after the date of the bid opening.

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

(Affix Corporate Seal)

Principal

By

(Affix Corporate Seal)

Surety

By

Name of California Agent of Surety

Address of California Agent of Surety

Telephone Number of California Agent of Surety

Bidder must attach Power of Attorney and Certificate of Authority for Surety and a Notarial Acknowledgment for all Surety's signatures. The California Department of Insurance must authorize the Surety to be an admitted Surety Insurer.

END OF DOCUMENT

DESIGNATED SUBCONTRACTORS LIST
(TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID)

PROJECT: _____

Bidder acknowledges and agrees that under Public Contract Code section 4100, et seq., it must clearly set forth below the name, location and California contractor license number of each subcontractor who will perform work or labor or render service to the Bidder in or about the construction of the Work or who will specially fabricate and install a portion of the Work according to detailed drawings contained in the plans and specifications in an amount in excess of one-half of one percent (0.5%) of Bidder's total Bid and the kind of Work that each will perform. Vendors or suppliers of materials only do not need to be listed.

Bidder acknowledges and agrees that under Public Contract Code section 4100, et seq., if Bidder fails to list as to any portion of Work, or if Bidder lists more than one subcontractor to perform the same portion of Work, Bidder must perform that portion itself or be subjected to penalty under applicable law. In case more than one subcontractor is named for the same kind of Work, state the portion of the kind of Work that each subcontractor will perform.

If alternate bids are called for and Bidder intends to use subcontractors different from or in addition to those subcontractors listed for work under the base Bid, Bidder must list subcontractors that will perform Work in an amount in excess of one half of one percent (0.5%) of Bidder's total Bid, including alternates.

If further space is required for the list of proposed subcontractors, attach additional sheets showing the required information, as indicated below.

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Date: _____

Proper Name of Bidder: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

SITE VISIT CERTIFICATION

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID
IF SITE VISIT WAS MANDATORY

PROJECT: _____

Check option that applies:

_____ I certify that I visited the Site of the proposed Work and became fully acquainted with the conditions relating to construction and labor. I fully understand the facilities, difficulties, and restrictions attending the execution of the Work under contract.

_____ I certify that _____ (Bidder's representative) visited the Site of the proposed Work and became fully acquainted with the conditions relating to construction and labor. The Bidder's representative fully understood the facilities, difficulties, and restrictions attending the execution of the Work under contract.

Bidder fully indemnifies the Marin Community College School District, its Architect, its Engineer, its Construction Manager, and all of their respective officers, agents, employees, and consultants from any damage, or omissions, related to conditions that could have been identified during my visit and/or the Bidder's representative's visit to the Site.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: _____

Proper Name of Bidder: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

**NON-COLLUSION DECLARATION
TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID
Public Contract Code Section 7106**

The undersigned declares:

I am the ____ of ____, 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].

Date: _____

Proper Name of Bidder: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

WORKERS' COMPENSATION CERTIFICATION

PROJECT/CONTRACT NO.: _____ between Marin Community College District ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

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:

- a. By being insured against liability to pay compensation by one or more insurers duly authorized to write compensation insurance in this state; and/or
- b. 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 his employees.

I am aware of the provisions of section 3700 of the Labor Code 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 provisions before commencing the performance of the Work of this Contract.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

(In accordance with Article Labor Code sections 1860 and 1861, the above certificate must be signed and filed with the awarding body prior to performing any Work under this Contract.)

END OF DOCUMENT

**DISABLED VETERAN BUSINESS
ENTERPRISE PARTICIPATION CERTIFICATION**

PROJECT/CONTRACT NO.: _____ Marin Community College District
("District") and _____ ("Contractor" or
"Bidder") ("Contract" or "Project").

GENERAL INSTRUCTIONS

Section 71028 of the Education Code and Public Contract Code section 10115 require community college districts using funds allocated by the State Allocation Board pursuant to the Leroy F. Greene School Facilities Act ("Act") to have a participation of at least three percent (3%), per year, of the overall dollar amount expended each year by the district, for disabled veteran business enterprises ("DVBE"). Therefore, lowest responsive responsible bidder awarded the Contract must submit this document to the District with its executed Agreement, identifying the steps contractor took to solicit DVBE participation in conjunction with this Contract. Do not submit this form with your bids.

Part I – Method of Compliance With DVBE Participation Goals. Check the appropriate box to indicate your method of committing the contract dollar amount.

YOUR BUSINESS ENTERPRISE IS:	AND YOU WILL	AND YOU WILL
A. <input type="checkbox"/> Disabled veteran owned and your forces will perform at least 3% of this Contract	Include a copy of your DVBE letter from Office of Small Business and Disabled Veterans Business Enterprise Services ("OSB")*	Complete Part 1 of this form and the Certification
B. <input type="checkbox"/> Disabled veteran owned but is unable to perform 3% of this Contract with your forces	Use DVBE subcontractors /suppliers to bring the Contract participation to at least 3%	Include a copy of each DVBE's letter from OSB (including yours, if applicable), and complete Part 1 of this form and the certification
C. <input type="checkbox"/> NOT disabled veteran owned	Use DVBE subcontractors /suppliers for at least 3% of this Contract	
D. <input type="checkbox"/> Unable to meet the required participation goals	Complete all of this Certification form	

* A DVBE letter from OSB is obtained from the participating DVBE.

You must complete the following table to show the dollar amount of DVBE participation:

	TOTAL CONTRACT PRICE
A. Prime Bidder, if DVBE (own participation)	\$
B. DVBE Subcontractor or Supplier	
1.	
2.	
3.	
4.	
C. Subtotal (A & B)	
D. Non-DVBE	
E. Total Bid	

Part II – Contacts. To identify DVBE subcontractors/suppliers for participation in your contract, you must contact each of the following categories. You should contact several DVBE organizations.

CATEGORY	TELEPHONE NUMBER	DATE CONTACTED	PERSON CONTACTED
1. The District			*
2. OSB, which publishes a list of DVBE’s; Internet Address: http://www.dgs.ca.gov/osbcr	(916) 323-5478 (916) 322-5060		*
3. DVBE Organization (List)			*

*Write “recorded message” in this column, if applicable.

Part III – Advertisement. You must advertise for DVBE participation in both a trade and focus paper. List the advertisement you place to solicit DVBE participation. Advertisements should be published at least fourteen (14) days prior to bid/proposal opening; if you cannot advertise fourteen (14) days prior, advertisements should be published as soon as possible. Advertisements must include that your firm is seeking DVBE participation, the project name and location, and you firm’s name, your contact person, and telephone number. Attach copies of advertisements to this form.

FOCUS/TRADE PAPER NAME	CHECK ONE		DATE OF ADVERTISEMENT
	TRADE	FOCUS	

Part IV. – DVBE Solicitations. List DVBE subcontractors/suppliers that were invited to bid. Use the following instructions to complete the remainder of this section (read the three columns as a sentence from left to right). If you need additional space to list DVBE solicitations, please use a separate page and attach to this form.

IF THE DVBE.....	THEN.....	AND.....		
was selected to participate	Check "yes" in the "SELECTED" column	include a copy of their DVBE letter(s) from OSB		
was NOT selected to participate	Check "NO" in the "SELECTED" column	state why in the "REASON NOT SELECTED" column		
did not respond to your solicitation	Check the "NO RESPONSE" column.			
DISABLED VETERANS BUSINESS ENTERPRISES CONTACTED	SELECTED		REASON NOT SELECTED	NO RESPONSE
	YES	NO		

A copy of this form must be retained by you and may be subject to a future audit.

CERTIFICATION

I, _____ certify that I am the bidder's _____ and that I have made a diligent effort to ascertain the facts with regard to the representations made herein. In making this certification, I am aware of section 12650 et seq. of the Government Code providing for the imposition of treble damages for making false claims.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DRUG-FREE WORKPLACE CERTIFICATION

PROJECT/CONTRACT NO.: _____ between Marin Community College District ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

This Drug-Free Workplace Certification form is required from the successful Bidder pursuant to 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 doing 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.

The District is not a "state agency" as defined in the applicable section(s) of the Government Code, but the District is a local agency and public school district under California law and requires all contractors on District projects to comply with the provisions and requirements of Government Code section 8350 et seq., the Drug-Free Workplace Act of 1990.

Contractor shall certify that it will provide a drug-free workplace by doing all of the following:

- a. 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.
- b. Establishing a drug-free awareness program to inform employees about all of the following:
 - (1) The dangers of drug abuse in the workplace.
 - (2) The person's or organization's policy of maintaining a drug-free workplace.
 - (3) The availability of drug counseling, rehabilitation, and employee-assistance programs.
 - (4) The penalties that may be imposed upon employees for drug abuse violations.
- c. Requiring that each employee engaged in the performance of the contract or grant be given a copy of the statement required above, 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 publish a statement notifying employees concerning (a) the prohibition of controlled substance at the workplace, (b) establishing a drug-free awareness program, and (c) requiring that each employee engaged in the performance of the Contract

be given a copy of the statement required by section 8355(a), and requiring that the employee agree to abide by the terms of that statement.

I also understand that if the 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 the aforementioned Act.

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: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

TOBACCO-FREE ENVIRONMENT CERTIFICATION

PROJECT/CONTRACT NO.: _____ between Marin Community College District ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

This Tobacco-Free Environment Certification form is required from the successful Bidder.

Pursuant to, without limitation, 20 U.S.C section 6083, Labor Code section 6400 et seq., Health & Safety Code section 104350 et seq. and District Board Policies, all District sites, including the Project site, are tobacco-free environments. Smoking and the use of tobacco products by all persons is prohibited on or in District property. District property includes school buildings, school grounds, school owned vehicles and vehicles owned by others while on District property.

I acknowledge that I am aware of the District's policy regarding tobacco-free environments at District sites, including the Project site and hereby certify that I will adhere to the requirements of that policy and not permit any of my firm's employees, agents, subcontractors, or my firm's subcontractors' employees or agents to use tobacco and/or smoke on the Project site.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

HAZARDOUS MATERIALS CERTIFICATION

PROJECT/CONTRACT NO.: _____ between Marin Community College District ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

1. Contractor hereby certifies that no Asbestos, or Asbestos-Containing Materials, polychlorinated biphenyl (PCB), or any material listed by the federal or state Environmental Protection Agency or federal or state health agencies as a hazardous material, or any other material defined as being hazardous under federal or state laws, rules, or regulations ("New Hazardous Material"), shall be furnished, installed, or incorporated in any way into the Project or in any tools, devices, clothing, or equipment used to affect any portion of Contractor's work on the Project for District.
2. Contractor further certifies that it has instructed its employees with respect to the above-mentioned standards, hazards, risks, and liabilities.
3. Asbestos and/or asbestos-containing material shall be defined as all items containing but not limited to chrysotile, crocidolite, amosite, anthophyllite, tremolite, and actinolite. Any or all material containing greater than one-tenth of one percent (0.1%) asbestos shall be defined as asbestos-containing material.
4. Any disputes involving the question of whether or not material is New Hazardous Material shall be settled by electron microscopy or other appropriate and recognized testing procedure, at the District's determination. The costs of any such tests shall be paid by Contractor if the material is found to be New Hazardous Material.
5. All Work or materials found to be New Hazardous Material or Work or material installed with equipment containing "New Hazardous Material" will be immediately rejected and this Work will be removed at Contractor's expense at no additional cost to the District.
6. Contractor has read and understood the document Hazardous Materials Procedures & Requirements, and shall comply with all the provisions outlined therein.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

LEAD-BASED MATERIALS CERTIFICATION

PROJECT/CONTRACT NO.: _____ between Marin Community College District ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

This certification provides notice to the Contractor that:

- (1) Contractor's work may disturb lead-containing building materials.
- (2) Contractor shall notify the District if any work may result in the disturbance of lead-containing building materials.
- (3) Contractor shall comply with the Renovation, Repair and Painting Rule, if lead-based paint is disturbed in a six-square-foot or greater area indoors or a 20-square-foot or greater area outdoors.

1. Lead as a Health Hazard

Lead poisoning is recognized as a serious environmental health hazard facing children today. Even at low levels of exposure, much lower than previously believed, lead can impair the development of a child's central nervous system, causing learning disabilities, and leading to serious behavioral problems. Lead enters the environment as tiny lead particles and lead dust disburse when paint chips, chalks, peels, wears away over time, or is otherwise disturbed. Ingestion of lead dust is the most common pathway of childhood poisoning; lead dust gets on a child's hands and toys and then into a child's mouth through common hand-to-mouth activity. Exposures may result from construction or remodeling activities that disturb lead paint, from ordinary wear and tear of windows and doors, or from friction on other surfaces.

Ordinary construction and renovation or repainting activities carried out without lead-safe work practices can disturb lead-based paint and create significant hazards. Improper removal practices, such as dry scraping, sanding, or water blasting painted surfaces, are likely to generate high volumes of lead dust.

Because the Contractor and its employees will be providing services for the District, and because the Contractor's work may disturb lead-containing building materials, CONTRACTOR IS HEREBY NOTIFIED of the potential presence of lead-containing materials located within certain buildings utilized by the District. All school buildings built prior to 1978 are presumed to contain some lead-based paint until sampling proves otherwise.

2. Overview of California Law

Education Code section 32240 et seq. is known as the Lead-Safe Schools Protection Act. Under this act, the Department of Health Services is to conduct a sample survey of schools in the State of California for the purpose of developing risk factors to predict lead contamination in public schools. (Ed. Code, § 32241.)

Any school that undertakes any action to abate existing risk factors for lead is required to utilize trained and state-certified contractors, inspectors, and workers. (Ed.

Code, § 32243, subd. (b).) Moreover, lead-based paint, lead plumbing, and solders, or other potential sources of lead contamination, shall not be utilized in the construction of any new school facility or the modernization or renovation of any existing school facility. (Ed. Code, § 32244.)

Both the Federal Occupational Safety and Health Administration ("Fed/OSHA") and the California Division of Occupational Safety and Health ("Cal/OSHA") have implemented safety orders applicable to all construction work where a contractor's employee may be occupationally exposed to lead.

The OSHA Regulations apply to all construction work where a contractor's employee may be occupationally exposed to lead. The OSHA Regulations contain specific and detailed requirements imposed on contractors subject to that regulation. The OSHA Regulations define construction work as work for construction, alteration, and/or repair, including painting and decorating. It includes, but is not limited to, the following:

- a. Demolition or salvage of structures where lead or materials containing lead are present;
- b. Removal or encapsulation of materials containing lead;
- c. New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead;
- d. Installation of products containing lead;
- e. Lead contamination/emergency cleanup;
- f. Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed; and
- g. Maintenance operations associated with the construction activities described in the subsection.

Because it is assumed by the District that all painted surfaces (interior as well as exterior) within the District contain some level of lead, it is imperative that the Contractor, its workers and subcontractors fully and adequately comply with all applicable laws, rules and regulations governing lead-based materials (including title 8, California Code of Regulations, section 1532.1).

Contractor shall notify the District if any Work may result in the disturbance of lead-containing building materials. Any and all Work that may result in the disturbance of lead-containing building materials shall be coordinated through the District. A signed copy of this Certification shall be on file prior to beginning Work on the Project, along with all current insurance certificates.

3. Renovation, Repair and Painting Rule, Section 402(c)(3) of the Toxic Substances Control Act

The EPA requires lead safe work practices to reduce exposure to lead hazards created by renovation, repair and painting activities that disturb lead-based paint. Pursuant to the Renovation, Repair and Painting Rule (RRP), renovations in homes, childcare facilities, and schools built prior to 1978 must be conducted by certified renovations firms, using renovators with training by a EPA-accredited training provider, and fully and adequately complying with all applicable laws, rules and regulations governing lead-based materials, including those rules and regulations appearing within title 40 of the Code of Federal Regulations as part 745 (40 CFR 745).

The RRP requirements apply to all contractors who disturb lead-based paint in a six-square-foot or greater area indoors or a 20-square-foot or greater area outdoors. If a DPH-certified inspector or risk assessor determines that a home constructed before 1978 is lead-free, the federal certification is not required for anyone working on that particular building.

4. Contractor's Liability

If the Contractor fails to comply with any applicable laws, rules, or regulations, and that failure results in a site or worker contamination, the Contractor will be held solely responsible for all costs involved in any required corrective actions, and shall defend, indemnify, and hold harmless the District, pursuant to the indemnification provisions of the Contract, for all damages and other claims arising therefrom.

If lead disturbance is anticipated in the Work, only persons with appropriate accreditation, registrations, licenses, and training shall conduct this Work.

It shall be the responsibility of the Contractor to properly dispose of any and all waste products, including, but not limited to, paint chips, any collected residue, or any other visual material that may occur from the prepping of any painted surface. It will be the responsibility of the Contractor to provide the proper disposal of any hazardous waste by a certified hazardous waste hauler. This company shall be registered with the Department of Transportation (DOT) and shall be able to issue a current manifest number upon transporting any hazardous material from any school site within the District.

The Contractor shall provide the District with any sample results prior to beginning Work, during the Work, and after the completion of the Work. The District may request to examine, prior to the commencement of the Work, the lead training records of each employee of the Contractor.

THE CONTRACTOR HEREBY ACKNOWLEDGES, UNDER PENALTY OF PERJURY, THAT IT:

1. HAS RECEIVED NOTIFICATION OF POTENTIAL LEAD-BASED MATERIALS ON THE OWNER'S PROPERTY;

2. IS KNOWLEDGEABLE REGARDING AND WILL COMPLY WITH ALL APPLICABLE LAWS, RULES, AND REGULATIONS GOVERNING WORK WITH, AND DISPOSAL, OF LEAD.

THE UNDERSIGNED WARRANTS THAT HE/SHE HAS THE AUTHORITY TO SIGN ON BEHALF OF AND BIND THE CONTRACTOR. THE DISTRICT MAY REQUIRE PROOF OF SUCH AUTHORITY.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

IMPORTED MATERIALS CERTIFICATION

PROJECT/CONTRACT NO.: _____ between Marin Community College District ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

This form shall be executed by all entities that, in any way, provide or deliver and/or supply any soils, aggregate, or related materials ("Fill") to the Project Site. All Fill shall satisfy all requirements of any environmental review of the Project performed pursuant to the statutes and guidelines of the California Environmental Quality Act, section 21000 et seq. of the Public Resources Code ("CEQA"), and all requirements of section 17210 et seq. of the Education Code, including requirements for a Phase I environmental assessment acceptable to the State of California Department of Education and Department of Toxic Substances Control.

Certification of: Delivery Firm/Transporter Supplier Manufacturer
 Wholesaler Broker Retailer
 Distributor Other _____

Type of Entity Corporation General Partnership
 Limited Partnership Limited Liability Company
 Sole Proprietorship Other _____

Name of firm ("Firm"): _____

Mailing address: _____

Addresses of branch office used for this Project: _____

If subsidiary, name and address of parent company: _____

By my signature below, I hereby certify that I am aware of section 25260 of the Health and Safety Code and the sections referenced therein regarding the definition of hazardous material. I further certify on behalf of the Firm that all soils, aggregates, or related materials provided, delivered, and/or supplied or that will be provided, delivered, and/or supplied by this Firm to the Project Site are free of any and all hazardous material as defined in section 25260 of the Health and Safety Code. I further certify that I am authorized to make this certification on behalf of the Firm.

Date: _____

Proper Name of Firm: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

SEX OFFENDER REGISTRATION ACT CERTIFICATION

PROJECT/CONTRACT NO.: _____ between the Marin Community College District ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

This certification provides notice to the Contractor that:

- Penal Code section 290.01 requires every person required to register pursuant to sections 290 to 290.009, inclusive, of the Sex Offender Registration Act who is carrying on a vocation at the community college for more than fourteen (14) days, or for an aggregate period exceeding thirty (30) days in a calendar year, shall, in addition to the registration required by the Sex Offender Registration Act, register with the campus police department within five working days of commencing employment at that community college on a form as may be required by the Department of Justice. The terms "employed or carries on a vocation" include employment whether or not financially compensated, volunteered, or performed for government or educational benefit.
- If the community college has no campus police department, the registrant shall instead register with the police of the city in which the campus is located or the sheriff of the county in which the campus is located if the campus is located in an unincorporated area or in a city that has no police department, on a form as may be required by the Department of Justice.
- The registrant shall also notify the campus police department within five (5) working days of ceasing to be employed, or ceasing to carry on a vocation, at the community college.

Contractor hereby acknowledges, under penalty of perjury, that it is aware of the provisions of section 290.01 of the Penal Code, and it will provide notice of the above provisions to all of its employees, subcontractors, and employees of subcontractors regardless of whether they are designated as employees or acting as independent contractors of the Contractor at least five (5) working days before commencing the performance of the Work of this Contract.

THE UNDERSIGNED WARRANTS THAT HE/SHE HAS THE AUTHORITY TO SIGN ON BEHALF OF AND BIND THE CONTRACTOR. THE DISTRICT MAY REQUIRE PROOF OF SUCH AUTHORITY.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

BUY AMERICAN CERTIFICATION

PROJECT/CONTRACT NO.: _____ between Marin Community College District ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

Federal regulations require that all of the iron, steel, and manufactured goods used in projects for the construction, installation, repairs, renovation, modernization, or maintenance of a public building or public work funded in part or in whole by federal stimulus funds, with the exception of projects funded by Qualified School Construction Bonds, be produced in the United States of America, unless a federal department waives this requirement because (1) it is inconsistent with the public interest, (2) the goods are not produced in sufficient quantities or of satisfactory quality in the United States, or (3) the requirement would increase the cost of the Project overall by more than twenty-five percent (25%) ("Buy American").

Contractor shall submit this Certification with its executed agreement, identifying the steps Contractor will take to use goods produced in the United States of America in carrying out this Contract. Bidder should not submit this form with its bid.

Contractor shall retain a copy of this form and may be subject to a future audit.

CERTIFICATION

On behalf of Contractor, I represent and covenant that Contractor will use on the Project only iron, steel and manufactured goods produced in the United States of America except goods for which a federal department has waived this requirement.

I, _____, certify that I am the Contractor's _____ and that the representations and covenants made herein are true and correct. In making this certification, I am aware of section 12650 et seq. of the Government Code providing for the imposition of treble damages for making false claims.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

By my signature below, I hereby certify that, to the best of my knowledge, the contents of this disclosure are true, or are believed to be true. I further certify on behalf of the Firm that I am aware of section 3000 et seq. of the California Public Contract Code, and the sections referenced therein regarding the penalties for providing false information or failing to disclose a financial relationship in this disclosure. I further certify that I am authorized to make this certification on behalf of the Firm.

Date: _____

Proper Name of Firm: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

IRAN CONTRACTING ACT CERTIFICATION
(Public Contract Code sections 2202-2208)

PROJECT/CONTRACT NO.: _____ between Marin Community College District ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

Prior to bidding on or submitting a proposal for a contract for goods or services of \$1,000,000 or more to the District, the Bidder must either: a) certify it is **not** on the current list of persons engaged in investment activities in Iran created by the California Department of General Services ("DGS") pursuant to Public Contract Code section 2203(b) and is not a financial institution extending twenty million dollars (\$20,000,000) or more in credit to another person, for 45 days or more, if that other person will use the credit to provide goods or services in the energy sector in Iran and is identified on the current list of persons engaged in investment activities in Iran created by DGS; or b) demonstrate it has been exempted from the certification requirement for that solicitation or contract pursuant to Public Contract Code section 2203(c) or (d).

To comply with this requirement, please insert your vendor or financial institution name and Federal ID Number (if available) and complete **one** of the options below. Please note: California law establishes penalties for providing false certifications, including civil penalties equal to the greater of \$250,000 or twice the amount of the contract for which the false certification was made; contract termination; and three-year ineligibility to bid on contracts. (Public Contract Code section 2205.)

OPTION #1 - CERTIFICATION

I, the official named below, certify I am duly authorized to execute this certification on behalf of the vendor/financial institution identified below, and the vendor/financial institution identified below is **not** on the current list of persons engaged in investment activities in Iran created by DGS and is not a financial institution extending twenty million dollars (\$20,000,000) or more in credit to another person/vendor, for 45 days or more, if that other person/vendor will use the credit to provide goods or services in the energy sector in Iran and is identified on the current list of persons engaged in investment activities in Iran created by DGS.

<i>Vendor Name/Financial Institution (Printed)</i>		<i>Federal ID Number (or n/a)</i>
<i>By (Authorized Signature)</i>		
<i>Printed Name and Title of Person Signing</i>		
<i>Date Executed</i>	<i>Executed in</i>	

OPTION #2 - EXEMPTION

Pursuant to Public Contract Code sections 2203(c) and (d), a public entity may permit a vendor/financial institution engaged in investment activities in Iran, on a case-by-case

basis, to be eligible for, or to bid on, submit a proposal for, or to enter into or to renew, a contract for goods and services.

If you have obtained an exemption from the certification requirement under the Iran Contracting Act, please fill out the information below, and attach documentation demonstrating the exemption approval.

<i>Vendor Name/Financial Institution (Printed)</i>	<i>Federal ID Number (or n/a)</i>
<i>By (Authorized Signature)</i>	
<i>Printed Name and Title of Person Signing</i>	<i>Date Executed</i>

END OF DOCUMENT

POST BID INTERVIEW

PART 1 – GENERAL

1.01 SUMMARY

If requested by the District, this Section requires the apparent low bidder to attend and participate in a Post Bid Interview with the Construction Manager, prior to award of any contract by the District. The Post Bid Interview will be scheduled by the CONSTRUCTION Manager within three (3) calendar days after the date of bid.

1.02 REQUIRED ATTENDANCE

- A. A duly authorized representative of the apparent low bidder is required to attend the Post Bid Interview, in person.
- B. The apparent low bidder's authorized representative must have signatory authority on behalf of the apparent low bidder.
- C. Failure to attend the Post Bid Interview will be considered just cause for the District to reject the Bid.

1.03 POST BID INTERVIEW PROCEDURE

- A. The Construction Manager will review the Bid with the attendees.
- B. The Construction Manager will review the Contract Documents with the attendees, including but not limited to:
 - (1) Insurance
 - (2) Bonding
 - (3) Addenda
 - (4) Pre-Bid Clarifications
 - (5) Scope of Work
 - (6) Bid Packages Descriptions
 - (7) Bid Alternates
 - (8) The Contract Plans
 - (9) The Contract Specifications
 - (10) The Project Schedule and Schedule Requirements
 - (11) Critical Dates Requirement for Other Bid Packages

- (12) Prevailing Wage Requirements
- (13) Liquidated Damages
- (14) Required Documentation for Contract Administration
- (15) Contract Coordination Requirements

1.04 POST BID INTERVIEW DOCUMENTATION

The Construction Manager will document the Post Bid Interview on the form attached to this Section. Both the Apparent Low Bidder and the Construction Manager are required to sign the Post Bid Interview Documentation.

POST BID INTERVIEW

CONSTRUCTION MANAGER

[Name]

[Address 1]

[Address 2]

[Phone]

[Fax]

BIDDER: _____

DATE: _____ TIME: _____ PHONE # _____

I. INTRODUCTIONS:

A. Present

_____	_____
CONTRACTOR	CONTRACTOR
_____	_____
_____	_____
[CM]	[CM]

II. PROPOSED CONTRACT: _____

III. PURPOSE OF INTERVIEW IS TO ASSURE:

- A. Do you acknowledge submission of a complete and accurate bid? Yes No
- B. Do you acknowledge the Bid Document submittal timelines after NOA and NTP and can you meet those timelines? Yes No
- C. Do you acknowledge the requirements for the escrow of bid documents? Yes No

IV. CONTRACTUAL REQUIREMENTS:

- A. Do you understand you are a prime contractor? Yes No
- B. Can you meet specified insurance requirements? Yes No
 - 1. Does any of your policies that require Additional Insured endorsements exceed the minimum coverage requirements? Yes No
 - 2. Are you requesting that the District accept an Umbrella or Excess Liability Insurance Policy to meet the policy limit? Yes No
 - 3. Will there be a gap between the per occurrence amount of any underlying policy and the start of the coverage under the Umbrella or Excess Liability Insurance Policy? Yes No

- | | | | |
|----|---|-----|----|
| C. | Will you provide the Performance, and a Labor and Material Bond for 100% of the Contract Price as stipulated? | Yes | No |
| 1. | Cost for bond: _____% | | |
| 2. | Is the cost of your bond in your base bid? | Yes | No |
| 3. | Is your surety licensed to issue bonds in California? | Yes | No |

V. SCOPE OF WORK:

- | | | | |
|----|--|-----|----|
| A. | Acknowledged Receipt of Addenda #1-__ | Yes | No |
| B. | Are the costs for addenda items included in your bid? (if applicable) | Yes | No |
| C. | Do you have a complete understanding of your Scope of Work under the proposed Agreement? | Yes | No |
| D. | You have re-reviewed the documents and understand the Scope of the Work. Are there any items that require clarification? | Yes | No |

If yes, please identify them.

1. _____

2. _____

3. _____

4. _____

5. _____

Is (are) the cost(s) for above items?	Yes	No
---------------------------------------	-----	----

- | | | | |
|----|---|-----|----|
| C. | Review bid alternative (if applicable) #1-__ | | |
| D. | Are the plans and specifications clear and understandable to your satisfaction? | Yes | No |

VI. SCHEDULE:

- A. Do you acknowledge and agree to the stipulated completion dates and milestones in the contract? Yes No
1. Will you provide a detailed construction schedule to _____ within the required ten (10) days, per the contract? Yes No
2. It is understood that the Project schedule is critical and that that weekend and overtime work may be required to meet the milestones. Yes No
3. It is understood that if rain does occur, then all dewatering and And protection of work is required, per the contract. Yes No

If not, what must change and why? _____

B. Identify critical materials, deliveries, long lead items and other dependencies, including Owner Furnished items that could affect the completion of your work.

1. _____
2. _____
3. _____
4. _____
5. _____

VII. CONTRACTOR COMMENTS/SUGGESTIONS:

1. _____
2. _____
3. _____
4. _____
5. _____

VIII. CONTRACTOR

You agree the information contained herein is part of your contractual obligations. Your signature acknowledges your agreement to perform all Work in the Contract Documents, and that costs for all Work are included in your bid.

The foregoing information is true and accurate, and I am authorized to sign as an officer of the company I am representing.

[Company Name]

Signature _____ Title: _____

Date: _____

IX. CONSTRUCTION MANAGER

Signature _____ Title: _____

Date: _____

Title of Document: POST BID INTERVIEW

Number of Pages: _____

Date of Document: _____

END OF DOCUMENT

NOTICE OF AWARD

Dated: _____ 20__

To: _____
(Contractor)

To: _____
(Address)

From: Governing Board ("Board") of Marin Community College District ("District" or "Owner")

PROJECT: _____

("Project" or "Contract").

Contractor has been awarded the referenced Contract on _____, 20__,
[**CHOOSE ONE**: by action of the District's Board [**OR**] by action of the superintendent or superintendent's designee pursuant to a delegation of authority by the District's Board].

The Contract Price is _____ Dollars (\$ _____), and includes alternates _____.

Three (3) copies of each of the Contract Documents (except Drawings) accompany this Notice of Award. Three (3) sets of the Drawings will be delivered separately or otherwise made available. Additional copies are available at cost of reproduction.

You must comply with the following conditions precedent within **SEVEN (7)** calendar days of the date of this Notice of Award.

The Bidder to whom Contract is awarded shall execute and submit the following documents by 5:00 p.m. of the **SEVENTH (7th)** calendar day following the date of the Notice of Award.

- a. Agreement: To be executed by successful Bidder. Submit four (4) copies, each bearing an original signature.
- b. Escrow of Bid Documentation: This must include all required documentation. See the document Escrow of Bid Documentation for more information.
- c. Performance Bond (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.
- d. Payment Bond (Contractor's Labor & Material Bond) (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.
- e. Insurance Certificates and Endorsements as required.
- f. Workers' Compensation Certification.

- g. Prevailing Wage and Related Labor Requirements Certification.
- h. Disabled Veterans' Business Enterprise Participation Certification. **[IF APPLICABLE]**
- i. Drug-Free Workplace Certification. **[IF APPLICABLE]**
- j. Tobacco-Free Environment Certification. **[IF APPLICABLE]**
- k. Hazardous Materials Certification. **[IF APPLICABLE]**
- l. Lead-Based Paint Certification. **[IF APPLICABLE]**
- m. Imported Materials Certification. **[IF APPLICABLE]**
- n. Buy American Certification. **[IF APPLICABLE]**
- o. Roofing Project Certification: from Contractor, Material Manufacturer and/or Vendor. **[IF APPLICABLE]**

Failure to comply with these conditions within the time specified will entitle District to consider your bid abandoned, to annul this Notice of Award, and to declare your Bid Security forfeited, as well as any other rights the District may have against the Contractor.

After you comply with those conditions, District will return to you one fully signed counterpart of the Agreement.

MARIN COMMUNITY COLLEGE SCHOOL DISTRICT

BY: _____

NAME: _____

TITLE: _____

END OF DOCUMENT

AGREEMENT

THIS AGREEMENT IS MADE AND ENTERED INTO THIS _____ DAY OF _____
_____, 20____, by and between the Marin Community College District ("District") and _____

("Contractor")
("Agreement").

WITNESSETH: That the parties hereto have mutually covenanted and agreed, and by these presents do covenant and agree with each other, as follows:

- 1. The Work:** Contractor agrees to furnish all tools, equipment, apparatus, facilities, labor, and material necessary to perform and complete in a good and workmanlike manner, the work of the following project:

PROJECT: _____

("Project" or "Contract" or "Work")

It is understood and agreed that the Work shall be performed and completed as required in the Contract Documents including, without limitation, the Drawings and Specifications and submission of all documents required to secure funding or by the Division of the State Architect for close-out of the Project, under the direction and supervision of, and subject to the approval of, the District or its authorized representative.

- 2. The Contract Documents:** The complete Contract consists of all Contract Documents as defined in the General Conditions and incorporated herein by this reference. Any and all obligations of the District and Contractor are fully set forth and described in the Contract Documents. All Contract Documents are intended to cooperate so that any Work called for in one and not mentioned in the other or vice versa is to be executed the same as if mentioned in all Contract Documents.

- 3. Interpretation of Contract Documents:** Should any question arise concerning the intent or meaning of Contract Documents, including the Drawings or Specifications, the question shall be submitted to the District for interpretation. If a conflict exists in the Contract Documents, modifications, beginning with the most recent, shall control over this Agreement (if any), which shall control over the Special Conditions, which shall control over any Supplemental Conditions, which shall control over the General Conditions, which shall control over the remaining Division 0 documents, which shall control over Division 1 Documents which shall control over Division 2 through Division 18 documents, which shall control over figured dimensions, which shall control over large-scale drawings, which shall control over small-scale drawings. In no case shall a document calling for lower quality and/or quantity material or workmanship control. The decision of the District in the matter shall be final.

- 4. Time for Completion:** It is hereby understood and agreed that the work under this contract shall be completed within _____ [SPELL OUT COMPLETION DAYS] (_____) [INDICATE NUMBER OF DAYS] consecutive calendar days ("Contract Time") from the date specified in the District's

Notice to Proceed. **[IF COMPLETION DATE IS REQUIRED, THEN PUT IN SPECIFIC COMPLETION DATE – THIS WOULD BE AN EXCEPTION TO THE STANDARD LISTING OF THE NUMBER OF DAYS. ENSURE THIS PARAGRAPH IS CONSISTENT WITH THE NOTICE TO PROCEED, DOCUMENT 00520.]**

5. **Completion-Extension of Time:** Should the Contractor fail to complete this Contract, and the Work provided herein, within the time fixed for completion, due allowance being made for the contingencies provided for herein, the Contractor shall become liable to the District for all loss and damage that the District may suffer on account thereof. The Contractor shall coordinate its work with the Work of all other contractors. The District shall not be liable for delays resulting from Contractor's failure to coordinate its Work with other contractors in a manner that will allow timely completion of Contractor's Work. Contractor shall be liable for delays to other contractors caused by Contractor's failure to coordinate its Work with the work of other contractors.
6. **Liquidated Damages:** Time is of the essence for all work under this Agreement. It is hereby understood and agreed that it is and will be difficult and/or impossible to ascertain and determine the actual damage that the District will sustain in the event of and by reason of Contractor's delay; therefore, Contractor agrees that it shall pay to the District the sum of _____ dollars (\$ _____) per day as liquidated damages for each and every day's delay beyond the time herein prescribed in finishing the Work. **[FOR EXAMPLE: \$1,000.00/DAY FOR CONTRACTS BELOW \$1,000,000.00; \$2,000.00/DAY FOR CONTRACTS \$1,000,000.01 -- \$4,000,000.00; \$3,500.00/DAY FOR CONTRACTS \$4,000,000.01 – \$10,000,000.00; \$5,000.00/DAY FOR CONTRACTS OVER \$10,000,000.01]**

It is hereby understood and agreed that this amount is not a penalty.

In the event that any portion of the liquidated damages is not paid to the District, the District may deduct that amount from any money due or that may become due the Contractor under this Agreement. The District's right to assess liquidated damages is as indicated herein and in the General Conditions.

The time during which the Contract is delayed for cause as hereinafter specified may extend the time of completion for a reasonable time as the District may grant. This provision does not exclude the recovery of damages for delay by either party under other provisions in the Contract Documents.

7. **Loss Or Damage:** The District and its authorized representatives shall not in any way or manner be answerable or suffer loss, damage, expense, or liability for any loss or damage that may happen to the Work, or any part thereof, or in or about the same during its construction and before acceptance, and the Contractor shall assume all liabilities of every kind or nature arising from the Work, either by accident, negligence, theft, vandalism, or any cause whatever; and shall hold the District and its authorized representatives harmless from all liability of every kind and nature arising from accident, negligence, or any cause whatever.
8. **Insurance and Bonds:** Before commencing the Work, Contractor shall provide all required certificates of insurance, and payment and performance bonds as evidence thereof.

[REPLACE WITH THE FOLLOWING IF DISTRICT PROVIDES OCIP]

Insurance and Bonds: Contractor and all Subcontractors under the Contractor shall participate in and comply with the owner-controlled or wrap-up insurance program (OCIP). Before commencing the Work, Contractor shall provide all required certificates of insurance, except for those coverages provided by the OCIP as described in the OCIP Manual, and payment and performance bonds as evidence thereof.

- 9. Prosecution of Work:** If the Contractor should neglect to prosecute the Work properly or fail to perform any provisions of this contract, the District, may, pursuant to the General Conditions and without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.
- 10. Authority of Architect, Project Inspector, and DSA:** Contractor hereby acknowledges that the Architect(s), the Project Inspector(s), and the Division of the State Architect have authority to approve and/or stop Work if the Contractor's Work does not comply with the requirements of the Contract Documents, Title 24 of the California Code of Regulations, and all applicable laws. The Contractor shall be liable for any delay caused by its non-compliant Work.
- 11. Assignment of Contract:** Neither the Contract, nor any part thereof, nor any moneys due or to become due thereunder, may be assigned by the Contractor without the written approval of the District, nor without the written consent of the Surety on the Contractor's Performance Bond (the "Surety"), unless the Surety has waived in writing its right to notice of assignment.
- 12. Classification of Contractor's License:** Contractor hereby acknowledges that it currently holds valid Type _____ Contractor's license(s) **[ENSURE ALL REQUIRED LICENSES ARE LISTED HERE]** issued by the State of California, Contractor's State Licensing Board, in accordance with division 3, chapter 9, of the Business and Professions Code and in the classification called for in the Contract Documents.
- 13. Registration as Public Works Contractor:** The Contractor and all Subcontractors currently are registered as public works contractors with the Department of Industrial Relations, State of California, in accordance with Labor Code section 1771.4.
- 14. Payment of Prevailing Wages:** The Contractor and all Subcontractors shall pay all workers on all Work performed pursuant to this Contract not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the District, pursuant to sections 1770 et seq. of the California Labor Code. **[If Project is funded in whole or in part with federal funds,** the Contractor and all Subcontractors shall comply with the Davis Bacon Act, applicable reporting requirements, and any other applicable requirements for federal funding. If a conflict exists, the more stringent provision shall control over this Agreement.]

15. This Project is subject to labor compliance monitoring and enforcement by the Department of Industrial Relations pursuant to Labor Code section 1771.4 and Title 8 of the California Code of Regulations. Contractor specifically acknowledges and understands that it shall perform the Work of this Agreement while complying with all the applicable provisions of Division 2, Part 7, Chapter 1, of the Labor Code, including, without limitation, the requirement that the Contractor and all of its Subcontractors shall timely submit complete and accurate electronic certified payroll records as required by the Contract Documents, or the District may not issue payment.

16. Contract Price: In consideration of the foregoing covenants, promises, and agreements on the part of the Contractor, and the strict and literal fulfillment of each and every covenant, promise, and agreement, and as compensation agreed upon for the Work and construction, erection, and completion as aforesaid, the District covenants, promises, and agrees that it will well and truly pay and cause to be paid to the Contractor in full, and as the full Contract Price and compensation for construction, erection, and completion of the Work hereinabove agreed to be performed by the Contractor, the following price:

Dollars

(\$ _____),

in lawful money of the United States, which sum is to be paid according to the schedule provided by the Contractor and accepted by the District and subject to additions and deductions as provided in the Contract. This amount supersedes any previously stated and/or agreed to amount(s).

17. Severability: If any term, covenant, condition, or provision in any of the Contract Documents is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remainder of the provisions in the Contract Documents shall remain in full force and effect and shall in no way be affected, impaired, or invalidated thereby.

IN WITNESS WHEREOF, accepted and agreed on the date indicated above:

CONTRACTOR

DISTRICT

MARIN COMMUNITY COLLEGE DISTRICT

By: _____

By: _____

Title: _____

Title: _____

NOTE: If the party executing this Contract is a corporation, a certified copy of the by-laws, or of the resolution of the Board of Directors, authorizing the officers of said corporation to execute the Contract and the bonds required thereby must be attached hereto.

END OF DOCUMENT

NOTICE TO PROCEED

Dated: _____, 20__

TO: _____
("Contractor")

ADDRESS: _____

PROJECT: _____

PROJECT/CONTRACT NO.: __ between the Marin Community College District and Contractor ("Contract").

You are notified that the Contract Time under the above Contract will commence to run on _____, 20__. By that date, you are to start performing your obligations under the Contract Documents. In accordance with the Agreement executed by Contractor, the date of completion is _____, 20__. **[ENSURE THIS PARAGRAPH IS CONSISTENT WITH §4 OF DOCUMENT 00 52 13 (AGREEMENT)]**

You must submit the following documents by 5:00 p.m. of the **(TENTH (10th))** calendar day following the date of this Notice to Proceed:

- a. Contractor's preliminary schedule of construction.
- b. Contractor's preliminary schedule of values for all of the Work.
- c. Contractor's preliminary schedule of submittals, including Shop Drawings, Product Data, and Samples submittals
- d. Contractor's Safety Plan specifically adapted for the Project.
- e. A complete subcontractors list, including the name, address, telephone number, facsimile number, California State Contractors License number, classification, and monetary value of all Subcontracts.

Thank you. We look forward to a very successful Project.

MARIN COMMUNITY COLLEGE DISTRICT

BY: _____

NAME: _____

TITLE: _____

END OF DOCUMENT

ESCROW BID DOCUMENTATION

1. Requirement to Escrow Bid Documentation

- a. Contractor shall submit, within **SEVEN (7)** calendar days after the date of the Notice of Award, one copy of all documentary information received or generated by Contractor in preparation of bid prices for this Contract, as specified herein. This material is referred to herein as "Escrow Bid Documentation." The Escrow Bid Documentation of the Contractor will be held in escrow for the duration of the Contract.
- b. Contractor agrees, as a condition of award of the Contract, that the Escrow Bid Documentation constitutes all written information used in the preparation of its bid, and that no other written bid preparation information shall be considered in resolving disputes or claims. Contractor also agrees that nothing in the Escrow Bid Documentation shall change or modify the terms or conditions of the Contract Documents.
- c. The Escrow Bid Documentation will not be opened by District except as indicated herein. The Escrow Bid Documentation will be used only for the resolution of change orders and claims disputes.
- d. Contractor's submission of the Escrow Bid Documentation, as with the bonds and insurance documents required, is considered an essential part of the Contract award. Should the Contractor fail to make the submission within the allowed time specified above, District may deem the Contractor to have failed to enter into the Contract, and the Contractor shall forfeit the amount of its bid security, accompanying the Contractor's bid, and District may award the Contract to the next lowest responsive responsible bidder.
- e. NO PAYMENTS WILL BE MADE, NOR WILL DISTRICT ACCEPT PROPOSED CHANGE ORDERS UNTIL THE ABOVE REQUIRED INFORMATION IS SUBMITTED AND APPROVED.
- f. The Escrow Bid Documentation shall be submitted in person by an authorized representative of the Contractor to the District.

2. Ownership of Escrow Bid Documentation

- a. The Escrow Bid Documentation is, and shall always remain, the property of Contractor, subject to review by District, as provided herein.
- b. Escrow Bid Documentation constitute trade secrets, not known outside Contractor's business, known only to a limited extent and only by a limited number of employees of Contractor, safeguarded while in Contractor's possession, extremely valuable to Contractor, and could be extremely valuable to Contractor's competitors by virtue of it reflecting Contractor's contemplated techniques of construction. Subject to the provisions herein, District agrees to safeguard the Escrow Bid Documentation, and all

information contained therein, against disclosure to the fullest extent permitted by law.

3. Format and Contents of Escrow Bid Documentation

- a. Contractor may submit Escrow Bid Documentation in its usual cost-estimating format; a standard format is not required. The Escrow Bid Documentation shall be submitted in the language (e.g., English) of the specification.
- b. Escrow Bid Documentation must clearly itemize the estimated costs of performing the work of each bid item contained in the bid schedule, separating bid items into sub-items as required to present a detailed cost estimate and allow a detailed cost review. The Escrow Bid Documentation shall include all subcontractor bids or quotes, supplier bids or quotes, quantity takeoffs, crews, equipment, calculations of rates of production and progress, copies of quotes from subcontractors and suppliers, and memoranda, narratives, add/deduct sheets, and all other information used by the Contractor to arrive at the prices contained in the bid proposal. Estimated costs should be broken down into Contractor's usual estimate categories such as direct labor, repair labor, equipment ownership and operation, expendable materials, permanent materials, and subcontract costs as appropriate. Plant and equipment and indirect costs should be detailed in the Contractor's usual format. The Contractor's allocation of indirect costs, contingencies, markup, and other items to each bid item shall be identified.
- c. All costs shall be identified. For bid items amounting to less than \$10,000, estimated unit costs are acceptable without a detailed cost estimate, provided that labor, equipment, materials, and subcontracts, as applicable, are included and provided that indirect costs, contingencies, and markup, as applicable, are allocated.
- d. Bid Documentation provided by District should not be included in the Escrow Bid Documentation unless needed to comply with the following requirements.

4. Submittal of Escrow Bid Documentation

- a. The Escrow Bid Documentation shall be submitted by the Contractor in a sealed container within **SEVEN (7)** calendar days after the date of the Notice of Award. The container shall be clearly marked on the outside with the Contractor's name, date of submittal, project name and the words "Escrow Bid Documentation – Intended to be opened in the presence of Authorized Representatives of Both District and Contractor".
- b. By submitting Escrow Bid Documentation, Contractor represents that the material in the Escrow Bid Documentation constitutes all the documentary information used in preparation of the bid and that the Contractor has personally examined the contents of the Escrow Bid Documentation container and has found that the documents in the container are complete.
- c. If Contractor's proposal is based upon subcontracting any part of the work, each subcontractor whose total subcontract price exceeds 5 percent of the total contract price proposed by Contractor, shall provide separate Escrow

Documents to be included with those of Contractor. Those documents shall be opened and examined in the same manner and at the same time as the examination described above for Contractor.

- d. If Contractor wishes to subcontract any portion of the Work after award, District retains the right to require Contractor to submit Escrow Documents for the Subcontractor before the subcontract is approved.

5. Storage, Examination and Final Disposition of Escrow Bid Documentation

- a. The Escrow Bid Documentation will be placed in escrow, for the life of the Contract, in a mutually agreeable institution. The cost of storage will be paid by Contractor for the duration of the project until final Contract payment. The storage facilities shall be the appropriate size for all the Escrow Bid Documentation and located conveniently to both District's and Contractor's offices.
- b. The Escrow Bid Documentation shall be examined by both District and Contractor, at any time deemed necessary by either District or Contractor, to assist in the negotiation of price adjustments and change orders or the settlement of disputes and claims. In the case of legal proceedings, Escrow Bid Documentation shall be used subject to the terms of an appropriate protective order if requested by Contractor and ordered by a court of competent jurisdiction. Examination of the Escrow Bid Documentation is subject to the following conditions:
 - (1) As trade secrets, the Escrow Bid Documentation is proprietary and confidential to the extent allowed by law.
 - (2) District and Contractor shall each designate, in writing to the other party **SEVEN (7)** calendar days prior to any examination, the names of representatives who are authorized to examine the Escrow Bid Documentation. No other person shall have access to the Escrow Bid Documentation.
 - (3) Access to the documents may take place only in the presence of duly designated representatives of the District and Contractor. If Contractor fails to designate a representative or appear for joint examination on **SEVEN (7)** calendar days notice, then the District representative may examine the Escrow Bid Documents alone upon an additional **THREE (3)** calendar days notice if a representative of the Contractor does not appear at the time set.
 - (4) If a subcontractor has submitted sealed information to be included in the Escrow Bid Documents, access to those documents may take place only in the presence of a duly designated representative of the District, Contractor and that subcontractor. If that subcontractor fails to designate a representative or appear for joint examination on **SEVEN (7)** calendar days notice, then the District representative and/or the Contractor may examine the Escrow Bid Documentation without that subcontractor present upon an additional **THREE (3)** calendar days

notice if a representative of that subcontractor does not appear at the time set.

- c. The Escrow Bid Documentation will be returned to Contractor at such time as the Contract has been completed and final settlement has been achieved.

END OF DOCUMENT

ESCROW AGREEMENT IN LIEU OF RETENTION
Public Contract Code Section 22300

(Note: Contractor must use this form.)

This Escrow Agreement ("Escrow Agreement") is made and entered into this _____ day of _____, 20____, by and between the Marin Community College District ("District"), whose address is _____, California, and _____ ("Contractor"), whose address is _____, and _____ ("Escrow Agent"), a state or federally chartered bank in the state of California, whose address is _____.

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

1. Pursuant to section 22300 of Public Contract Code of the State of California, which is hereby incorporated by reference, Contractor has the following two (2) options:
 - Deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by District pursuant to the Construction Contract No. _____ entered into between District and Contractor for the _____ Project, in the amount of _____ Dollars (\$ _____) dated, _____, 20____, (the "Contract"); **or**
 - On written request of Contractor, District shall make payments of the retention earnings for the above referenced Contract directly to Escrow Agent.

When Contractor deposits the securities as a substitute for Contract earnings (first option), Escrow Agent shall notify District within ten (10) calendar days of the deposit. The market value of the securities at the time of substitution and at all times from substitution until the termination of the Escrow Agreement shall be at least equal to the cash amount then required to be withheld as retention under terms of Contract between District and Contractor.

Securities shall be held in name of Marin Community College Community College District, and shall designate Contractor as beneficial owner.

2. District shall make progress payments to Contractor for those funds which otherwise would be withheld from progress payments pursuant to Contract provisions, provided that Escrow Agent holds securities in form and amount specified above.
3. When District makes payment of retention earned directly to Escrow Agent, Escrow Agent shall hold them for the benefit of Contractor until the time that the escrow created under this Escrow Agreement is terminated. Contractor may direct the investment of the payments into securities. All terms and conditions of this Escrow

Agreement and the rights and responsibilities of the Parties shall be equally applicable and binding when District pays 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 District. The District will charge Contractor \$_____ for each of District's deposits to the escrow account. These expenses and payment terms shall be determined by District, Contractor, and Escrow Agent.
5. Interest earned on securities or money market accounts held in escrow and all interest earned on that interest shall be for sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to District.
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 District to Escrow Agent that District consents to withdrawal of amount sought to be withdrawn by Contractor.
7. District shall have the right to draw upon the securities and/or withdraw amounts from the Escrow Account in the event of default by Contractor. Upon seven (7) days' written notice to Escrow Agent from District of the default, if applicable, Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by District.
8. Upon receipt of written notification from District certifying that the Contract is final and complete, and that 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 monies and securities on deposit and payments of fees and charges.
9. Escrow Agent shall rely on written notifications from District and Contractor pursuant to Paragraphs 5 through 8, inclusive, of this Escrow Agreement and District and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of securities and interest as set forth above.
10. Names of persons who are authorized to give written notice or to receive written notice on behalf of District and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of District:

On behalf of Contractor:

Title

Title

Name

Name

Signature

Signature

Address

Address

On behalf of Escrow Agent:

Title

Name

Signature

Address

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

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

On behalf of District:

Title

Name

Signature

Address

On behalf of Contractor:

Title

Name

Signature

Address

END OF DOCUMENT

PERFORMANCE BOND
(100% of Contract Price)

(Note: Bidders must use this form, NOT a surety company form.)

KNOW ALL PERSONS BY THESE PRESENTS:

WHEREAS, the governing board ("Board") of the Marin Community College District, ("District") and _____ ("Principal") have entered into a contract for the furnishing of all materials and labor, services and transportation, necessary, convenient, and proper to perform the following project:

_____ (Project Name)

("Project" or "Contract") which Contract dated _____, 20____, and all of the Contract Documents attached to or forming a part of the Contract, are hereby referred to and made a part hereof; and

WHEREAS, said Principal is required under the terms of the Contract to furnish a bond for the faithful performance of the Contract.

NOW, THEREFORE, the Principal and _____ ("Surety") are held and firmly bound unto the Board of the District in the penal sum of _____

Dollars (\$_____), lawful money of the United States, for the payment of which sum well and truly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally, firmly by these presents, to:

- Perform all the work required to complete the Project; and
- Pay to the District all damages the District incurs as a result of the Principal's failure to perform all the Work required to complete the Project.

The condition of the obligation is such that, if the above bounden Principal, his or its 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 the Contract and any alteration thereof made as therein provided, on his or its part to be kept and performed at the time and in the intent and meaning, including all contractual guarantees and warranties of materials and workmanship, and shall indemnify and save harmless the District, its trustees, officers and agents, as therein stipulated, then this obligation shall become null and void, otherwise it shall be and remain in full force and virtue.

Surety expressly agrees that the District may reject any contractor or subcontractor proposed by Surety to fulfill its obligations in the event of default by the Principal. Surety shall not utilize Principal in completing the Work nor shall Surety accept a Bid from Principal for completion of the Work if the District declares the Principal to be in default and notifies

Surety of the District's objection to Principal's further participation in the completion of the Work.

As a condition precedent to the satisfactory completion of the Contract, the above obligation shall hold good for a period equal to the warranty and/or guarantee period of the Contract, during which time Surety's obligation shall continue if Contractor shall fail to make full, complete, and satisfactory repair and replacements and totally protect the District from loss or damage resulting from or caused by defective materials or faulty workmanship. The obligations of Surety hereunder shall continue so long as any obligation of Contractor remains. Nothing herein shall limit the District's rights or the Contractor or Surety's obligations under the Contract, law or equity, including, but not limited to, California Code of Civil Procedure section 337.15.

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

IN WITNESS WHEREOF, two (2) identical counterparts of this instrument, each of which shall for all purposes be deemed an original thereof, have been duly executed by the Principal and Surety above named, on the _____ day of _____, 20__.

(Affix Corporate Seal)

Principal

By

Surety

By

Name of California Agent of Surety

Address of California Agent of Surety

Telephone No. of California Agent of Surety

Bidder must attach a Notarial Acknowledgment for all Surety's signatures and a Power of Attorney and Certificate of Authority for Surety. The California Department of Insurance must authorize the Surety to be an admitted surety insurer.

END OF DOCUMENT

PAYMENT BOND
Contractor's Labor & Material Bond
(100% of Contract Price)

(Note: Bidders must use this form, NOT a surety company form.)

KNOW ALL PERSONS BY THESE PRESENTS:

WHEREAS, the governing board ("Board") of the Marin Community College District, (or "District") and _____
_____, ("Principal") have entered into a contract for the furnishing of all materials and labor, services and transportation, necessary, convenient, and proper to perform the following project:

_____ (Project Name)

("Project" or "Contract") which Contract dated _____, 20____, and all of the Contract Documents attached to or forming a part of the Contract, are hereby referred to and made a part hereof; and

WHEREAS, pursuant to law and the Contract, the Principal is required, before entering upon the performance of the work, to file a good and sufficient bond with the body by which the Contract is awarded in an amount equal to one hundred percent (100%) of the Contract price, to secure the claims to which reference is made in sections 9000 through 9510 and 9550 through 9566 of the Civil Code, and division 2, part 7, of the Labor Code.

NOW, THEREFORE, the Principal and _____ ("Surety")

are held and firmly bound unto all laborers, material men, and other persons referred to in said statutes in the sum of _____ Dollars (\$_____), lawful money of the United States, being a sum not less than the total amount payable by the terms of Contract, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, or assigns, jointly and severally, by these presents.

The condition of this obligation is that if the Principal or any of his or its subcontractors, of the heirs, executors, administrators, successors, or assigns of any, all, or either of them shall fail to pay for any labor, materials, provisions, provender, 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 required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the Principal or any of his or its subcontractors of any tier under Section 13020 of the Unemployment Insurance Code with respect to such work or labor, that the Surety will pay the same in an amount not exceeding the amount herein above set forth, and also in case suit is brought upon this bond, will pay a reasonable attorney's fee to be awarded and fixed by the Court, and to be taxed as costs and to be included in the judgment therein rendered.

It is hereby expressly stipulated and agreed that this bond shall inure to the benefit of any and all persons, companies, and corporations entitled to file claims under section 9100 of

the Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should the condition of this bond be fully performed, then this obligation shall become null and void; otherwise it shall be and remain in full force and affect.

And the Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of Contract or the specifications accompanying the same shall in any manner affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration, or addition.

IN WITNESS WHEREOF, two (2) identical counterparts of this instrument, each of which shall for all purposes be deemed an original thereof, have been duly executed by the Principal and Surety above named, on the _____ day of _____, 20__.

(Affix Corporate Seal)

Principal

By

Surety

By

Name of California Agent of Surety

Address of California Agent of Surety

Telephone No. of California Agent of Surety

Bidder must attach a Notarial Acknowledgment for all Surety's signatures and a Power of Attorney and Certificate of Authority for Surety. The California Department of Insurance must authorize the Surety to be an admitted surety insurer.

END OF DOCUMENT

AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS

THIS AGREEMENT AND RELEASE OF CLAIMS ("Agreement and Release") IS MADE AND ENTERED INTO THIS _____ DAY OF _____, 20__ by and between the MARIN COMMUNITY COLLEGE DISTRICT ("District") and _____ ("Contractor"), whose place of business is _____.

RECITALS:

- 1. District and Contractor entered into PROJECT/CONTRACT NO.: _____ ("Contract" or "Project") in the County of _____, California.
- 2. The Work under the Contract has been completed.

NOW, THEREFORE, it is mutually agreed between District and Contractor as follows:

AGREEMENT

- 3. Contractor will only be assessed liquidated damages as detailed below:

Original Contract Sum	\$ _____
Modified Contract Sum	\$ _____
Payment to Date	\$ _____
Liquidated Damages	\$ _____
Payment Due Contractor	\$ _____

- 4. Subject to the provisions hereof, District shall forthwith pay to Contractor the undisputed sum of _____ Dollars (\$ _____) under the Contract, less any amounts represented by any notice to withhold funds on file with District as of the date of such payment.
- 5. Contractor acknowledges and hereby agrees that there are no unresolved or outstanding claims in dispute against District arising from the performance of work under the Contract, except for the claims described in Paragraph 6 and continuing obligations described in Paragraph 8. It is the intention of the parties in executing this Agreement and Release that this Agreement and Release shall be effective as a full, final and general release of all claims, demands, actions, causes of action, obligations, costs, expenses, damages, losses and liabilities of Contractor against District, all its respective agents, employees, inspectors, assignees and transferees except for the Disputed Claim is set forth in Paragraph 6 and continuing obligations described in Paragraph 8 hereof.
- 6. The following claims are disputed (hereinafter, the "Disputed Claims") and are specifically excluded from the operation of this Agreement and Release:

<u>Claim No.</u> <u>Submitted</u>	<u>Description of Claim</u>	<u>Amount of Claim</u>	<u>Date Claim</u>
_____	_____	\$ _____	_____
_____	_____	\$ _____	_____
_____	_____	\$ _____	_____

[If further space is required, attach additional sheets showing the required information.]

7. Consistent with California Public Contract Code section 7100, Contractor hereby agrees that, in consideration of the payment set forth in Paragraph 4 hereof, Contractor hereby releases and forever discharges District, all its agents, employees, inspectors, assignees, and transferees from any and all liability, claims, demands, actions, or causes of action of whatever kind or nature arising out of or in any way concerned with the Work under the Contract.
8. Guarantees and warranties for the Work, and any other continuing obligation of Contractor, shall remain in full force and effect as specified in the Contract Documents.
9. To the furthest extent permitted by California law, Contractor shall defend, indemnify, and hold harmless the District, its agents, representatives, officers, consultants, employees, trustees, and volunteers (the "indemnified parties") from any and all losses, liabilities, claims, suits, and actions of any kind, nature, and description, including, but not limited to, attorneys' fees and costs, directly or indirectly arising out of, connected with, or resulting from the performance of the Contract unless caused wholly by the sole negligence or willful misconduct of the indemnified parties.
10. Contractor hereby waives the provisions of California Civil Code section 1542 which provides as follows:

A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS OR HER FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM OR HER MUST HAVE MATERIALLY AFFECTED HIS OR HER SETTLEMENT WITH THE DEBTOR.
11. The provisions of this Agreement and Release are contractual in nature and not mere recitals and shall be considered independent and severable. If any such provision or any part thereof shall be at any time held invalid in whole or in part under any federal, state, county, municipal, or other law, ruling, or regulations, then such provision, or part thereof, shall remain in force and effect to the extent permitted by law, and the remaining provisions of this Agreement and Release shall also remain in full force and effect, and shall be enforceable.
12. All rights of District shall survive completion of the Work or termination of Contract, and execution of this Release.

* * * CAUTION: THIS IS A RELEASE - READ BEFORE EXECUTING * * *

MARIN COMMUNITY COLLEGE DISTRICT

SIGNATURE: _____

PRINT NAME: _____

TITLE: _____

CONTRACTOR: _____

SIGNATURE: _____

PRINT NAME: _____

TITLE: _____

END OF DOCUMENT

GUARANTEE FORM

_____ ("Contractor") hereby agrees that the _____
_____ ("Work" of Contractor) which Contractor has installed for the Marin
Community College District ("District") for the following project:

PROJECT: _____

("Project" or "Contract") 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 that may be
displaced in connection with such replacement within a period of _____
year(s) from the date of completion as defined in Public Contract Code section 7107,
subdivision (c), ordinary wear and tear and unusual abuse or neglect excepted. The date of
completion is _____, 20____.

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 District, but not later than seven
(7) days after being notified in writing by the District, the undersigned authorizes the
District to proceed to have said defects repaired and made good at the expense of the
undersigned. The undersigned shall pay the costs and charges therefor upon demand.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

Representatives to be contacted for service subject to terms of Contract:

NAME: _____

ADDRESS: _____

PHONE NO.: _____

END OF DOCUMENT

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GENERAL CONDITIONS

1. CONTRACT TERMS AND DEFINITIONS

1.1. Definitions

Wherever used in the Contract Documents, the following terms shall have the meanings indicated, which shall be applicable to both the singular and plural thereof:

1.1.1. Adverse Weather: Shall be only weather that satisfies all of the following conditions: (1) unusually severe precipitation, sleet, snow, hail, heat, or cold conditions in excess of the norm for the location and time of year it occurred, (2) unanticipated, and (3) at the Project.

1.1.2. Approval, Approved, and/or Accepted: Refer to written authorization, unless stated otherwise.

1.1.3. Architect: The individual, partnership, corporation, joint venture, or any combination thereof, named as Architect, who will have the rights and authority assigned to the Architect in the Contract Documents. The term Architect means the Design Professional in General Responsible Charge as defined in DSA PR 13-02 on this Project or the Architect's authorized representative.

1.1.4. As-Built Drawings: Unless otherwise defined in the Special Conditions, reproducible blue line prints of drawings to be prepared on a monthly basis pursuant to the Contract Documents, that reflect changes made during the performance of the Work, recording differences between the original design of the Work and the Work as constructed since the preceding monthly submittal.

1.1.5. Bidder: A contractor who intends to provide a proposal to the District to perform the Work of this Contract.

1.1.6. Change Order: A written order to the Contractor authorizing an addition to, deletion from, or revision in the Work, and/or authorizing an adjustment in the Contract Price or Contract Time.

1.1.7. Claim: A Dispute that remains unresolved at the conclusion of the all the applicable Dispute Resolution requirements provided herein.

1.1.8. Construction Change Directive: A written order prepared and issued by the District, the Construction Manager, and/or the Architect and signed by the District and the Architect, directing a change in the Work.

1.1.9. Construction Manager: The individual, partnership, corporation, joint venture, or any combination thereof, or its authorized representative, named as such by the District. If no Construction Manager is used on the Project that is the subject of this Contract, then all references to Construction Manager herein shall be read to refer to District.

1.1.10. Construction Schedule: The progress schedule of construction of the Project as provided by Contractor and approved by District.

1.1.11. Contract, Contract Documents: The Contract consists exclusively of the documents evidencing the agreement of the District and Contractor, identified as the Contract Documents. The Contract Documents consist of the following documents:

- 1.1.11.1.** Notice to Bidders
- 1.1.11.2.** Instructions to Bidders
- 1.1.11.3.** Bid Form and Proposal
- 1.1.11.4.** Bid Bond
- 1.1.11.5.** Designated Subcontractors List
- 1.1.11.6.** Site-Visit Certification (if a site visit was required)
- 1.1.11.7.** Noncollusion Declaration
- 1.1.11.8.** Notice of Award
- 1.1.11.9.** Notice to Proceed
- 1.1.11.10.** Agreement
- 1.1.11.11.** Escrow of Bid Documentation
- 1.1.11.12.** Escrow Agreement for Security Deposits in Lieu of Retention
- 1.1.11.13.** Performance Bond
- 1.1.11.14.** Payment Bond (Contractor's Labor & Material Bond)
- 1.1.11.15.** General Conditions
- 1.1.11.16.** Special Conditions (if applicable)
- 1.1.11.17.** Labor Compliance Program Information and Forms (if applicable)
- 1.1.11.18.** Hazardous Materials Procedures and Requirements
- 1.1.11.19.** Workers' Compensation Certification
- 1.1.11.20.** Prevailing Wage Certification
- 1.1.11.21.** Disabled Veterans Business Enterprise Participation Certification (if applicable)
- 1.1.11.22.** Drug-Free Workplace Certification
- 1.1.11.23.** Tobacco-Free Environment Certification
- 1.1.11.24.** Hazardous Materials Certification
- 1.1.11.25.** Lead-Based Paint Certification
- 1.1.11.26.** Imported Materials Certification
- 1.1.11.27.** Criminal Background Investigation/Fingerprinting Certification
- 1.1.11.28.** Buy American Certification (if applicable)
- 1.1.11.29.** Roofing Project Certification (if applicable)
- 1.1.11.30.** Iran Contracting Act Certification (if applicable)
- 1.1.11.31.** All Plans, Technical Specifications, and Drawings
- 1.1.11.32.** Any and all addenda to any of the above documents
- 1.1.11.33.** Any and all change orders or written modifications to the above documents if approved in writing by the District

1.1.12. Contract Price: The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

1.1.13. Contract Time: The time period stated in the Agreement for the completion of the Work.

1.1.14. Contractor: The person or persons identified in the Agreement as contracting to perform the Work to be done under this Contract, or the legal representative of such a person or persons.

1.1.15. Daily Job Report(s): Daily Project reports prepared by the Contractor's employee(s) who are present on Site, which shall include the information required herein.

1.1.16. Day(s): Unless otherwise designated, day(s) means calendar day(s).

1.1.17. Department of Industrial Relations (or "DIR"): is responsible, among other things, for labor compliance monitoring and enforcement of California prevailing wage laws and regulations for public works contracts.

1.1.18. Dispute: A separate demand by Contractor for a time extension; payment of money or damages arising from Work done by or on behalf of the Contractor pursuant to the Contract and payment of which is not otherwise expressly provided for or Contractor is not otherwise entitled to; or an amount of payment disputed by the District.

1.1.19. District: The public agency or the school district for which the Work is performed. The governing board of the District or its designees will act for the District in all matters pertaining to the Contract. The District may, at any time,

1.1.19.1. Direct the Contractor to communicate with or provide notice to the Construction Manager or the Architect on matters for which the Contract Documents indicate the Contractor will communicate with or provide notice to the District; and/or

1.1.19.2. Direct the Construction Manager or the Architect to communicate with or direct the Contractor on matters for which the Contract Documents indicate the District will communicate with or direct the Contractor.

1.1.20. Drawings (or "Plans"): The graphic and pictorial portions of the Contract Documents showing the design, location, scope and dimensions of the work, generally including plans, elevations, sections, details, schedules, sequence of operation, and diagrams.

1.1.21. DSA: Division of the State Architect.

1.1.22. Force Account Directive: A process that may be used when the District and the Contractor cannot agree on a price for a specific portion of work or before the Contractor prepares a prices for a specific portion of work and whereby the Contractor performs the work as indicated herein on a time and materials basis.

1.1.23. Labor Commissioner's Office (or "Labor Commissioner") also known as the Division of Labor Standards Enforcement ("DLSE"): Division of the DIR responsible for adjudicating wage claims, investigating discrimination and public works complaints, and enforcing Labor Code statutes and Industrial Welfare Commission orders.

1.1.24. Municipal Separate Storm Sewer System (or "MS4"): A system of conveyances used to collect and/or convey storm water, including, without limitation, catch basins, curbs, gutters, ditches, man-made channels, and storm drains.

1.1.25. Premises: The real property owned by the District on which the Site is located.

1.1.26. Product(s): New material, machinery, components, equipment, fixtures and systems forming the Work, including existing materials or components required and approved by the District for reuse.

1.1.27. Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work.

1.1.28. Project: The planned undertaking as provided for in the Contract Documents.

1.1.29. Project Inspector (or "Inspector"): The individual(s) retained by the District in accordance with title 24 of the California Code of Regulations to monitor and inspect the Project.

1.1.30. Project Labor Agreement (or "PLA"): a prehire collective bargaining agreement in accordance with Public Contract Code section 2500 et seq. that establishes terms and conditions of employment for a specific construction project or projects and/or is an agreement described in Section 158(f) of Title 29 of the United States Code.

1.1.31. Program Manager: The individual, partnership, corporation, joint venture, or any combination thereof, or its authorized representative, named as such by the District. If no Program Manager is designated for Project that is the subject of this Contract, then all references to Project Manager herein shall be read to refer to District.

1.1.32. Provide: Shall include "provide complete in place," that is, "furnish and install," and "provide complete and functioning as intended in place" unless specifically stated otherwise.

1.1.33. Qualified SWPPP Practitioners ("QSP"): certified personnel that attended a State Water Resources Control Board sponsored or approved training class and passed the qualifying exam.

1.1.34. Record Drawings: Unless otherwise defined in the Special Conditions, Reproducible drawings (or Plans) prepared pursuant to the requirements of the Contract Documents, that reflect all changes made during the performance of the Work, recording differences between the original design of the Work and the Work as constructed upon completion of the Project.

1.1.35. Request for Information (or "RFI"):: A written request prepared by the Contractor requesting that the Architect provide additional information necessary to clarify or amplify an item in the Contract Documents that the Contractor believes is not clearly shown or called for in the Drawings or Specifications or other portions of

the Contract Documents, or to address problems that have arisen under field conditions.

1.1.36. Request for Substitution for Specified Item: A request by Contractor to substitute an equal or superior material, product, thing, or service for a specific material, product, thing, or service that has been designated in the Contract Documents by a specific brand or trade name.

1.1.37. Safety Orders: Written and/or verbal orders for construction issued by the California Division of Industrial Safety ("CalOSHA") or by the United States Occupational Safety and Health Administration ("OSHA").

1.1.38. Safety Plan: Contractor's safety plan specifically adapted for the Project. Contractor's Safety Plan shall comply with all provisions regarding Project safety, including all applicable provisions in these General Conditions.

1.1.39. Samples: Physical examples that illustrate materials, products, equipment, finishes, colors, or workmanship and that, when approved in accordance with the Contract Documents, establish standards by which portions of the Work will be judged.

1.1.40. Shop Drawings: All drawings, prints, diagrams, illustrations, brochures, schedules, and other data that are prepared by the Contractor, a subcontractor, manufacturer, supplier, or distributor, that illustrate how specific portions of the Work shall be fabricated or installed.

1.1.41. Site: The Project site as shown on the Drawings.

1.1.42. Specifications: That portion of the Contract Documents, Division 1 through Division 17, and all technical sections, and addenda to all of these, if any, consisting of written descriptions and requirements of a technical nature of materials, equipment, construction methods and systems, standards, and workmanship.

1.1.43. State: The State of California.

1.1.44. Storm Water Pollution Prevention Plan (or "SWPPP"): A document which identifies sources and activities at a particular facility that may contribute pollutants to storm water and contains specific control measures and time frames to prevent or treat such pollutants.

1.1.45. Subcontractor: A contractor and/or supplier who is under contract with the Contractor or with any other subcontractor, regardless of tier, to perform a portion of the Work of the Project.

1.1.46. Submittal Schedule: The schedule of submittals as provided by Contractor and approved by District.

1.1.47. Surety: The person, firm, or corporation that executes as surety the Contractor's Performance Bond and Payment Bond, and must be a California admitted surety insurer as defined in the Code of Civil Procedure section 995.120.

1.1.48. Work: All labor, materials, equipment, components, appliances, supervision, coordination, and services required by, or reasonably inferred from, the Contract Documents, that are necessary for the construction and completion of the Project.

1.2. Laws Concerning The Contract

Contract is subject to all provisions of the Constitution and laws of California and the United States governing, controlling, or affecting District, or the property, funds, operations, or powers of District, and such provisions are by this reference made a part hereof. Any provision required by law to be included in this Contract shall be deemed to be inserted.

1.3. No Oral Agreements

No oral agreement or conversation with any officer, agent, or employee of District, either before or after execution of Contract, shall affect or modify any of the terms or obligations contained in any of the documents comprising the Contract.

1.4. No Assignment

Contractor shall not assign this Contract or any part thereof including, without limitation, any services or money to become due hereunder without the prior written consent of the District. Assignment without District's prior written consent shall be null and void. Any assignment of money due or to be come due under this Contract shall be subject to a prior lien for services rendered or material supplied for performance of work called for under this Contract in favor of all persons, firms, or corporations rendering services or supplying material to the extent that claims are filed pursuant to the Civil Code, Code of Civil Procedure, Government Code, Labor Code, and/or Public Contract Code, and shall also be subject to deductions for liquidated damages or withholding of payments as determined by District in accordance with this Contract. Contractor shall not assign or transfer in any manner to a Subcontractor or supplier the right to prosecute or maintain an action against the District.

1.5. Notice And Service Thereof

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

1.5.1.1. If notice is given by personal delivery thereof, it shall be considered delivered on the day of delivery.

1.5.1.2. If notice is given by overnight delivery service, it shall be considered delivered on (1) day after date deposited, as indicated by the delivery service.

1.5.1.3. If notice is given by depositing same in United States mail, enclosed in a sealed envelope, it shall be considered delivered three (3) days after date deposited, as indicated by the postmarked date.

1.5.1.4. If notice is given by registered or certified mail with postage prepaid, return receipt requested, it shall be considered delivered on the day the notice is signed for.

1.6. 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. No action or failure to act by the District, Architect, or Construction Manager shall constitute a waiver of any right or duty afforded the District under the Contract, nor shall any action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

1.7. Substitutions For Specified Items

Unless the Special Conditions contain different provisions, Contractor shall not substitute different items for any items identified in the Contract Documents without prior written approval of the District.

1.8. Materials and Work

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

1.8.2. Unless otherwise specified, all materials shall be new and the best of their respective kinds and grades as noted or specified, and workmanship shall be of good quality.

1.8.3. 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.

1.8.4. For all materials 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, functioning as intended. Incidental items not indicated on 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.

1.8.5. Contractor shall, after award of Contract by District and after relevant submittals have been approved, 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 District, present documentary evidence showing that orders have been placed.

1.8.6. District reserves the right but has no obligation, for any neglect in complying with the above instructions, to place orders for such materials and/or equipment as it may deem advisable in order that the Work may be completed at the date specified in the Agreement, and all expenses incidental to the procuring of said materials and/or equipment shall be paid for by Contractor or withheld from payment(s) to Contractor.

1.8.7. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all Work to deliver the Site to District, together with all improvements and appurtenances constructed or placed thereon by it, and 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 the Contract shall have any right to lien any portion of the Premises or any improvement or appurtenance thereon, except that Contractor may install metering devices or other equipment of utility companies or of political subdivision, title to which is commonly retained by utility company or political subdivision. In the event of installation of any such metering device or equipment, Contractor shall advise District as to owner thereof.

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

1.8.7.2. If the Contractor fails to furnish to the District within ten (10) calendar days after demand by the District, satisfactory evidence that a lien or a claim based on a stop payment notice has been so released, discharged, or secured, the District may discharge such indebtedness and deduct the amount required therefor, together with any and all losses, costs, damages, and attorney's fees and expense incurred or suffered by District from any sum payable to Contractor under the Contract.

1.8.8. Nothing contained in this Article, however, shall defeat or impair the rights of persons furnishing materials or labor under any bond given by Contractor for their protection or any rights under any law permitting such protection or any rights under any law permitting such persons to look to funds due Contractor in hands of District (e.g., stop payment notices), and this provision shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing material for work when no formal contract is entered into for such material.

1.8.9. Title to new materials and/or equipment for the Work of this Contract and attendant liability for its protection and safety shall remain with Contractor until incorporated in the Work of this Contract and accepted by District. No part of any materials and/or equipment shall be removed from its place of storage except for immediate installation in the Work of this Contract. Should the District, in its discretion, allow the Contractor to store materials and/or equipment for the Work off-site, Contractor will store said materials and/or equipment at a bonded

warehouse and with appropriate insurance coverage at no cost to District. Contractor shall keep an accurate inventory of all materials and/or equipment in a manner satisfactory to District or its authorized representative and shall, at the District's request, forward it to the District.

2. [RESERVED]

3. ARCHITECT

3.1. The Architect shall represent the District during the Project and will observe the progress and quality of the Work on behalf of the District. Architect shall have the authority to act on behalf of District to the extent expressly provided in the Contract Documents and to the extent determined by District. Architect shall have authority to reject materials, workmanship, and/or the Work whenever rejection may be necessary, in Architect's reasonable opinion, to insure the proper execution of the Contract.

3.2. Architect shall, with the District and on behalf of the District, determine the amount, quality, acceptability, and fitness of all parts of the Work, and interpret the Specifications, Drawings, and shall, with the District, interpret all other Contract Documents.

3.3. Architect shall have all authority and responsibility established by law, including title 24 of the California Code of Regulations.

3.4. Contractor shall provide District and the Construction Manager with a copy of all written communication between Contractor and Architect at the same time as that communication is made to Architect, including, without limitation, all RFIs, correspondence, submittals, claims, and proposed change orders.

4. CONSTRUCTION MANAGER

4.1. If a construction manager is used on this Project ("Construction Manager" or "CM"), the Construction Manager will provide administration of the Contract on the District's behalf. After execution of the Contract and Notice to Proceed, all correspondence and/or instructions from Contractor and/or District shall be forwarded through the Construction Manager. The Construction Manager will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences, or procedures or for safety precautions in connection with the Work, which shall all remain the Contractor's responsibility.

4.2. The Construction Manager, however, will have authority to reject materials and/or workmanship not conforming to the Contract Documents, as determined by the District, the Architect, and/or the Project Inspector. The Construction Manager shall also have the authority to require special inspection or testing of any portion of the Work, whether it has been fabricated, installed, or fully completed. Any decision made by the Construction Manager, in good faith, shall not give rise to any duty or responsibility of the Construction Manager to the Contractor, any Subcontractor, their agents, employees, or other persons performing any of the Work. The Construction Manager shall have free access to any or all parts of Work at any time.

4.3. If the District does not use a Construction Manager on this Project, all references to Construction Manager or CM shall be read as District.

5. INSPECTOR, INSPECTIONS, AND TESTS

5.1. Project Inspector

5.1.1. One or more Project Inspector(s), including special Project Inspector(s), as required, will be assigned to the Work by District, in accordance with requirements of title 24, part 1, of the California Code of Regulations, to enforce the building code and monitor compliance with Plans and Specifications for the Project previously approved by the DSA. Duties of Project Inspector(s) are specifically defined in section 4-342 of said part 1 of title 24.

5.1.2. No Work shall be carried on except with the knowledge and under the inspection of the Project Inspector(s). The Project Inspector(s) shall have free access to any or all parts of Work at any time. Contractor shall furnish Project Inspector(s) reasonable opportunities for obtaining such information as may be necessary to keep Project Inspector(s) fully informed respecting progress and manner of work and character of materials, including, but not limited to, submission of form DSA 156 (or the most current version) to the Project Inspector at least 48 hours in advance of the commencement and completion of construction of each and every aspect of the Work. Forms are available on the DSA's website at: <http://www.dgs.ca.gov/dsa/Forms.aspx>. Inspection of Work shall not relieve Contractor from an obligation to fulfill this Contract. Project Inspector(s) and the DSA are authorized to stop work whenever the Contractor and/or its Subcontractor(s) are not complying with the Contract Documents. Any work stoppage by the Project Inspector(s) and/or DSA shall be without liability to the District. Contractor shall instruct its Subcontractors and employees accordingly.

5.1.3. If Contractor and/or any Subcontractor requests that the Project Inspector(s) perform any inspection off-site, this shall only be done if it is allowable pursuant to applicable regulations and DSA, if the Project Inspector(s) agree to do so, and at the expense of the Contractor.

5.2. Tests and Inspections

5.2.1. Tests and Inspections shall comply with title 24, part 1, California Code of Regulations, group 1, article 5, section 4-335, and with the provisions of the Specifications.

5.2.2. The District will select an independent testing laboratory to conduct the tests. Selection of the materials required to be tested shall be by the laboratory or the District's representative and not by the Contractor. The Contractor shall notify the District's representative a sufficient time in advance of its readiness for required observation or inspection.

5.2.3. The Contractor shall notify the District's representative a sufficient time in advance of the manufacture of material to be supplied under the Contract Documents, which must by terms of the Contract Documents be tested, in order that the District may arrange for the testing of same at the source of supply. This notice shall be, at a minimum, seventy-two (72) hours prior to the manufacture of the material that needs to be tested.

5.2.4. 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 into and/or onto the Project.

5.2.5. The District will select and pay testing laboratory costs for all tests and inspections. Costs of tests of any materials found to be not in compliance with the Contract Documents shall be paid for by the District and reimbursed by the Contractor or deducted from the Contract Price.

5.3. Costs for After Hours and/or Off Site Inspections

If the Contractor performs Work outside the Inspector's regular working hours or requests the Inspector to perform inspections off Site, costs of any inspections required outside regular working hours or off Site shall be borne by the Contractor and may be invoiced to the Contractor by the District or the District may deduct those expenses from the next Progress Payment.

6. CONTRACTOR

Contractor shall construct the Work for the Contract price including any adjustment(s) to the Contract Price pursuant to provisions herein regarding changes to the Contract Price. Except as otherwise noted, Contractor shall provide and pay for all labor, materials, equipment, permits, fees, licenses, facilities, transportation, taxes, and services necessary for the proper execution and completion of the Work, except as indicated herein.

6.1. Status of Contractor

6.1.1. 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 and its Subcontractors perform the services required of it by the Contract Documents. 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 Subcontractors, 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 Subcontractors, agents, and its employees shall not be entitled to any rights or privileges of District employees. District shall be permitted to monitor the Contractor's activities to determine compliance with the terms of this Contract.

6.1.2. As required by law, Contractor and all Subcontractors shall be properly licensed and regulated by the Contractor's State License Board 9821 Business Park Drive, Sacramento, California 95827, <http://www.cslb.ca.gov>.

6.1.3. As required by law, Contractor and all Subcontractors shall be properly registered as public works contractors by the Department of Industrial Relations at <https://efiling.dir.ca.gov/PWCR/ActionServlet?action=displayPWCRRegistrationForm> or current URL.

6.2. Project Inspection Card(s)

Contractor shall verify that forms DSA 152 (or current version) are issued for the Project prior to the commencement of construction.

6.3. Contractor's Supervision

6.3.1. During progress of the Work, Contractor shall keep on the Premises, and at all other locations where any Work related to the Contract is being performed, a competent project manager and construction superintendent who are employees of the Contractor, to whom the District does not object and at least one of whom shall be fluent in English, written and verbal.

6.3.2. The project manager and construction superintendent shall both speak fluently the predominant language of the Contractor's employees.

6.3.3. Before commencing the Work herein, Contractor shall give written notice to District of the name of its project manager and construction superintendent. Neither the Contractor's project manager nor construction superintendent shall be changed except with prior written notice to District, unless the Contractor's project manager and/or construction superintendent proves to be unsatisfactory to Contractor, District, any of the District's employees, agents, the Construction Manager, or the Architect, in which case, Contractor shall notify District in writing. The Contractor's project manager and construction superintendent shall each represent Contractor, and all directions given to Contractor's project manager and/or construction superintendent shall be as binding as if given to Contractor.

6.3.4. Contractor shall give efficient supervision to Work, using its best skill and attention. Contractor shall carefully study and compare all Contract Documents, Drawings, Specifications, and other instructions and shall at once report to District, Construction Manager, and Architect any error, inconsistency, or omission that Contractor or its employees and Subcontractors may discover, in writing, with a copy to District's Project Inspector(s). The Contractor shall have responsibility for discovery of errors, inconsistencies, or omissions.

6.4. Duty to Provide Fit Workers

6.4.1. Contractor and Subcontractor(s) shall at all times enforce strict discipline and good order among their employees and shall not employ or work any unfit person or anyone not skilled in work assigned to that person. It shall be the responsibility of Contractor to ensure compliance with this requirement. District may require Contractor to permanently remove unfit persons from Project Site.

6.4.2. Any person in the employ of Contractor or Subcontractor(s) whom District may deem incompetent or unfit shall be excluded from working on the Project and shall not again be employed on the Project except with the prior written consent of District.

6.4.3. The Contractor shall furnish labor that can work in harmony with all other elements of labor employed or to be employed in the Work.

6.4.4. If Contractor intends to make any change in the name or legal nature of the Contractor's entity, Contractor must first notify the District. The District shall

determine if Contractor's intended change is permissible while performing this Contract.

6.5. Field Office

6.5.1. Contractor shall provide a temporary office on the Work Site for the District's use exclusively, during the term of the Contract.

6.6. Purchase of Materials and Equipment

The Contractor is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from District to assure that there will be no delays.

6.7. Documents On Work

6.7.1. Contractor shall at all times keep on the Work Site, or at another location as the District may authorize in writing, one legible copy of all Contract Documents, including Addenda and Change Orders, and Titles 19 and 24 of the California Code of Regulations, the specified edition(s) of the Uniform Building Code, all approved Drawings, Plans, Schedules, and Specifications, and all codes and documents referred to in the Specifications, and made part thereof. These documents shall be kept in good order and available to District, Construction Manager, Architect, Architect's representatives, the Project Inspector(s), and all authorities having jurisdiction. Contractor shall be acquainted with and comply with the provisions of these titles as they relate to this Project. (See particularly the duties of Contractor, Title 24, Part 1, California Code of Regulations, section 4-343.) Contractor shall also be acquainted with and comply with all California Code of Regulations provisions relating to conditions on this Project, particularly Titles 8 and 17. Contractor shall coordinate with Architect and Construction Manager and shall submit its verified report(s) according to the requirements of Title 24.

6.7.2. Daily Job Reports.

6.7.2.1. Contractor shall maintain, at a minimum, at least one (1) set of Daily Job Reports on the Project. These must be prepared by the Contractor's employee(s) who are present on Site, and must include, at a minimum, the following information:

- 6.7.2.1.1.** A brief description of all Work performed on that day.
- 6.7.2.1.2.** A summary of all other pertinent events and/or occurrences on that day.
- 6.7.2.1.3.** The weather conditions on that day.
- 6.7.2.1.4.** A list of all Subcontractor(s) working on that day,
- 6.7.2.1.5.** A list of each Contractor employee working on that day and the total hours worked for each employee.
- 6.7.2.1.6.** A complete list of all equipment on Site that day, whether in use or not.
- 6.7.2.1.7.** All complete list of all materials, supplies, and equipment delivered on that day.
- 6.7.2.1.8.** A complete list of all inspections and tests performed on that day.

6.7.2.2. Each day Contractor shall provide a copy of the previous day's Daily Job Report to the District or the Construction Manager.

6.8. Preservation of Records

The District shall have the right to examine and audit all Daily Job Reports or other Project records of Contractor's project manager(s), project superintendent(s), and/or project foreperson(s), all certified payroll records and/or related documents including, without limitation, payroll, payment, timekeeping and tracking documents; all books, estimates, records, contracts, documents, bid documents, bid cost data, subcontract job cost reports, and other data of the Contractor, any Subcontractor, and/or supplier, including computations and projections related to bidding, negotiating, pricing, or performing the Work or Contract modification, in order to evaluate the accuracy, completeness, and currency of the cost, manpower, coordination, supervision, or pricing data at no additional cost to the District. These documents may be duplicative and/or be in addition to any Bid Documents held in escrow by the District. The Contractor shall make available at its office at all reasonable times the materials described in this paragraph for the examination, audit, or reproduction until three (3) years after final payment under this Contract. Notwithstanding the provisions above, Contractor shall provide any records requested by any governmental agency, if available, after the time set forth above.

6.9. Integration of Work

6.9.1. Contractor shall do all cutting, fitting, patching, and preparation of Work as required to make its several parts come together properly, to fit it to receive or be received by work of other contractors, and to coordinate tolerances to various pieces of work, showing upon, or reasonably implied by, the Drawings and Specifications for the completed structure, and shall conform them as District and/or Architect may direct.

6.9.2. Contractor shall make its own layout of lines and elevations and shall be responsible for the accuracy of both Contractor's and Subcontractors' work resulting therefrom.

6.9.3. Contractor and all Subcontractors shall take all field dimensions required in performance of the Work, and shall verify all dimensions and conditions on the Site. All dimensions affecting proper fabrication and installation of all Work must be verified prior to fabrication by taking field measurements of the true conditions. If there are any discrepancies between dimensions in drawings and existing conditions which will affect the Work, Contractor shall bring such discrepancies to the attention of the District and Architect for adjustment before proceeding with the Work. In doing so, it is recognized that Contractor is not acting in the capacity of a licensed design professional, and that Contractor's examination is made in good faith to facilitate construction and does not create an affirmative responsibility to detect errors, omissions or inconsistencies in the Contract Documents or to ascertain compliance with applicable laws, building codes or regulations. Following receipt of written notice from Contractor, the District and/or Architect shall inform Contractor what action, if any, Contractor shall take with regard to such discrepancies

6.9.4. All cost caused by defective or ill-timed Work shall be borne by Contractor, inclusive of repair work.

6.9.5. Contractor shall not endanger any work performed by it or anyone else by cutting, excavating, or otherwise altering work and shall not cut or alter work of any other contractor except with consent of District.

6.10. Notifications

6.10.1. Contractor shall notify the Architect and Project Inspector, in writing, of the commencement of construction of each and every aspect of the Work at least 48 hours in advance by submitting form DSA 156 (or current version) to the Project Inspector. Forms are available on the DSA's website at:
<http://www.dgs.ca.gov/dsa/Forms.aspx>.

6.10.2. Contractor shall notify the Architect and Project Inspector, in writing, of the completion of construction of each and every aspect of the Work at least 48 hours in advance by submitting form DSA 156 (or current version) to the Project Inspector.

6.11. Obtaining of Permits, Licenses and Registration

Contractor shall secure and pay for all permits, licenses, registrations and certificates necessary for prosecution of Work, including but not limited to those listed in the Special Conditions, if any, before the date of the commencement of the Work or before the permits, licenses, registrations and certificates are legally required to continue the Work without interruption. The Contractor shall obtain and pay, only when legally required, for all licenses, registrations, permits, inspections, and inspection certificates required to be obtained from or issued by any authority having jurisdiction over any part of the Work included in the Contract. All final permits, licenses, and certificates shall be delivered to District before demand is made for final payment.

6.12. Royalties and Patents

6.12.1. Contractor shall obtain and pay, only when legally required, all royalties and license fees necessary for prosecution of Work before the earlier of the date of the commencement of the Work or the date that the license is legally required to continue the Work without interruption. Contractor shall defend suits or claims of infringement of patent, copyright, or other rights and shall hold the District, the Architect, and the Construction Manager harmless and indemnify them from loss on account thereof except when a particular design, process, or make or model of product is required by the Contract Documents. However, if the Contractor has reason to believe that the required design, process, or product is an infringement of a patent or copyright, the Contractor shall indemnify and defend the District, Architect and Construction Manager against any loss or damage unless the Contractor promptly informs the District of its information.

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

6.13. Work to Comply With Applicable Laws and Regulations

6.13.1. Contractor shall give all notices and comply with the following specific laws, ordinances, rules, and regulations and all other applicable laws, ordinances, rules, and regulations bearing on conduct of Work as indicated and specified, including but not limited to the appropriate statutes and administrative code sections. If Contractor observes that Drawings and Specifications are at variance therewith, or should Contractor become aware of the development of conditions not covered by Contract Documents that will result in finished Work being at variance therewith, Contractor shall promptly notify District in writing and any changes deemed necessary by District shall be made as provided in Contract for changes in Work.

- 6.13.1.1.** National Electrical Safety Code, U. S. Department of Commerce
- 6.13.1.2.** National Board of Fire Underwriters' Regulations
- 6.13.1.3.** Uniform Building Code, latest addition, and the California Code of Regulations, title 24, and other amendments
- 6.13.1.4.** Manual of Accident Prevention in Construction, latest edition, published by A.G.C. of America
- 6.13.1.5.** Industrial Accident Commission's Safety Orders, State of California
- 6.13.1.6.** Regulations of the State Fire Marshall (title 19, California Code of Regulations) and Pertinent Local Fire Safety Codes
- 6.13.1.7.** Americans with Disabilities Act
- 6.13.1.8.** Education Code of the State of California
- 6.13.1.9.** Government Code of the State of California
- 6.13.1.10.** Labor Code of the State of California, division 2, part 7, Public Works and Public Agencies
- 6.13.1.11.** Public Contract Code of the State of California
- 6.13.1.12.** California Art Preservation Act
- 6.13.1.13.** U. S. Copyright Act
- 6.13.1.14.** U. S. Visual Artists Rights Act

6.13.2. Contractor shall comply with all applicable mitigation measures, if any, adopted by any public agency with respect to this Project pursuant to the California Environmental Quality Act (Public Resources Code section 21000 et seq.)

6.13.3. If Contractor performs any Work that it knew, or through exercise of reasonable care should have known, to be contrary to any applicable laws, ordinance, rules, or regulations, Contractor shall bear all costs arising therefrom.

6.13.4. Where Specifications or Drawings state that materials, processes, or procedures must be approved by the DSA, State Fire Marshall, or other body or agency, Contractor shall be responsible for satisfying requirements of such bodies or agencies.

6.14. Safety/Protection of Persons and Property

6.14.1. The Contractor will be solely and completely responsible for conditions of the Work Site, including safety of all persons and property during performance of the Work. This requirement will apply continuously and not be limited to normal working hours.

6.14.2. The wearing of hard hats will be mandatory at all times for all personnel on Site. Contractor shall supply sufficient hard hats to properly equip all employees and visitors.

6.14.3. Any construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the Work Site.

6.14.4. Implementation and maintenance of safety programs shall be the sole responsibility of the Contractor.

6.14.5. The Contractor shall furnish to the District a copy of the Contractor's safety plan within the time frame indicated in the Contract Documents and specifically adapted for the Project.

6.14.6. 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 completion and final acceptance by District. All Work shall be solely at Contractor's risk with the exception of damage to the Work caused by "acts of God" as defined in Public Contract Code section 7105.

6.14.7. Contractor shall take, and require Subcontractors to take, all necessary precautions for safety of workers on the Project 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. Contractor shall furnish, erect, and properly maintain at all times, all necessary safety devices, safeguards, construction canopies, signs, 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.

6.14.8. Hazards Control – Contractor shall store volatile wastes in covered metal containers and remove them from the Site daily. Contractor shall prevent accumulation of wastes that create hazardous conditions. Contractor shall provide adequate ventilation during use of volatile or noxious substances.

6.14.9. Contractor shall designate a responsible member of its organization on the Project, 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.

6.14.10. 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, Contractor shall correct such violation promptly.

6.14.11. Contractor shall comply with any District storm water requirements that are approved by the District and applicable to the Project, at no additional cost to the District.

6.14.12. In an emergency affecting safety of life or of work or of adjoining property, Contractor, without special instruction or authorization, shall act, at its discretion, to prevent such threatened loss or injury. Any compensation claimed by Contractor on account of emergency work shall be determined by agreement.

6.14.13. All salvage materials will become the property of the Contractor and shall be removed from the Site unless otherwise called for in the Contract Documents. However, the District reserves the right to designate certain items of value that shall be turned over to the District unless otherwise directed by District.

6.14.14. All connections to public utilities and/or existing on-site services shall be made and maintained in such a manner as to not interfere with the continuing use of same by the District during the entire progress of the Work.

6.14.15. Contractor shall provide such heat, covering, and enclosures as are necessary to protect all Work, materials, equipment, appliances, and tools against damage by weather conditions, such as extreme heat, cold, rain, snow, dry winds, flooding, or dampness.

6.14.16. The Contractor shall protect and preserve the Work from all damage or accident, providing any temporary roofs, window and door coverings, boxings, or other construction as required by the Architect. The Contractor shall be responsible for existing structures, walks, roads, trees, landscaping, and/or improvements in working areas; and shall provide adequate protection therefor. If temporary removal is necessary of any of the above items, or damage occurs due to the Work, the Contractor shall replace same at his expense with same kind, quality, and size of Work or item damaged. This shall include any adjoining property of the District and others.

6.14.17. 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.

6.14.18. Contractor shall 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. Contractor shall enforce all instructions of District and Architect regarding signs, advertising, fires, and smoking, and require that all workers comply with all regulations while on Project Site.

6.14.19. Contractor, Contractor's employees, Subcontractors, Subcontractors' employees, or any person associated with the Work shall conduct themselves in a manner appropriate for a school site. No verbal or physical contact with neighbors, students, and faculty, profanity, or inappropriate attire or behavior will be permitted. District may require Contractor to permanently remove non-complying persons from Project Site.

6.14.20. Contractor shall take care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners. If

such markers are disturbed, Contractor shall have a civil engineer, registered as a professional engineer in California, replace them at no cost to District.

6.14.21. In the event that the Contractor enters into any agreement with owners of any adjacent property to enter upon the adjacent property for the purpose of performing the Work, Contractor shall fully indemnify, defend, and hold harmless each person, entity, firm, or agency that owns or has any interest in adjacent property. The form and content of the agreement of indemnification shall be approved by the District prior to the commencement of any Work on or about the adjacent property. The Contractor shall also indemnify the District as provided in the indemnification provision herein. These provisions shall be in addition to any other requirements of the owners of the adjacent property.

6.15. Working Evenings and Weekends

Contractor may be required to work evenings and/or weekends at no additional cost to the District. Contractor shall give the District seventy-two (72) hours notice prior to performing any evening and/or weekend work. Contractor shall perform all evening and/or weekend work only upon District's approval and in compliance with all applicable rules, regulations, laws, and local ordinances including, without limitation, all noise and light limitations. Contractor shall reimburse the District for any Inspector charges necessitated by the Contractor's evening and/or weekend work.

6.16. Cleaning Up

6.16.1. The Contractor shall provide all services, labor, materials, and equipment necessary for protecting the Work, all school occupants, furnishings, equipment, and building structure from damage until its completion and final acceptance by District. Dust barriers shall be provided to isolate dust and dirt from construction operations. At completion of the Work and portions thereof, Contractor shall clean to the original state any areas beyond the Work area that become dust laden as a result of the Work. The Contractor must erect the necessary warning signs and barricades to ensure the safety of all school occupants. The Contractor at all times must maintain good housekeeping practices to reduce the risk of fire damage and must make a fire extinguisher, fire blanket, and/or fire watch, as applicable, available at each location where cutting, braising, soldering, and/or welding is being performed or where there is an increased risk of fire.

6.16.2. 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 on a daily basis. If Contractor fails to clean up, District may do so and the cost thereof shall be charged to Contractor. If Contract is for work on an existing facility, Contractor shall also perform specific clean-up on or about the Premises upon request by the District as it deems necessary for the continuing education process. Contractor shall comply with all related provisions of the Specifications.

6.16.3. If the Construction Manager, Architect, or District observes the accumulation of trash and debris, the District will give the Contractor a 24-hour written notice to mitigate the condition.

6.16.4. Should the Contractor fail to perform the required clean-up, or should the clean-up be deemed unsatisfactory by the District, the District will then perform the clean-up. All cost associated with the clean-up work (including all travel, payroll burden, and costs for supervision) will be deducted from the Contract Price, or District may withhold those amounts from payment(s) to Contractor.

7. SUBCONTRACTORS

7.1. Contractor shall provide the District with information for all Subcontracts as indicated in the Contractor's Submittals and Schedules Section herein.

7.2. No contractual relationship exists between the District and any Subcontractor, supplier, or sub-subcontractor by reason of this Contract.

7.3. Contractor agrees to bind every Subcontractor by terms of this Contract as far as those terms are applicable to Subcontractor's work including, without limitation, all labor, wage & hour, apprentice and related provisions and requirements. 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. The divisions or sections of the Specifications are not intended to control the Contractor in dividing the Work among Subcontractors or limit the work performed by any trade.

7.4. District's consent to, or approval of, or failure to object to, any Subcontractor under this Contract shall not in any way relieve Contractor of any obligations under this Contract and no such consent shall be deemed to waive any provisions of this Contract.

7.5. Contractor is directed to familiarize itself with sections 4100 through 4114 of the Public Contract Code of the State of California, as regards subletting and subcontracting, and to comply with all applicable requirements therein. In addition, Contractor is directed to familiarize itself with sections 1720 through 1861 of the Labor Code of the State of California, as regards the payment of prevailing wages and related issues, and to comply with all applicable requirements therein all including, without limitation, section 1775 and the Contractor's and Subcontractors' obligations and liability for violations of prevailing wage law and other applicable laws.

7.6. No Contractor whose Bid is accepted shall, without consent of the awarding authority and in full compliance with section 4100, et seq. of the Public Contract Code, and section 1771.1 of the Labor Code, including, without limitation, sections 4107, 4107.5, and 4109 of the Public Contract Code, either:

7.6.1. Substitute any person as a Subcontractor in place of the Subcontractor designated in the original Bid; or

7.6.2. Permit any Subcontract to be assigned or transferred, or allow any portion of the Work to be performed by anyone other than the original Subcontractor listed in the Bid; or

7.6.3. Sublet or subcontract any portion of the Work in excess of one-half of one percent (0.5%) of the Contractor's total bid as to which his original bid did not designate a Subcontractor.

7.7. The Contractor shall be responsible for the coordination of the trades, Subcontractors, sub-subcontractors, and material or equipment suppliers working on the Project.

7.7.1. If the Contract is valued at \$1 million or more and uses or plans to use state bond funds, Contractor is responsible for ensuring that first tier Subcontractors, holding C-4, C-7, C-10, C-16, C-20, C-34, C-36, C-38, C-42, C-43, and/or C-46 licenses, are prequalified by the District to work on the Project pursuant to Public Contract Code section 20111.6.

7.7.2. Contractor is responsible for ensuring that all Subcontractors are properly registered as public works contractors by the Department of Industrial Relations.

7.8. Contractor is solely responsible for settling any differences between the Contractor and its Subcontractor(s) or between Subcontractors.

7.9. Contractor must include in all of its subcontracts the assignment provisions as indicated in the Termination section of these General Conditions.

8. OTHER CONTRACTS/CONTRACTORS

8.1. District reserves the right to let other contracts, and/or to perform work with its own forces, in connection with the Project. Contractor shall afford other contractors reasonable opportunity for introduction and storage of their materials and execution of their work and shall properly coordinate and connect Contractor's Work with the work of other contractors.

8.2. In addition to Contractor's obligation to protect its own Work, Contractor shall protect the work of any other contractor that Contractor encounters while working on the Project.

8.3. If any part of Contractor's Work depends for proper execution or results upon work of District or any other contractor, the Contractor shall inspect and promptly report to the District in writing before proceeding with its Work any defects in District's or any other contractor's work that render Contractor's Work unsuitable for proper execution and results. Contractor shall be held accountable for damages to District for District's or any other contractor's work that Contractor failed to inspect or should have inspected. Contractor's failure to inspect and report shall constitute Contractor's acceptance of all District's or any other contractor's work as fit and proper for reception of Contractor's Work, except as to defects that may develop in District's or any other contractor's work after execution of Contractor's Work.

8.4. To ensure proper execution of its subsequent work, Contractor shall measure and inspect work already in place and shall at once report to the District in writing any discrepancy between that executed work and the Contract Documents.

8.5. Contractor shall ascertain to its own satisfaction the scope of the Project and nature of District's or any other contracts that have been or may be awarded by

District in prosecution of the Project to the end that Contractor may perform this Contract in light of the other contracts, if any.

8.6. Nothing herein contained shall be interpreted as granting to Contractor exclusive occupancy of the Site, the Premises, or of the Project. Contractor shall not cause any unnecessary hindrance or delay to the use and/or school operation(s) of the Premises and/or to District or any other contractor working on the Project. If simultaneous execution of any contract or school operation is likely to cause interference with performance of Contractor's Contract, Contractor shall coordinate with those contractor(s), person(s), and/or entity(s) and shall notify the District of the resolution.

9. DRAWINGS AND SPECIFICATIONS

9.1. A complete list of all Drawings that form a part of the Contract is to be found as an index on the Drawings themselves, and/or may be provided to the Contractor and/or in the Table of Contents.

9.2. Materials or Work described in words that so applied have a well known technical or trade meaning shall be deemed to refer to recognized standards, unless noted otherwise.

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

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

9.5. Contract Documents are complementary, and what is called for by one shall be binding as if called for by all. As such, 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 District and Architect in writing, and any necessary changes shall be made as provided in the Contract Documents.

9.6. In the case of discrepancy or ambiguity in the Contract Documents, the order of precedence in the Agreement shall prevail. However, in the case of discrepancy or ambiguity solely between and among the Drawings and Specifications, the discrepancy or ambiguity shall be resolved in favor of the interpretation that will provide District with the functionally complete and operable Project described in the Drawings and Specifications. In case of ambiguity, conflict, or lack of information, District will furnish clarifications with reasonable promptness.

9.7. 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, the laws, ordinances, rules, and regulations shall be

considered as a part of the Contract within the limits specified. Contractor shall bear all expense of correcting work done contrary to said laws, ordinances, rules, and regulations.

9.8. Ownership of Drawings

All copies of Plans, Drawings, Designs, Specifications, and copies of other incidental architectural and engineering work, or copies of other Contract Documents furnished by District, are the property of District. They are not to be used by Contractor in other work and, with the exception of signed sets of Contract Documents, are to be returned to District on request at completion of Work, or may be used by District as it may require without any additional costs to District. Neither the Contractor nor any Subcontractor, or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by the Architect. District hereby grants the Contractor, Subcontractors, sub-subcontractors, and material or equipment suppliers a limited license to use applicable portions of the Drawings prepared for the Project in the execution of their Work under the Contract Documents.

10. CONTRACTOR'S SUBMITTALS AND SCHEDULES

Contractor's submittals shall comply with the provisions and requirements of the Specifications including, without limitation Submittals.

10.1. Schedule of Work, Schedule of Submittals, and Schedule of Values

10.1.1. Within **TEN (10)** calendar days after the date of the Notice to Proceed (unless otherwise specified in the Specifications), the Contractor shall prepare and submit to the District for review, in a form supported by sufficient data to substantiate its accuracy as the District may require:

10.1.1.1. Preliminary Schedule. A preliminary schedule of construction indicating the starting and completion dates of the various stages of the Work, including any information and following any form as may be specified in the Specifications. Once approved by District, this shall become the Construction Schedule. This schedule shall include and identify all tasks that are on the Project's critical path with a specific determination of the start and completion of each critical path task as well as all Contract milestones and each milestone's completion date(s) as may be required by the District.

10.1.1.2. Preliminary Schedule of Values. A preliminary schedule of values for all of the Work, which must include quantities and prices of items aggregating the Contract Price and must subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Unless the Special Conditions contain different limits, this preliminary schedule of values shall include, at a minimum, the following information and the following structure:

10.1.1.2.1. Divided into at least the following categories:

- 10.1.1.2.1.1.** Overhead and profit;
- 10.1.1.2.1.2.** Supervision;
- 10.1.1.2.1.3.** General conditions;

- 10.1.1.2.1.4.** Layout;
- 10.1.1.2.1.5.** Mobilization;
- 10.1.1.2.1.6.** Submittals;
- 10.1.1.2.1.7.** Bonds and insurance;
- 10.1.1.2.1.8.** Close-out/Certification documentation;
- 10.1.1.2.1.9.** Demolition;
- 10.1.1.2.1.10.** Installation;
- 10.1.1.2.1.11.** Rough-in;
- 10.1.1.2.1.12.** Finishes;
- 10.1.1.2.1.13.** Testing;
- 10.1.1.2.1.14.** Punchlist and acceptance.

10.1.1.2.2. Divided by each of the following areas:

- 10.1.1.2.2.1.** Site work;
- 10.1.1.2.2.2.** By each building;
- 10.1.1.2.2.3.** By each floor.

10.1.1.2.3. The preliminary schedule of values shall not provide for values any greater than the following percentages of the Contract value:

- 10.1.1.2.3.1.** Mobilization and layout combined to equal not more than 1%;
- 10.1.1.2.3.2.** Submittals, samples and shop drawings combined to equal not more than 3%;
- 10.1.1.2.3.3.** Bonds and insurance combined to equal not more than 2%.

10.1.1.2.4. Closeout documentation shall have a value in the preliminary schedule of not less than 5%.

10.1.1.2.5. Notwithstanding any provision of the Contract Documents to the contrary, payment of the Contractor's overhead, supervision, general conditions costs, and profit, as reflected in the Cost Breakdown, shall be paid based on percentage complete, with the disbursement of Progress Payments and the Final Payment.

10.1.1.2.6. Contractor shall certify that the preliminary schedule of values as submitted to the District is accurate and reflects the costs as developed in preparing Contractor's bid. The preliminary schedule of values shall be subject to the District's review and approval of the form and content thereof. In the event that the District objects to any portion of the preliminary schedule of values, the District shall notify the Contractor, in writing, of the District's objection(s) to the preliminary schedule of values. Within five (5) calendar days of the date of the District's written objection(s), Contractor shall submit a revised preliminary schedule of values to the District for review and approval. The foregoing procedure for the preparation, review and approval of the preliminary schedule of values shall continue until the District has approved the entirety of the preliminary schedule of values.

10.1.1.2.7. Once the preliminary schedule of values is approved by the District, this shall become the Schedule of Values. The Schedule of Values

shall not be thereafter modified or amended by the Contractor without the prior consent and approval of the District, which may be granted or withheld in the sole discretion of the District.

10.1.1.3. Preliminary Schedule of Submittals. A preliminary schedule of submittals, including Shop Drawings, Product Data, and Samples submittals. Once approved by District, this shall become the Submittal Schedule. All submittals shall be forwarded to the District by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those submittals shall be forwarded to the District so as not to delay the Construction Schedule. Upon request by the District, Contractor shall provide an electronic copy of all submittals to the District.

10.1.1.4. Safety Plan. Contractor's Safety Plan specifically adapted for the Project. Contractor's Safety Plan shall comply with the following requirements:

10.1.1.4.1. All applicable requirements of California Division of Industrial Safety ("CalOSHA") and/or of the United States Occupational Safety and Health Administration ("OSHA").

10.1.1.4.2. All provisions regarding Project safety, including all applicable provisions in these General Conditions.

10.1.1.4.3. Contractor's Safety Plan shall be in English and in the language(s) of the Contractor's and its Subcontractors' employees.

10.1.1.5. Complete Subcontractor List. The name, address, telephone number, facsimile number, California State Contractors License number, classification, and monetary value of all Subcontracts for parties furnishing labor, material, or equipment for completion of the Project.

10.1.2. Contractor must provide all schedules both in hard copy and electronically, in a format (e.g., Microsoft Project or Primavera) approved in advance by the District.

10.1.3. The District will review the schedules submitted and the Contractor shall make changes and corrections in the schedules as requested by the District and resubmit the schedules until approved by the District.

10.1.4. The District shall have the right at any time to revise the schedule of values if, in the District's sole opinion, the schedule of values does not accurately reflect the value of the Work performed.

10.1.5. All submittals and schedules must be approved by the District before Contractor can rely on them as a basis for payment.

10.2. Monthly Progress Schedule(s)

10.2.1. Contractor shall provide Monthly Progress Schedule(s) to the District. A Monthly Progress Schedule shall update the approved Construction Schedule or the last Monthly Progress Schedule, showing all work completed and to be completed. The monthly Progress Schedule shall be sent within the timeframe requested by the District and shall be in a format acceptable to the District and contain a written narrative of the progress of work that month and any changes, delays, or events that may affect the work. The process for District approval of the Monthly Progress Schedule shall be the same as the process for approval of the Construction Schedule.

10.2.2. Contractor shall submit Monthly Progress Schedule(s) with all payment applications.

10.3. Material Safety Data Sheets (MSDS)

Contractor is required to ensure Material Safety Data Sheets are available in a readily accessible place at the Work Site for any material requiring a Material Safety Data Sheet per the Federal "Hazard Communication" standard, or employees right to know law. The Contractor is also required to ensure proper labeling on substance brought onto the job site and that any person working with the material or within the general area of the material is informed of the hazards of the substance and follows proper handling and protection procedures. Two additional copies of the Material Safety Data Sheets shall also be submitted directly to the District.

11. SITE ACCESS, CONDITIONS, AND REQUIREMENTS

11.1. Site Investigation

Before bidding on this Work, Contractor shall make a careful investigation of the Site and thoroughly familiarize itself with the requirements of the Contract. By the act of submitting a bid for the Work included in this Contract, Contractor shall be deemed to have made a complete study and investigation, and to be familiar with and accepted the existing conditions of the Site.

Prior to commencing the Work, Contractor and the District's representative shall survey the Site to document the condition of the Site. Contractor will record the survey in digital videotape format and provide an electronic copy to the District within fourteen (14) days of the survey. This electronic record shall serve as a basis for determining any damages caused by the Contractor during the Project. The Contractor may also document any pre-existing conditions in writing, provided that both the Contractor and the District's representative agree on said conditions and sign a memorandum documenting the same.

11.2. Soils Investigation Report

11.2.1. When a soils investigation report obtained from test holes at Site is available, that report shall be available to the Contractor but shall not be a part of this Contract. Any information obtained from that report or any information given on Drawings as to subsurface soil condition or to elevations of existing grades or elevations of underlying rock is approximate only, is not guaranteed, does not form a part of this Contract, and Contractor may not rely thereon. By submitting its bid,

Contractor acknowledges that it has made visual examination of Site and has made whatever tests Contractor deems appropriate to determine underground condition of soil.

11.2.2. Contractor agrees that no claim against District will be made by Contractor for damages and hereby waives any rights to damages if, during progress of Work, Contractor encounters subsurface or latent conditions at Site materially differing from those shown on Drawings or indicated in Specifications, or for unknown conditions of an unusual nature that differ materially from those ordinarily encountered in the work of the character provided for in Plans and Specifications, except as indicated in the provisions of these General Conditions regarding trenches, trenching, and/or existing utility lines.

11.3. Access to Work

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

11.4. Layout and Field Engineering

11.4.1. All field engineering required for layout of this Work and establishing grades for earthwork operations shall be furnished by Contractor at its expense. This Work shall be done by a qualified, California-registered civil engineer approved in writing by District and Architect. Any required Record and/or As-Built Drawings of Site development shall be prepared by the approved civil engineer.

11.4.2. The Contractor shall be responsible for having ascertained pertinent local conditions such as location, accessibility, and general character of the Site and for having satisfied itself as to the conditions under which the Work is to be performed. Contractor shall follow best practices, including but not limited to pot holing to avoid utilities. District shall not be liable for any claim for allowances because of Contractor's error, failure to follow best practices, or negligence in acquainting itself with the conditions at the Site.

11.4.3. Contractor shall protect and preserve established benchmarks and monuments and shall make no changes in locations without the prior written approval of District. Contractor shall replace any benchmarks or monuments that are lost or destroyed subsequent to proper notification of District and with District's approval.

11.5. Utilities

Utilities shall be provided as indicated in the Specifications.

11.6. Sanitary Facilities

Sanitary facilities shall be provided as indicated in the Specifications.

11.7. Surveys

Contractor shall provide surveys done by a California-licensed civil engineer surveyor to determine locations of construction, grading, and site work as required to perform the Work.

11.8. Regional Notification Center

The Contractor, except in an emergency, shall contact the appropriate regional notification center at least two (2) days prior to commencing any excavation if the excavation will be conducted in an area or in a private easement that is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the District, and obtain an inquiry identification number from that notification center. No excavation shall be commenced and/or carried out by the Contractor unless an inquiry identification number has been assigned to the Contractor or any Subcontractor and the Contractor has given the District the identification number. Any damages arising from Contractor's failure to make appropriate notification shall be at the sole risk and expense of the Contractor. Any delays caused by failure to make appropriate notification shall be at the sole risk of the Contractor and shall not be considered for an extension of the Contract time.

11.9. Existing Utility Lines

11.9.1. Pursuant to Government Code section 4215, District assumes the responsibility for removal, relocation, and protection of main or trunk utility lines and facilities located on the construction Site at the time of commencement of construction under this Contract with respect to any such utility facilities that are not identified in the Plans and Specifications. Contractor shall not be assessed for liquidated damages for delay in completion of the Project caused by failure of District or the owner of a utility to provide for removal or relocation of such utility facilities.

11.9.2. Locations of existing utilities provided by District shall not be considered exact, but approximate within reasonable margin and shall not relieve Contractor of responsibilities to exercise reasonable care costs of repair due to Contractor's failure to do so. District shall compensate Contractor for the costs of locating, repairing damage not due to the failure of Contractor to exercise reasonable care, and removing or relocating such utility facilities not indicated in the Plans and Specifications with reasonable accuracy, and for equipment necessarily idle during such work.

11.9.3. No provision herein shall be construed to preclude assessment against Contractor for any other delays in completion of the Work. Nothing in this Article shall be deemed to require District to indicate the presence of existing service laterals, appurtenances, or other utility lines, within the exception of main or trunk utility lines. Whenever the presence of these utilities on the Site of the construction Project can be inferred from the presence of other visible facilities, such as buildings, meter junction boxes, on or adjacent to the Site of the construction.

11.9.4. If Contractor, while performing Work under this Contract, discovers utility facilities not identified by District in Contract Plans and Specifications, Contractor shall immediately notify the District and the utility in writing. The cost of repair for damage to above-mentioned visible facilities without prior written notification to the District shall be borne by the Contractor.

11.10. Notification

Contractor understands, acknowledges and agrees that the purpose for prompt notification to the District pursuant to these provisions is to allow the District to investigate the condition(s) so that the District shall have the opportunity to decide how the District desires to proceed as a result of the condition(s). Accordingly, failure of Contractor to promptly notify the District in writing, pursuant to these provisions, shall constitute Contractor's waiver of any claim for damages or delay incurred as a result of the condition(s).

11.11. Hazardous Materials

Contractor shall comply with all provisions and requirements of the Contract Documents related to hazardous materials including, without limitation, Hazardous Materials Procedures and Requirements.

11.12. No Signs

Neither the Contractor nor any other person or entity shall display any signs not required by law or the Contract Documents at the Site, fences trailers, offices, or elsewhere on the Site without specific prior written approval of the District.

12. TRENCHES

12.1. Trenches Greater Than Five Feet

Pursuant to Labor Code section 6705, if the Contract Price exceeds \$25,000 and involves the excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall, in advance of excavation, promptly submit to the District and/or a registered civil or structural engineer employed by the District or Architect, a detailed plan, stamped by a licensed engineer retained by the Contractor, showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches.

12.2. Excavation Safety

If such plan varies from the Shoring System Standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer, but in no case shall such plan be less effective than that required by the Construction Safety Orders. No excavation of such trench or trenches shall be commenced until said plan has been accepted by the District or by the person to whom authority to accept has been delegated by the District.

12.3. No Tort Liability of District

Pursuant to Labor Code section 6705, nothing in this Article shall impose tort liability upon the District or any of its employees.

12.4. No Excavation Without Permits

The Contractor shall not commence any excavation Work until it has secured all necessary permits including the required CAL OSHA excavation/shoring permit. Any permits shall be prominently displayed on the Site prior to the commencement of any excavation.

12.5. Discovery of Hazardous Waste and/or Unusual Conditions

12.5.1. Pursuant to Public Contract Code section 7104, if the Work involves digging trenches or other excavations that extend deeper than four feet below the Surface, the Contractor shall promptly, and before the following conditions are disturbed, notify the District, in writing, of any:

12.5.1.1. Material that the Contractor believes may be material that is hazardous waste, as defined in section 25117 of the Health and Safety Code, is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

12.5.1.2. Subsurface or latent physical conditions at the Site differing from those indicated.

12.5.1.3. Unknown physical conditions at the Site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

12.5.2. The District shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the Work, shall issue a Change Order under the procedures described herein.

12.5.3. In the event that a dispute arises between District and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the Work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all work to be performed under the Contract. The Contractor shall retain any and all rights provided either by Contract or by law that pertain to the resolution of disputes and protests.

13. INSURANCE AND BONDS

13.1. Insurance

Unless different provisions and/or limits are indicated in the Special Conditions, all insurance required of Contractor and/or its Subcontractor(s) shall be in the amounts and include the provisions set forth herein.

13.1.1. Commercial General Liability and Automobile Liability Insurance

13.1.1.1. Contractor shall procure and maintain, during the life of this Contract, Commercial General Liability Insurance and Automobile Liability Insurance that shall protect Contractor, District, State, Construction Manager(s), Project Inspector(s), and Architect(s) from all claims for bodily injury, property damage, personal injury, death, advertising injury, and medical payments arising from operations under this Contract. This coverage shall be provided in a form at least as broad as Insurance Services (ISO) Form CG 0001 11188. Contractor shall ensure that Products Liability and Completed Operations coverage, Fire Damage Liability, and Any Auto including owned, non-owned, and hired, are included within the above policies and at the required limits, or Contractor shall procure and maintain these coverages separately.

13.1.1.2. Contractor's deductible or self-insured retention for its Commercial General Liability Insurance policy shall not exceed \$25,000 unless approved in writing by District.

13.1.1.3. All such policies shall be written on an occurrence form.

13.1.2. Excess Liability Insurance

13.1.2.1. Contractor may procure and maintain, during the life of this Contract, an Excess Liability Insurance Policy to meet the policy limit requirements of the required policies if Contractor's underlying policy limits are less than required.

13.1.2.2. There shall be no gap between the per occurrence amount of any underlying policy and the start of the coverage under the Excess Liability Insurance Policy. Any Umbrella or Excess Liability Insurance Policy shall be written on a following form and shall protect Contractor, District, State, Construction Manager(s), Project Manager(s), and Architect(s) in amounts and including the provisions as set forth in the Supplementary Conditions (if any) and/or Special Conditions, and that complies with all requirements for Commercial General Liability and Automobile Liability and Employers' Liability Insurance.

13.1.3. Subcontractor(s): Contractor shall require its Subcontractor(s), if any, to procure and maintain Commercial General Liability Insurance, Automobile Liability Insurance, and Excess Liability Insurance (if Subcontractor elects to satisfy, in part the insurance required herein by procuring and maintaining an Excess Liability Insurance Policy) with forms of coverage and limits equal to the amounts required of the Contractor.

13.1.4. Workers' Compensation and Employers' Liability Insurance

13.1.4.1. In accordance with provisions of section 3700 of the California Labor Code, the Contractor and every Subcontractor shall be required to secure the payment of compensation to its employees.

13.1.4.2. Contractor shall procure and maintain, during the life of this Contract, Workers' Compensation Insurance and Employers' Liability Insurance

for all of its employees engaged in work under this Contract, on/or at the Site of the Project. This coverage shall cover, at a minimum, medical and surgical treatment, disability benefits, rehabilitation therapy, and survivors' death benefits. Contractor shall require its Subcontractor(s), if any, to procure and maintain Workers' Compensation Insurance and Employers' Liability Insurance for all employees of Subcontractor(s). Any class of employee or employees not covered by a Subcontractor's insurance shall be covered by Contractor's insurance. If any class of employee or employee engaged in Work under this Contract, on or at the Site of the Project, is not protected under the Workers' Compensation Insurance, Contractor shall provide, or shall cause a Subcontractor to provide, adequate insurance coverage for the protection of any employee(s) not otherwise protected before any of those employee(s) commence work.

13.1.5. Builder's Risk Insurance: Builder's Risk "All Risk" Insurance

Contractor shall procure and maintain, during the life of this Contract, Builder's Risk (Course of Construction), or similar first party property coverage acceptable to the District, issued on a replacement cost value basis. The cost shall be consistent with the total replacement cost of all insurable Work of the Project included within the Contract Documents. Coverage is to insure against all risks of accidental physical loss and shall include without limitation the perils of vandalism and/or malicious mischief (both without any limitation regarding vacancy or occupancy), sprinkler leakage, civil authority, theft, sonic disturbance, earthquake, flood, collapse, wind, fire, war, terrorism, lightning, smoke, and rioting. Coverage shall include debris removal, demolition, increased costs due to enforcement of all applicable ordinances and/or laws in the repair and replacement of damaged 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, including completed Work and Work in progress, to the full insurable value thereof.

13.1.6. Pollution Liability Insurance

13.1.6.1. Contractor shall procure and maintain Pollution Liability Insurance that shall protect Contractor, District, State, Construction Manager(s), Project Inspector(s), and Architect(s) from all claims for bodily injury, property damage, including natural resource damage, cleanup costs, removal, storage, disposal, and/or use of the pollutant arising from operations under this Contract, and defense, including costs and expenses incurred in the investigation, defense, or settlement of claims. Coverage shall apply to sudden and/or gradual pollution conditions resulting from the escape or release of smoke, vapors, fumes, acids, alkalis, toxic chemicals, liquids, or gases, natural gas, waste materials, or other irritants, contaminants, or pollutants, including asbestos. This coverage shall be provided in a form at least as broad as Insurance Services (ISO) Form CG 2415, or Contractor shall procure and maintain these coverages separately.

13.1.6.2. Contractor shall warrant that any retroactive date applicable to coverage under the policy predates the effective date of the Contract and that continuous coverage will be maintained or an extended reporting or discovery period will be exercised for a period of three (3) years, beginning from the time that the Work under the Contract is completed.

13.1.6.3. If Contractor is responsible for removing any pollutants from a site, then Contractor shall ensure that Any Auto, including owned, non-owned, and hired, are included within the above policies and at the required limits, to cover its automobile exposure from transporting the pollutants from the site to an approved disposal site. This coverage shall include the Motor Carrier Act Endorsement, MCS 90.

13.1.7. Proof of Carriage of Insurance and Other Requirements: Endorsements and Certificates

13.1.7.1. Contractor shall not commence Work nor shall it allow any Subcontractor to commence Work under this Contract, until Contractor and its Subcontractor(s) have procured all required insurance and Contractor has delivered in duplicate to the District complete endorsements (or entire insurance policies) and certificates indicating the required coverages have been obtained, and the District has approved these documents.

13.1.7.2. Endorsements, certificates, and insurance policies shall include the following:

13.1.7.2.1. A clause stating:

“This policy shall not be amended, canceled or modified and the coverage amounts shall not be reduced until notice has been mailed to District, Architect, and Construction Manager stating date of amendment, modification, cancellation or reduction. Date of amendment, modification, cancellation or reduction may not be less than thirty (30) days after date of mailing notice.”

13.1.7.2.2. Language stating in particular those insured, extent of insurance, location and operation to which insurance applies, expiration date, to whom cancellation and reduction notice will be sent, and length of notice period.

13.1.7.3. All endorsements, certificates and insurance policies shall state that District, its trustees, employees and agents, the State of California, Construction Manager(s), Project Manager(s), Inspector(s) and Architect(s) are named additional insureds under all policies except Workers’ Compensation Insurance and Employers’ Liability Insurance.

13.1.7.4. Insurance written on a “claims made” basis is to be renewed by the Contractor and all Subcontractors for a period of five (5) years following completion of the Work or termination of this Agreement. Such insurance must have the same coverage and limits as the policy that was in effect during the term of this Agreement, and will cover the Contractor and all Subcontractors for all claims made.

13.1.7.5. Contractor’s and Subcontractors’ insurance policy(s) shall be primary and non-contributory to any insurance or self-insurance maintained by District, its trustees, employees and/or agents, the State of California, Construction Manager(s), Project Manager(s), Inspector(s), and/or Architect(s).

13.1.7.6. All endorsements shall waive any right to subrogation against any of the named additional insureds.

13.1.7.7. Unless otherwise stated in the Special Conditions, all of Contractor's insurance shall be with insurance companies with an A.M. Best rating of no less than **A: VII.**

13.1.7.8. The insurance requirements set forth herein shall in no way limit the Contractor's liability arising out of or relating to the performance of the Work or related activities.

13.1.7.9. Failure of Contractor and/or its Subcontractor(s) to comply with the insurance requirements herein shall be deemed a material breach of the Agreement.

13.1.8. Insurance Policy Limits

Unless different limits are indicated in the Special Conditions, the limits of insurance shall not be less than the following amounts:

Commercial General Liability	Product Liability and Completed Operations, Fire Damage Liability – Split Limit	\$2,000,000 per occurrence; \$4,000,000 aggregate
Automobile Liability – Any Auto	Combined Single Limit	\$1,000,000
Workers Compensation		Statutory limits pursuant to State law
Employers' Liability		\$1,000,000
Builder's Risk (Course of Construction)		Issued for the value and scope of Work indicated herein.
Pollution Liability		\$1,000,000 per claim; \$2,000,000 aggregate

13.2. Contract Security - Bonds

13.2.1. Contractor shall furnish two surety bonds issued by a California admitted surety insurer as follows:

13.2.1.1. Performance Bond: A bond in an amount at least equal to one hundred percent (100%) of Contract Price as security for faithful performance of this Contract.

13.2.1.2. Payment Bond: A 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/or furnishing materials in connection with this Contract.

13.2.2. Cost of bonds shall be included in the Bid and Contract Price.

13.2.3. All bonds related to this Project shall be in the forms set forth in these Contract Documents and shall comply with all requirements of the Contract Documents, including, without limitation, the bond forms.

14. WARRANTY/GUARANTEE/INDEMNITY

14.1. Warranty/Guarantee

14.1.1. The Contractor shall obtain and preserve for the benefit of the District, manufacturer's warranties on materials, fixtures, and equipment incorporated into the Work.

14.1.2. In addition to guarantees required elsewhere, Contractor shall, and hereby does guarantee and warrant all Work furnished on the job against all defects for a period of **ONE (1)** year after the later of the following dates:

14.1.2.1. The date of completion as defined in Public Contract Code section 7107, subdivision (c), or

14.1.2.2. The commissioning date for the Project, if any.

At the District's sole option, Contractor shall repair or replace any and all of that Work, together with any other Work that may be displaced in so doing, that may prove defective in workmanship and/or materials within a **ONE (1)** year period from date of completion as defined above without expense whatsoever to District. In the event of failure of Contractor and/or Surety to commence and pursue with diligence said replacements or repairs within ten (10) days after being notified in writing, Contractor and Surety hereby acknowledge and agree that District is authorized to proceed to have defects repaired and made good at expense of Contractor and/or Surety who hereby agree to pay costs and charges therefore immediately on demand.

14.1.3. If, in the opinion of District, defective work creates a dangerous condition or requires immediate correction or attention to prevent further loss to District or to prevent interruption of operations of District, District will attempt to give the notice required above. If Contractor or Surety cannot be contacted or neither complies with District's request for correction within a reasonable time as determined by District, District may, notwithstanding the above provision, proceed to make any and all corrections and/or provide attentions the District believes are necessary. The costs of correction or attention shall be charged against Contractor and Surety of the guarantees provided in this Article or elsewhere in this Contract.

14.1.4. The above provisions do not in any way limit the guarantees on any items for which a longer guarantee is specified or on any items for which a manufacturer gives a guarantee for a longer period. Contractor shall furnish to District all appropriate guarantee or warranty certificates as indicated in the Specifications or upon request by District.

14.1.5. Nothing herein shall limit any other rights or remedies available to District.

14.2. Indemnity

14.2.1. To the furthest extent permitted by California law, the Contractor shall indemnify, defend with legal counsel reasonably acceptable to the District, keep and hold harmless the District, the Architect, and the Construction Manager, their consultants and separate contractors, and their respective board members, officers, representatives, contractors, agents, and employees, in both individual and official capacities ("Indemnitees"), against all suits, claims, damages, losses, and expenses, including but not limited to attorney's fees, caused by, arising out of, resulting from, or incidental to, the performance of the Work under this Contract by the Contractor, its Subcontractors, vendors, or suppliers, except to the extent caused by the sole negligence, active negligence, or willful misconduct of the Indemnitees, and/or to any extent that would render these provisions void or unenforceable. This agreement and obligation of the Contractor shall not be construed to negate, abridge, or otherwise reduce any right or obligation of indemnity that would otherwise exist as to any party or person described herein. This indemnification, defense, and hold harmless obligation includes any failure or alleged failure by Contractor to comply with any provision of law, any failure or alleged failure to timely and properly fulfill all of its obligations under the Contract Documents in strict accordance with their terms, and without limitation, any stop payment notice actions or liens, including Civil Wage and Penalty Assessments and/or Orders by the California Department of Industrial Relations.

14.2.2. The Contractor shall give prompt notice to the District in the event of any injury (including death), loss, or damage included herein. Without limitation of the provisions herein, if the Contractor's agreement to indemnify, defend, and hold harmless the Indemnitees as provided herein shall be determined to be void or unenforceable, in whole or in part, it is the intention of the parties that these circumstances shall not otherwise affect the validity or enforceability of the Contractor's agreement to indemnify, defend, and hold harmless the rest of the Indemnitees, as provided herein. Further, the Contractor shall be and remain fully liable on its agreements and obligations herein to the full extent permitted by law.

14.2.3. In any and all claims against any of the Indemnitees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the Contractor's indemnification obligation herein shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or any Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

14.2.4. The District may retain so much of the moneys due the Contractor as shall be considered necessary, until disposition of any such suit, claims or actions for damages or until the District, Architect and Construction Manager have received written agreement from the Contractor that they will unconditionally defend the District, Architect and Construction Manager, their officers, agents and employees, and pay any damages due by reason of settlement or judgment.

14.2.5. The defense and indemnification obligations hereunder shall survive the completion of Work, including the warranty/guarantee period, and/or the termination of the Agreement.

15. TIME

15.1. Notice to Proceed

15.1.1. District may issue a Notice to Proceed within three (3) months from the date of the Notice of Award. Once Contractor has received the Notice to Proceed, Contractor shall complete the Work within the period of time indicated in the Contract Documents.

15.1.2. In the event that the District desires to postpone issuing the Notice to Proceed beyond this 3-month period, it is expressly understood that with reasonable notice to the Contractor, the District may postpone issuing the Notice to Proceed. It is further expressly understood by Contractor that Contractor shall not be entitled to any claim of additional compensation as a result of the postponement of the issuance of the Notice to Proceed.

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

15.2. Computation of Time / Adverse Weather

15.2.1. The Contractor will only be allowed a time extension for Adverse Weather conditions if requested by Contractor and only if all of the following conditions are met:

15.2.1.1. The weather conditions constitute Adverse Weather, as defined herein and further specified in the Special Conditions;

15.2.1.2. Contractor can verify that the Adverse Weather caused delays in excess of five hours of the indicated labor required to complete the scheduled tasks of Work on the day affected by the Adverse Weather;

15.2.1.3. The Contractor's crew is dismissed as a result of the Adverse Weather;

15.2.1.4. Said delay adversely affects the critical path in the Construction Schedule; and

15.2.1.5. The number of days of delay for the month exceeds those indicated in the Special Conditions.

15.2.2. If the aforementioned conditions are met, a day-for-day extension will only be allowed for those days in excess of those indicated in the Special Conditions.

15.2.3. The Contractor shall work seven (7) days per week, if necessary, irrespective of inclement weather, to maintain access and the Construction Schedule, and to protect the Work under construction from the effects of Adverse Weather, all at no further cost to the District.

15.2.4. The Contract Time has been determined with consideration given to the average climate weather conditions prevailing in the County in which the Project is located.

15.3. Hours of Work

15.3.1. Sufficient Forces

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

15.3.2. Performance During Working Hours

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

15.4. Progress and Completion

15.4.1. Time of the Essence

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

15.4.2. No Commencement Without Insurance or Bonds

The Contractor shall not commence operations on the Project or elsewhere prior to the effective date of insurance and bonds. The date of commencement of the Work shall not be changed by the effective date of such insurance or bonds. If Contractor commences Work without insurance and bonds, all Work is performed at Contractor's peril and shall not be compensable until and unless Contractor secures bonds and insurance pursuant to the terms of the Contract Documents and subject to District claim for damages.

15.5. Schedule

Contractor shall provide to District, Construction Manager, and Architect a schedule in conformance with the Contract Documents and as required in the Notice to Proceed and the Contractor's Submittals and Schedules section of these General Conditions.

15.6. Expeditious Completion

The Contractor shall proceed expeditiously with adequate forces and shall achieve Completion within the Contract Time.

16. EXTENSIONS OF TIME – LIQUIDATED DAMAGES

16.1. Liquidated Damages

Contractor and District hereby agree that the exact amount of damages for failure to complete the Work within the time specified is extremely difficult or impossible to determine. If the Work is not completed within the time specified in the Contract Documents, it is understood that the District will suffer damage. It being impractical and unfeasible to determine the amount of actual damage, it is agreed the Contractor shall pay to District as fixed and liquidated damages, and not as a penalty, the amount set forth in the Agreement for each calendar day of delay in completion. Contractor and its Surety shall be liable for the amount thereof pursuant to Government Code section 53069.85.

16.2. Excusable Delay

16.2.1. Contractor shall not be charged for liquidated damages because of any delays in completion of Work which are not the fault of Contractor or its Subcontractors, including acts of God as defined in Public Contract Code section 7105, acts of enemy, epidemics, and quarantine restrictions. Contractor shall, within five (5) calendar days of beginning of any delay, notify District in writing of causes of delay including documentation and facts explaining the delay. District shall review the facts and extent of any delay and shall grant extension(s) of time for completing Work when, in its judgment, the findings of fact justify an extension. Extension(s) of time shall apply only to that portion of Work affected by delay, and shall not apply to other portions of Work not so affected. An extension of time may only be granted if Contractor has timely submitted the Construction Schedule as required herein.

16.2.2. Contractor shall notify the District pursuant to the claims provisions in these General Conditions of any anticipated delay and its cause. Following submission of a claim, the District may determine whether the delay is to be considered avoidable or unavoidable, how long it continues, and to what extent the prosecution and completion of the Work might be delayed thereby.

16.2.3. In the event the Contractor requests an extension of Contract Time for unavoidable delay, such request shall be submitted in accordance with the provisions in the Contract Documents governing changes in Work. When requesting time, requests must be submitted with full justification and documentation. If the Contractor fails to submit justification, it waives its right to a time extension at a later date. Such justification must be based on the official Construction Schedule as updated at the time of occurrence of the delay or execution of Work related to any changes to the Scope of Work. Any claim for delay must include the following information as support, without limitation:

16.2.3.1. The duration of the activity relating to the changes in the Work and the resources (manpower, equipment, material, etc.) required to perform the activities within the stated duration.

16.2.3.2. Specific logical ties to the Contract Schedule for the proposed changes and/or delay showing the activity/activities in the Construction Schedule

that are affected by the change and/or delay. (A portion of any delay of seven (7) days or more must be provided.)

16.2.3.3. A recovery schedule must be submitted within twenty (20) calendar days of written notification to the District of causes of delay.

16.3. No Additional Compensation for Delays Within Contractor's Control

16.3.1. Contractor is aware that governmental agencies, including, without limitation, the Division of the State Architect, the Department of General Services, gas companies, electrical utility companies, water districts, and other agencies may have to approve Contractor-prepared drawings or approve a proposed installation. Accordingly, Contractor shall include in its bid, time for possible review of its drawings and for reasonable delays and damages that may be caused by such agencies. Thus, Contractor is not entitled to make a claim for damages or delays arising from the review of Contractor's drawings.

16.3.2. Contractor shall only be entitled to compensation for delay when all of the following conditions are met:

16.3.2.1. The District is responsible for the delay;

16.3.2.2. The delay is unreasonable under the circumstances involved;

16.3.2.3. The delay was not within the contemplation of the District and Contractor; and

16.3.2.4. Contractor complies with the claims procedure of the Contract Documents.

16.4. Float or Slack in the Schedule

Float or slack is the amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any of the activities in the schedule. Float or slack is not for the exclusive use of or benefit of either the District or the Contractor, but its use shall be determined solely by the District.

17. CHANGES IN THE WORK

17.1. No Changes Without Authorization

17.1.1. There shall be no change whatsoever in the Drawings, Specifications, or in the Work without an executed Change Order or a written Construction Change Directive authorized by the District as herein provided. District shall not be liable for the cost of any extra work or any substitutions, changes, additions, omissions, or deviations from the Drawings and Specifications unless the District's governing board has authorized the same and the cost thereof has been approved in writing by Change Order or Construction Change Directive. No extension of time for performance of the Work shall be allowed hereunder unless claim for such extension is made at the time changes in the Work are ordered, and such time duly adjusted in writing in the Change Order or Construction Change Directive. Contractor shall be responsible for any costs incurred by the District for professional services and DSA

fees and/or delay to the Project Schedule, if any, for DSA to review any request for changes to the DSA approved plans and specifications for the convenience of the Contractor and/or to accommodate the Contractor's means and methods. The provisions of the Contract Documents shall apply to all such changes, additions, and omissions with the same effect as if originally embodied in the Drawings and Specifications.

17.1.2. Contractor shall perform immediately all work that has been authorized by a fully executed Change Order or Construction Change Directive. Contractor shall be fully responsible for any and all delays and/or expenses caused by Contractor's failure to expeditiously perform this Work.

17.1.3. Should any Change Order result in an increase in the Contract Price, the cost of that Change Order shall be agreed to, in writing, in advance by Contractor and District and be subject to the monetary limitations set forth in Public Contract Code section 20118.4. In the event that Contractor proceeds with any change in Work without a Change Order executed by the District or Construction Change Directive, Contractor waives any claim of additional compensation or time for that additional work.

17.1.4. Contractor understands, acknowledges, and agrees that the reason for District authorization is so that District may have an opportunity to analyze the Work and decide whether the District shall proceed with the Change Order or alter the Project so that a change in Work becomes unnecessary.

17.2. Architect Authority

The Architect will have authority to order minor changes in the Work not involving any adjustment in the Contract Price, or an extension of the Contract Time, or a change that is inconsistent with the intent of the Contract Documents. These changes shall be effected by written Change Order, Construction Change Directive, or by Architect's response(s) to RFI(s)) by Architect's Supplemental Instructions ("ASI").

17.3. Change Orders

17.3.1. A Change Order is a written instrument prepared and issued by the District and/or the Architect and signed by the District (as authorized by the District's Board of Trustees), the Contractor, the Architect, and approved by the Project Inspector (if necessary) and DSA (if necessary), stating their agreement regarding all of the following:

17.3.1.1. A description of a change in the Work;

17.3.1.2. The amount of the adjustment in the Contract Price, if any; and

17.3.1.3. The extent of the adjustment in the Contract Time, if any.

17.4. Construction Change Directives

17.4.1. A Construction Change Directive is a written order prepared and issued by the District, the Construction Manager, and/or the Architect and signed by the

District and the Architect, directing a change in the Work. The District may as provided by law, by Construction Change Directive and without invalidating the Contract, order changes in the Work consisting of additions, deletions, or other revisions. The adjustment to the Contract Price or Time, if any, is subject to the provisions of this section regarding Changes in the Work. If all or a portion of the Project is being funded by funds requiring approval by the State Allocation Board (SAB), these revisions may be subject to compensation once approval of same is received and funded by the SAB, and funds are released by the Office of Public School Construction (OPSC). Any dispute as to the adjustment in the Contract Price, if any, of the Construction Change Directive or timing of payment shall be resolved pursuant to the Payment and Claims and Disputes provisions herein.

17.4.2. The District may issue a Construction Change Directive in the absence of agreement on the terms of a Change Order.

17.5. Force Account Directives

17.5.1. When work, for which a definite price has not been agreed upon in advance, is to be paid for on a force account basis, all direct costs necessarily incurred and paid by the Contractor for labor, material, and equipment used in the performance of that Work, shall be subject to the approval of the District and compensation will be determined as set forth herein.

17.5.2. The District will issue a Force Account Directive to proceed with the Work on a force account basis, and a not-to-exceed budget will be established by the District.

17.5.3. All requirements regarding direct cost for labor, labor burden, material, equipment, and markups on direct costs for overhead and profit described in this section shall apply to Force Account Directives. However, the District will only pay for actual costs verified in the field by the District or its authorized representative(s) on a daily basis.

17.5.4. The Contractor shall be responsible for all cost related to the administration of Force Account Directive. The markup for overhead and profit for Contractor modifications shall be full compensation to the Contractor to administer Force Account Directive.

17.5.5. The Contractor shall notify the District or its authorized representative(s) at least twenty-four (24) hours prior to proceeding with any of the force account work. Furthermore, the Contractor shall notify the District when it has consumed eighty percent (80%) of the budget, and shall not exceed the budget unless specifically authorized in writing by the District. The Contractor will not be compensated for force account work in the event that the Contractor fails to timely notify the District regarding the commencement of force account work, or exceeding the force account budget.

17.5.6. The Contractor shall diligently proceed with the work, and on a daily basis, submit a daily force account report on a form supplied by the District no later than 5:00 p.m. each day. The report shall contain a detailed itemization of the daily labor, material, and equipment used on the force account work only. The names of the individuals performing the force account work shall be included on the daily force

account reports. The type and model of equipment shall be identified and listed. The District will review the information contained in the reports, and sign the reports no later than the next work day, and return a copy of the report to the Contractor for their records. The District will not sign, nor will the Contractor receive compensation for work the District cannot verify. The Contractor will provide a weekly force account summary indicating the status of each Force Account Directive in terms of percent complete of the not-to-exceed budget and the estimated percent complete of the work

17.5.7. In the event the Contractor and the District reach a written agreement on a set cost for the work while the work is proceeding based on a Force Account Directive, the Contractor's signed daily force account reports shall be discontinued and all previously signed reports shall be invalid.

17.6. Price Request

17.6.1. Definition of Price Request

A Price Request ("PR") is a written request prepared by the Architect requesting the Contractor to submit to the District and the Architect an estimate of the effect of a proposed change in the Work on the Contract Price and the Contract Time.

17.6.2. Scope of Price Request

A Price Request shall contain adequate information, including any necessary Drawings and Specifications, to enable Contractor to provide the cost breakdowns required herein. The Contractor shall not be entitled to any additional compensation for preparing a response to a Price Request, whether ultimately accepted or not.

17.7. Proposed Change Order

17.7.1. Definition of Proposed Change Order

A Proposed Change Order ("PCO") is a written request prepared by the Contractor requesting that the District and the Architect issue a Change Order based upon a proposed change to the Work.

17.7.2. Changes in Contract Price

A PCO shall include breakdowns pursuant to the revisions herein to validate any change in Contract Price. In no case shall Contractor or any of its Subcontractors be permitted to reserve rights for additional compensation for Change Order Work.

17.7.3. Changes in Time

A PCO shall also include any changes in time required to complete the Project. Any additional time requested shall not be the number of days to make the proposed change, but must be based upon the impact to the Construction Schedule as defined in the Contract Documents. If Contractor fails to request a time extension in a PCO, then the Contractor is thereafter precluded from requesting time and/or claiming a delay. In no case shall Contractor or any of its Subcontractors be permitted to reserve rights for additional time for Change Order Work.

17.7.4. Unknown and/or Unforeseen Conditions

If Contractor submits a PCO requesting an increase in Contract Price and/or Contract Time that is based at least partially on Contractor's assertion that Contractor has encountered unknown and/or unforeseen condition(s) on the Project, then Contractor shall base the PCO on provable information that, beyond a reasonable doubt and to the District's satisfaction, demonstrates that the unknown and/or unforeseen condition(s) were actually unknown and/or unforeseen and that the condition(s) were reasonably unknown and/or unforeseen. If not, the District shall deny the PCO and the Contractor shall complete the Project without any increase in Contract Price and/or Contract Time based on that PCO.

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17.8. Format for Proposed Change Order

17.8.1. The following format shall be used as applicable by the District and the Contractor (e.g. Change Orders, PCO’s) to communicate proposed additions and deductions to the Contract, supported by attached documentation. Any spaces left blank will be deemed no change to cost or time.

	<u>WORK PERFORMED OTHER THAN BY CONTRACTOR</u>	<u>ADD</u>	<u>DEDUCT</u>
(a)	<u>Material</u> (attach itemized quantity and unit cost plus sales tax)		
(b)	<u>Add Labor</u> (attach itemized hours and rates, fully encumbered)		
(c)	<u>Add Equipment</u> (attach suppliers’ invoice)		
(d)	<u>Subtotal</u>		
(e)	<u>Add overhead and profit for any and all tiers of Subcontractor,</u> the total not to exceed ten percent (10%) of Item (d)		
(f)	<u>Subtotal</u>		
(g)	<u>Add overhead and profit for Contractor,</u> not to exceed five percent (5%) of Item (f)		
(h)	<u>Subtotal</u>		
(i)	<u>Add Bond and Insurance,</u> not to exceed one and a half percent (1.5%) of Item (h)		
(j)	<u>TOTAL</u>		
(k)	<u>Time</u> (zero unless indicated)		<u> </u> Calendar Days

	<u>WORK PERFORMED BY CONTRACTOR</u>	<u>ADD</u>	<u>DEDUCT</u>
(a)	<u>Material</u> (attach itemized quantity and unit cost plus sales tax)		
(b)	<u>Add Labor</u> (attach itemized hours and rates, fully encumbered)		
(c)	<u>Add Equipment</u> (attach suppliers’ invoice)		
(d)	<u>Subtotal</u>		
(e)	<u>Add overhead and profit for Contractor,</u> not to exceed fifteen percent (15%) of Item (d)		
(f)	<u>Subtotal</u>		
(g)	<u>Add Bond and Insurance,</u> not to exceed one and a half percent (1.5%) of Item (f)		
(h)	<u>TOTAL</u>		
(i)	<u>Time</u> (zero unless indicated)		<u> </u> Calendar Days

	<u>WORK PERFORMED OTHER THAN BY CONTRACTOR</u>	<u>ADD</u>	<u>DEDUCT</u>
(a)	<u>Material</u> (attach itemized quantity and unit cost plus sales tax)		

(b)	Add Labor (attach itemized hours and rates, fully encumbered)		
(c)	Add Equipment (attach suppliers' invoice)		
(d)	Subtotal		
(e)	Add overhead and profit for any and all tiers of Subcontractor , the total not to exceed ten percent (10%) of Item (d)		
(f)	Subtotal		
(g)	Add overhead and profit for Contractor , not to exceed five percent (5%) of Item (f)		
(h)	Subtotal		
(i)	Add Bond and Insurance , not to exceed one and a half percent (1.5%) of Item (h)		
(j)	TOTAL		
(k)	Time (zero unless indicated)		<u> </u> Calendar Days

	WORK PERFORMED BY CONTRACTOR	ADD	DEDUCT
(a)	Material (attach itemized quantity and unit cost plus sales tax)		
(b)	Add Labor (attach itemized hours and rates, fully encumbered)		
(c)	Add Equipment (attach suppliers' invoice)		
(d)	Subtotal		
(e)	Add overhead and profit for Contractor , not to exceed fifteen percent (15%) of Item (d)		
(f)	Subtotal		
(g)	Add Bond and Insurance , not to exceed one and a half percent (1.5%) of Item (f)		
(h)	TOTAL		
(i)	Time (zero unless indicated)		<u> </u> Calendar Days

17.8.2. Labor. Contractor shall be compensated for the costs of labor actually and directly utilized in the performance of the Work. Such labor costs shall be limited to field labor for which there is a prevailing wage rate classification. Wage rates for labor shall not exceed the prevailing wage rates in the locality of the Site and shall be in the labor classification(s) necessary for the performance of the Work. Labor costs shall exclude costs incurred by the Contractor in preparing estimate(s) of the costs of the change in the Work, in the maintenance of records relating to the costs of the change in the Work, coordination and assembly of materials and information relating to the change in the Work or performance thereof, or the supervision and other overhead and general conditions costs associated with the change in the Work or performance thereof, including but not limited to the cost for the job superintendent.

17.8.3. Materials. Contractor shall be compensated for the costs of materials necessarily and actually used or consumed in connection with the performance of the change in the Work. Costs of materials may include reasonable costs of transportation from a source closest to the Site of the Work and delivery to the Site. If discounts by material suppliers are available for materials necessarily used in the performance of the change in the Work, they shall be credited to the District. If materials necessarily used in the performance of the change in the Work are obtained from a supplier or source owned in whole or in part by the Contractor, compensation therefor shall not exceed the current wholesale price for such materials. If, in the reasonable opinion of the District, the costs asserted by the Contractor for materials in connection with any change in the Work are excessive, or if the Contractor fails to provide satisfactory evidence of the actual costs of such materials from its supplier or vendor of the same, the costs of such materials and the District's obligation to pay for the same shall be limited to the then lowest wholesale price at which similar materials are available in the quantities required to perform the change in the Work. The District may elect to furnish materials for the change in the Work, in which event the Contractor shall not be compensated for the costs of furnishing such materials or any mark-up thereon.

17.8.4. Equipment. As a precondition for the District's duty to pay for Equipment rental or loading and transportation, Contractor shall provide satisfactory evidence of the actual costs of Equipment from the supplier, vendor or rental agency of same. Contractor shall be compensated for the actual cost of the necessary and direct use of Equipment in the performance of the change in the Work. Use of such Equipment in the performance of the change in the Work shall be compensated in increments of fifteen (15) minutes. Rental time for Equipment moved by its own power shall include time required to move such Equipment to the site of the Work from the nearest available rental source of the same. If Equipment is not moved to the Site by its own power, Contractor will be compensated for the loading and transportation costs in lieu of rental time. The foregoing notwithstanding, neither moving time or loading and transportation time shall be allowed if the Equipment is used for performance of any portion of the Work other than the change in the Work. Unless prior approval in writing is obtained by the Contractor from the Architect, the Project Inspector and the District, no costs or compensation shall be allowed for time while Construction Equipment is inoperative, idle or on standby, for any reason. Contractor shall not be entitled to an allowance or any other compensation for Equipment or tools used in the performance of change in the Work where such Equipment or tools have a replacement value of **\$500.00** or less. Equipment costs claimed by the Contractor in connection with the performance of any Work shall not exceed rental rates established by distributors or construction equipment rental agencies in the locality of the Site; any costs asserted which exceed such rental rates shall not be allowed or paid. Unless otherwise specifically approved in writing by the Architect, the Project Inspector and the District, the allowable rate for the use of Equipment in connection with the Work shall constitute full compensation to the Contractor for the cost of rental, fuel, power, oil, lubrication, supplies, necessary attachments, repairs or maintenance of any kind, depreciation, storage, insurance, labor (exclusive of labor costs of the Equipment operator), and any and all other costs incurred by the Contractor incidental to the use of such Equipment.

17.9. Change Order Certification

17.9.1. All Change Orders and PCOs must include the following certification by the Contractor:

17.9.1.1. The undersigned Contractor approves the foregoing as to the changes, if any, and the Contract Price specified for each item and as to the extension of time allowed, if any, for completion of the entire Work as stated herein, and agrees to furnish all labor, materials, and service, and perform all work necessary to complete any additional work specified for the consideration stated herein. Submission of sums which have no basis in fact or which Contractor knows are false are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650 et seq. It is understood that the changes herein to the Contract shall only be effective when approved by the governing board of the District.

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

17.10. Determination of Change Order Cost

17.10.1. The amount of the increase or decrease in the Contract Price from a Change Order, if any, shall be determined in one or more of the following ways as applicable to a specific situation and at the District's discretion:

17.10.1.1. District acceptance of a PCO;

17.10.1.2. By unit prices contained in Contractor's original bid;

17.10.1.3. By agreement between District and Contractor.

17.11. Deductive Change Orders

All deductive Change Order(s) must be prepared pursuant to the provisions herein. Where a portion of the Work is deleted from the Contract, the reasonable value of the deducted work less the value of work performed shall be considered the appropriate deduction. The value submitted on the Schedule of Values shall be used to calculate the credit amount unless the bid documentation is being held in escrow as part of the Contract Documents. If Contractor offers a proposed amount for a deductive Change Order(s), Contractor shall include a minimum of five percent (5%) total profit and overhead to be deducted with the amount of the work of the Change Order(s). If Subcontractor work is involved, Subcontractors shall also include a minimum of five percent (5%) profit and overhead to be deducted with the amount of its deducted work. Any deviation from this provision shall not be allowed.

17.12. Addition or Deletion of Alternate Bid Item(s)

If the Bid Form and Proposal includes proposal(s) for Alternate Bid Item(s), during Contractor's performance of the Work, the District may elect to add or delete any such Alternate Bid Item(s) if not included in the Contract at the time of award. If the District elects to add or delete Alternate Bid Item(s) after Contract award, the cost or credit for such Alternate Bid Item(s) shall be as set forth in the Bid Form and Proposal unless the parties agree to a different price and the Contract Time shall be adjusted by the number of days allocated in the Contract Documents. If days are not allocated in the Contract Documents, the Contract Time shall be equitably adjusted.

17.13. Discounts, Rebates, and Refunds

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

17.14. Accounting Records

With respect to portions of the Work performed by Change Orders and Construction Change Directives, the Contractor shall keep and maintain cost-accounting records satisfactory to the District, which shall be available to the District on the same terms as any other books and records the Contractor is required to maintain under the Contract Documents. Such records shall include without limitation hourly records for Labor and Equipment and itemized records of materials and Equipment used that day in connection with the performance of any Work. All records maintained hereunder shall be subject to inspection, review and/or reproduction by the District, the Architect or the Project Inspector upon request. In the event that the Contractor fails or refuses, for any reason, to maintain or make available for inspection, review and/or reproduction such records, the District's reasonable good faith determination of the extent of adjustment to the Contract Price shall be final, conclusive, dispositive and binding upon Contractor.

17.15. Notice Required

If the Contractor desires to make a claim for an increase in the Contract Price, or any extension in the Contract Time for completion, it shall notify the District pursuant to the provisions herein, including the Article on Claims and Disputes. No claim shall be considered unless made in accordance with this subparagraph. Contractor shall proceed to execute the Work even though the adjustment may not have been agreed upon. Any change in the Contract Price or extension of the Contract Time resulting from such claim shall be authorized by a Change Order.

17.16. Applicability to Subcontractors

Any requirements under this Article shall be equally applicable to Change Orders or Construction Change Directives issued to Subcontractors by the Contractor to the extent as required by the Contract Documents.

17.17. Alteration to Change Order Language

Contractor shall not alter Change Orders or reserve time in Change Orders. Contractor shall execute finalized Change Orders and proceed under the provisions herein with proper notice.

17.18. Failure of Contractor to Execute Change Order

Contractor shall be in default of the Contract if Contractor fails to execute a Change Order when the Contractor agrees with the addition and/or deletion of the Work in that Change Order.

18. REQUEST FOR INFORMATION

18.1. Any Request for Information shall reference all applicable Contract Document(s), including Specification section(s), detail(s), page number(s), drawing number(s), and sheet number(s), etc. The Contractor shall make suggestions and interpretations of the issue raised by each Request for Information. A Request for Information cannot modify the Contract Price, Contract Time, or the Contract Documents. Upon request by the District, Contractor shall provide an electronic copy of the Request for Information in addition to the hard copy.

18.2. The Contractor shall be responsible for any costs incurred for professional services that District may deduct from any amounts owing to the Contractor, if a Request for Information requests an interpretation or decision of a matter where the information sought is equally available to the party making the request. District, at its sole discretion, shall deduct from and/or invoice Contractor for all the professional services arising herein.

19. PAYMENTS

19.1. Contract Price

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

19.2. Applications for Progress Payments

19.2.1. Procedure for Applications for Progress Payments

19.2.1.1. Application for Progress Payment

19.2.1.1.1. Not before the fifth (5th) day of each calendar month during the progress of the Work, Contractor shall submit to the District and the Architect an itemized Application for Payment for operations completed in accordance with the Schedule of Values. Such application shall be notarized, if required, and supported by the following or each portion thereof unless waived by the District in writing:

19.2.1.1.1.1. The amount paid to the date of the Application to the Contractor, to all its Subcontractors, and all others furnishing labor, material, or equipment for its Contract;

- 19.2.1.1.1.2.** The amount being requested under the Application for Payment by the Contractor on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract;
- 19.2.1.1.1.3.** The balance that will be due to each of such entities after said payment is made;
- 19.2.1.1.1.4.** A certification that the As-Built Drawings and annotated Specifications are current;
- 19.2.1.1.1.5.** Itemized breakdown of work done for the purpose of requesting partial payment;
- 19.2.1.1.1.6.** An updated and acceptable construction schedule in conformance with the provisions herein;
- 19.2.1.1.1.7.** The additions to and subtractions from the Contract Price and Contract Time;
- 19.2.1.1.1.8.** A total of the retentions held;
- 19.2.1.1.1.9.** Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the District may require from time to time;
- 19.2.1.1.1.10.** The percentage of completion of the Contractor's Work by line item;
- 19.2.1.1.1.11.** Schedule of Values updated from the preceding Application for Payment;
- 19.2.1.1.1.12.** A duly completed and executed conditional waiver and release upon progress payment compliant with Civil Code section 8132 from the Contractor and each subcontractor of any tier and supplier to be paid from the current progress payment;
- 19.2.1.1.1.13.** A duly completed and executed unconditional waiver and release upon progress payment compliant with Civil Code section 8134 from the Contractor and each subcontractor of any tier and supplier that was paid from the previous progress payment(s); and
- 19.2.1.1.1.14.** A certification by the Contractor of the following:

The Contractor warrants title to all Work performed as of the date of this payment application has been completed in accordance with the Contract Documents for the Project. The Contractor further warrants that all amounts have been paid for work which previous Certificates for Payment were issued and payments received and all Work performed as of the date of this payment application is free and clear of liens, claims, security interests, or encumbrances in favor of the

Contractor, Subcontractors, material and equipment suppliers, workers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work, except those of which the District has been informed.

19.2.1.1.1.15. The Contractor shall be subject to the False Claims Act set forth in Government Code section 12650 et seq. for information provided with any Application for Progress Payment.

19.2.1.1.1.16. All remaining certified payroll records ("CPR(s)") for each journeyman, apprentice, worker, or other employee employed by the Contractor and/or each Subcontractor in connection with the Work for the period of the Application for Payment. As indicated herein, the District shall not make any payment to Contractor until:

19.2.1.1.1.16.1 Contractor and/or its Subcontractor(s) provide electronic CPRs weekly for all weeks any journeyman, apprentice, worker or other employee was employed in connection with the Work directly to the DIR, or within ten (10) days of any request by the District or the DIR, and

19.2.1.1.1.16.2 Any delay in Contractor and/or its Subcontractor(s) providing CPRs in a timely manner may directly delay the Contractor's payment.

19.2.2. Prerequisites for Progress Payments

19.2.2.1. First Payment Request: The following items, if applicable, must be completed before the District will accept and/or process the Contractor's first payment request:

- 19.2.2.1.1.** Installation of the Project sign;
- 19.2.2.1.2.** Installation of field office;
- 19.2.2.1.3.** Installation of temporary facilities and fencing;
- 19.2.2.1.4.** Schedule of Values;
- 19.2.2.1.5.** Contractor's Construction Schedule;
- 19.2.2.1.6.** Schedule of unit prices, if applicable;
- 19.2.2.1.7.** Submittal Schedule;
- 19.2.2.1.8.** Receipt by Architect of all submittals due as of the date of the payment application;
- 19.2.2.1.9.** Copies of necessary permits;
- 19.2.2.1.10.** Copies of authorizations and licenses from governing authorities;

19.2.2.1.11. Initial progress report;

19.2.2.1.12. Surveyor qualifications;

19.2.2.1.13. Written acceptance of District's survey of rough grading, if applicable;

19.2.2.1.14. List of all Subcontractors, with names, license numbers, telephone numbers, and Scope of Work;

19.2.2.1.15. All bonds and insurance endorsements; and

19.2.2.1.16. Resumes of Contractor's project manager, and if applicable, job site secretary, record documents recorder, and job site superintendent.

19.2.2.2. Second Payment Request The District will not process the second payment request until and unless all submittals and Shop Drawings have been accepted for review by the Architect.

19.2.2.3. No Waiver of Criteria Any payments made to Contractor where criteria set forth herein have not been met shall not constitute a waiver of said criteria by District. Instead, such payment shall be construed as a good faith effort by District to resolve differences so Contractor may pay its Subcontractors and suppliers. Contractor agrees that failure to submit such items may constitute a breach of contract by Contractor and may subject Contractor to termination.

19.3. Progress Payments

19.3.1. District's Approval of Application for Payment

19.3.1.1. Upon receipt of a Application for Payment, The District shall act in accordance with both of the following:

19.3.1.1.1. Each Application for Payment shall be reviewed by the District as soon as practicable after receipt for the purpose of determining that the Application for Payment is a proper Application for Payment.

19.3.1.1.2. Any Application for Payment determined not to be a proper Application for Payment suitable for payment shall be returned to the Contractor as soon as practicable, but not later than seven (7) days, after receipt. An Application for Payment returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the Application for Payment is not proper. The number of days available to the District to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which the District exceeds this seven-day return requirement.

19.3.1.1.3. An Application for Payment shall be considered properly executed if funds are available for payment of the Application for Payment, and payment is not delayed due to an audit inquiry by the financial officer of the District.

19.3.1.2. The District's review of the Contractor's Application for Payment will be based on the District's and the Architect's observations at the Site and the data comprising the Application for Payment that the Work has progressed to the point indicated and that, to the best of the District's and the Architect's knowledge, information, and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to:

19.3.1.2.1. Observation of the Work for general conformance with the Contract Documents,

19.3.1.2.2. Results of subsequent tests and inspections,

19.3.1.2.3. Minor deviations from the Contract Documents correctable prior to completion, and

19.3.1.2.4. Specific qualifications expressed by the Architect.

19.3.1.3. District's approval of the certified Application for Payment shall be based on Contractor complying with all requirements for a fully complete and valid certified Application for Payment.

19.3.2. Payments to Contractor

19.3.2.1. Within thirty (30) days after approval of the Application for Payment, Contractor shall be paid a sum equal to ninety-five percent (95%) of the value of the Work performed (as verified by Architect and Inspector and certified by Contractor) up to the last day of the previous month, less the aggregate of previous payments and amount to be withheld. The value of the Work completed shall be Contractor's best estimate. No inaccuracy or error in said estimate shall operate to release the Contractor, or any Surety upon any bond, from damages arising from such Work, or from the District's right to enforce each and every provision of this Contract, and the District shall have the right subsequently to correct any error made in any estimate for payment.

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

19.3.2.3. If the District fails to make any progress payment within thirty (30) days after receipt of an undisputed and properly submitted Application for Payment from the Contractor, the District shall pay interest to the Contractor equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure.

19.3.3. No Waiver

No payment by District hereunder shall be interpreted so as to imply that District has inspected, approved, or accepted any part of the Work. Notwithstanding any payment, the District may enforce each and every provision of this Contract. The District may correct or require correction of any error subsequent to any payment.

19.4. Decisions to Withhold Payment

19.4.1. Reasons to Withhold Payment

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

19.4.1.1. Defective Work not remedied within **FORTY-EIGHT (48)** hours of written notice to Contractor.

19.4.1.2. Stop Payment Notices or other liens served upon the District as a result of the Contract. Contractor agrees that the District may withhold up to 125% of the amount claimed in the Stop Payment Notice to answer the claim and to provide for the District's reasonable cost of any litigation pursuant to the stop payment notice.

19.4.1.3. Liquidated damages assessed against the Contractor.

19.4.1.4. The cost of completion of the Contract if there exists reasonable doubt that the Work can be completed for the unpaid balance of the Contract Price or by the completion date.

19.4.1.5. Damage to the District or other contractor(s).

19.4.1.6. Unsatisfactory prosecution of the Work by the Contractor.

19.4.1.7. Failure to store and properly secure materials.

19.4.1.8. Failure of the Contractor to submit, on a timely basis, proper, sufficient, and acceptable documentation required by the Contract Documents, including, without limitation, a Construction Schedule, Schedule of Submittals, Schedule of Values, Monthly Progress Schedules, Shop Drawings, Product Data and samples, Proposed product lists, executed Change Orders, and/or verified reports.

19.4.1.9. Failure of the Contractor to maintain As-Built Drawings.

19.4.1.10. Erroneous estimates by the Contractor of the value of the Work performed, or other false statements in an Application for Payment.

19.4.1.11. Unauthorized deviations from the Contract Documents.

19.4.1.12. Failure of the Contractor to prosecute the Work in a timely manner in compliance with the Construction Schedule, established progress schedules, and/or completion dates.

19.4.1.13. Failure to provide acceptable electronic certified payroll records, as required by the Labor Code, by these Contract Documents, or by written request; for each journeyman, apprentice, worker, or other employee employed by the Contractor and/or by each Subcontractor in connection with the Work for the period of the Application for Payment or if payroll records are delinquent or inadequate.

19.4.1.14. Failure to properly pay prevailing wages as required in Labor Code section 1720 et seq., failure to comply with any other Labor Code requirements, and/or failure to comply with labor compliance monitoring and enforcement by the DIR.

19.4.1.15. Failure to properly pay prevailing wages as required in Labor Code section 1720 et seq., failure to comply with any other Labor Code requirements, and/or failure to comply with State labor compliance monitoring and enforcement, if applicable.

19.4.1.16. Failure to comply with any applicable federal statutes and regulations regarding minimum wages, withholding, payrolls and basic records, apprentice and trainee employment requirements, equal employment opportunity requirements, Copeland Act requirements, Davis-Bacon Act and related requirements, Contract Work Hours and Safety Standards Act requirements, if applicable.

19.4.1.17. Failure to properly maintain or clean up the Site.

19.4.1.18. Failure to timely indemnify, defend, or hold harmless the District.

19.4.1.19. Any payments due to the District, including but not limited to payments for failed tests, utilities changes, or permits.

19.4.1.20. Failure to pay Subcontractor(s) or supplier(s) as required by law and by the Contract Documents.

19.4.1.21. Failure to pay any royalty, license or similar fees.

19.4.1.22. Contractor is otherwise in breach, default, or in substantial violation of any provision of this Contract.

19.4.1.23. Failure to perform any implementation and/or monitoring required by any SWPPP for the Project and/or the imposition of any penalties or fines therefore whether imposed on the District or Contractor.

19.4.2. Reallocation of Withheld Amounts

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

19.4.2.2. 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 **FORTY-EIGHT (48)** hours written notice to the Contractor and, without prejudice to any other remedy, make good such deficiencies. The District shall adjust the total Contract Price by reducing the amount thereof by the cost of making good such deficiencies. If District deems it inexpedient to correct Work that is damaged, defective, or not done in accordance with Contract provisions, an equitable reduction in the Contract Price (of at least one hundred fifty percent (150%) of the estimated reasonable value of the nonconforming Work) shall be made therefor.

19.4.3. Payment After Cure

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

19.5. Subcontractor Payments

19.5.1. Payments to Subcontractors

No later than seven (7) days after receipt, or pursuant to Business and Professions Code section 7108.5 and Public Contract Code section 7107, the Contractor shall pay to each Subcontractor, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to its Sub-subcontractors in a similar manner.

19.5.2. No Obligation of District for Subcontractor Payment

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

19.5.3. Joint Checks

District shall have the right in its sole discretion, if necessary for the protection of the District, to issue joint checks made payable to the Contractor and Subcontractors and/or material or equipment suppliers. The joint check payees shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint check payment be construed to create any contract between the District and a Subcontractor of any tier, or a material or equipment supplier, any obligation from the District to such Subcontractor or a material or equipment supplier, or rights in such Subcontractor or a material or equipment supplier against the District.

20. COMPLETION OF THE WORK

20.1. Completion

20.1.1. District will accept completion of Contract and have the Notice of Completion recorded when the entire Work shall have been completed to the satisfaction of District.

20.1.2. The Work may only be accepted as complete by action of the governing board of the District.

20.1.3. District, at its sole option, may accept completion of Contract and have the Notice of Completion recorded when the entire Work shall have been completed to the satisfaction of District, except for minor corrective items, as distinguished from incomplete items. If Contractor fails to complete all minor corrective items within fifteen (15) days after the date of the District's acceptance of completion, District shall withhold from the final payment one hundred fifty percent (150%) of an estimate of the amount sufficient to complete the corrective items, as determined by District, until the item(s) are completed.

20.1.4. At the end of the 15-day period, if there are any items remaining to be corrected, District may elect to proceed as provided herein related to adjustments to Contract Price, and/or District's right to perform the Work of the Contractor.

20.2. Close-Out/Certification Procedures

20.2.1. Punch List

The Contractor shall notify the Architect when Contractor considers the Work complete. Upon notification, Architect will prepare a list of minor items to be completed or corrected ("Punch List"). The Contractor and/or its Subcontractors shall proceed promptly to complete and correct items on the Punch List. Failure to include an item on Punch List does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

20.2.2. Close-Out/Certification Requirements

20.2.2.1. Utility Connections

Buildings shall be connected to water, gas, sewer, and electric services, complete and ready for use. Service connections shall be made and existing services reconnected.

20.2.2.2. Record Drawings

20.2.2.2.1. Contractor shall provide exact Record Drawings of the Work upon completion of the Project as indicated in the Specifications.

20.2.2.2.2. Contractor is liable and responsible for any and all inaccuracies in the Record Drawings, even if inaccuracies become evident at a future date.

20.2.2.2.3. Upon completion of the Work and as a condition precedent to approval of final payment, Contractor shall obtain the Inspector's approval of the corrected prints and employ a competent draftsman to transfer the Record Drawings information to the most current version of Autocad that is, at that time, currently utilized for plan check submission by either the District, the Architect, OPSC, and/or DSA, and print a complete set of transparent sepias. When completed, Contractor shall deliver corrected sepias and diskette/CD/other data storage device acceptable to District with Autocad file to the District.

20.2.2.3. Maintenance Manuals: Contractor shall prepare all operation and maintenance manuals and date as indicated in the Specifications.

20.2.2.4. Source Programming: Contractor shall provide all source programming for all items in the Project.

20.2.2.5. Verified Reports: Contractor shall completely and accurately fill out and file forms DSA 6-C or DSA 152 (or current form), as appropriate. Refer to section 4-336 and section 4-343 of Part 1, Title 24 of the California Code of Regulations.

20.3. Final Inspection

20.3.1. Contractor shall comply with Punch List procedures as provided herein, and maintain the presence of a Project Superintendent and Project Manager until the Punch List is complete to ensure proper and timely completion of the Punch List. Under no circumstances shall Contractor demobilize its forces prior to completion of the Punch List. Upon receipt of Contractor's written notice that all of the Punch List items have been fully completed and the Work is ready for final inspection and acceptance, Architect and Project Inspector will inspect the Work and shall submit to Contractor and District a final inspection report noting the Work, if any, required in order to complete in accordance with the Contract Documents. Absent unusual circumstances, this report shall consist of the Punch List items not yet satisfactorily completed.

20.3.2. Upon Contractor's completion of all items on the Punch List and any other uncompleted portions of the Work, the Contractor shall notify the District and Architect, who shall again inspect such Work. If the Architect finds the Work complete and acceptable under the Contract Documents, the Architect will notify

Contractor, who shall then jointly submit to the Architect and the District its final Application for Payment.

20.3.3. Final Inspection Requirements

20.3.3.1. Before calling for final inspection, Contractor shall determine that the following have been performed:

- 20.3.3.1.1.** The Work has been completed.
- 20.3.3.1.2.** All life safety items are completed and in working order.
- 20.3.3.1.3.** Mechanical and electrical Work are complete and tested, fixtures are in place, connected, and ready for tryout.
- 20.3.3.1.4.** Electrical circuits scheduled in panels and disconnect switches labeled.
- 20.3.3.1.5.** Painting and special finishes complete.
- 20.3.3.1.6.** Doors complete with hardware, cleaned of protective film, relieved of sticking or binding, and in working order.
- 20.3.3.1.7.** Tops and bottoms of doors sealed.
- 20.3.3.1.8.** Floors waxed and polished as specified.
- 20.3.3.1.9.** Broken glass replaced and glass cleaned.
- 20.3.3.1.10.** Grounds cleared of Contractor's equipment, raked clean of debris, and trash removed from Site.
- 20.3.3.1.11.** Work cleaned, free of stains, scratches, and other foreign matter, of damaged and broken material replaced.
- 20.3.3.1.12.** Finished and decorative work shall have marks, dirt, and superfluous labels removed.
- 20.3.3.1.13.** Final cleanup, as provided herein.

20.4. Costs of Multiple Inspections

More than two (2) requests of the District to make a final inspection shall be considered an additional service of District, Architect, Construction Manager, and/or Project Inspector, and all subsequent costs will be invoiced to Contractor and if funds are available, withheld from remaining payments.

20.5. Partial Occupancy or Use Prior to Completion

20.5.1. District's Rights to Occupancy

The District may occupy or use any completed or partially completed portion of the Work at any stage, and such occupancy shall not constitute the District's Final Acceptance of any part of the Work. Neither the District's Final Acceptance, the making of Final Payment, any provision in Contract Documents, nor the use or occupancy of the Work, in whole or in part, by District shall constitute acceptance of Work not in accordance with the Contract Documents nor relieve the Contractor or the Contractor's Performance Bond Surety from liability with respect to any warranties or responsibility for faulty or defective Work or materials, equipment and workmanship incorporated therein. In the event that the District occupies or uses any completed or partially completed portion of the Work, the Contractor shall remain responsible for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement of warranties required by the Contract Documents unless the Contractor requests in writing, and the District agrees, to otherwise divide those responsibilities. Any dispute as to responsibilities shall be resolved pursuant to the Claims and Disputes provisions herein, with the added provision that during the dispute process, the District shall have the right to occupy or use any portion of the Work that it needs or desires to use.

20.5.2. Inspection Prior to Occupancy or Use

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

20.5.3. No Waiver

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

21. FINAL PAYMENT AND RETENTION

21.1. Final Payment

Upon receipt and approval of a valid and final Application for Payment, the Architect will issue a final Certificate of Payment. The District shall thereupon jointly inspect the Work and either accept the Work as complete or notify the Architect and the Contractor in writing of reasons why the Work is not complete. Upon acceptance of the Work of the Contractor as fully complete by the Governing Board of the District (that, absent unusual circumstances, will occur when the Punch List items have been satisfactorily completed), the District shall record a Notice of Completion with the County Recorder, and the Contractor shall, upon receipt of final payment from the District, pay the amount due Subcontractors.

21.2. Prerequisites for Final Payment The following conditions must be fulfilled prior to Final Payment:

21.2.1. A full release of all Stop Payment Notices served in connection with the Work shall be submitted by Contractor.

21.2.2. A duly completed and executed conditional waiver and release upon final payment compliant with Civil Code section 8136, from the Contractor and each subcontractor of any tier and supplier to be paid from the final payment.

21.2.3. A duly completed and executed unconditional waiver and release upon progress payment compliant with Civil Code section 8134, from the Contractor and each subcontractor of any tier and supplier that was paid from the previous progress payments.

21.2.4. A duly completed and executed Document 00880, "AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS" from the Contractor.

21.2.5. The Contractor shall have made all corrections to the Work that are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of District required under the Contract Documents.

21.2.6. Each Subcontractor shall have delivered to the Contractor all written guarantees, warranties, applications, and bonds required by the Contract Documents for its portion of the Work.

21.2.7. Contractor must have completed all requirements set forth under "Close-Out/Certification Procedures," including, without limitation, submission of an approved set of complete Record Drawings.

21.2.8. Architect shall have issued its written approval that final payment can be made.

21.2.9. The Contractor shall have delivered to the District all manuals and materials required by the Contract Documents.

21.2.10. The Contractor shall have completed final clean-up as provided herein.

21.3. Retention

21.3.1. The retention, less any amounts disputed by the District or that the District has the right to withhold pursuant to provisions herein, shall be paid:

21.3.1.1. After approval of the District by the Architect's Certificate of Payment,

21.3.1.2. After the satisfaction of the conditions set forth herein, and

21.3.1.3. After forty-five (45) days after the recording of the Notice of Completion by District.

21.3.2. No interest shall be paid on any retention, or on any amounts withheld due to a failure of the Contractor to perform, in accordance with the terms and conditions of the Contract Documents, except as provided to the contrary in any

Escrow Agreement between the District and the Contractor pursuant to Public Contract Code section 22300.

21.4. Substitution of Securities The District will permit the substitution of securities in accordance with the provisions of Public Contract Code section 22300.

22. UNCOVERING OF WORK

If a portion of the Work is covered without Inspector or Architect approval or not in compliance with the Contract Documents, it must, if required in writing by the District, the Project Inspector, or the Architect, be uncovered for the Project Inspector's or the Architect's observation and be replaced at the Contractor's expense without change in the Contract Price or Contract Time.

23. NONCONFORMING WORK AND CORRECTION OF WORK

23.1. Nonconforming Work

23.1.1. Contractor shall promptly remove from Premises all Work identified by District as failing to conform to the Contract Documents whether incorporated or not. Contractor shall promptly replace and re-execute its own Work to comply with the Contract Documents without additional expense to the District and shall bear the expense of making good all work of other contractors destroyed or damaged by any removal or replacement pursuant hereto and/or any delays to the District or other Contractors caused thereby.

23.1.2. If Contractor does not remove Work that District has identified as failing to conform to the Contract Documents within a reasonable time, not to exceed **FORTY-EIGHT (48)** hours, District may remove it and may store any material at Contractor's expense. If Contractor does not pay expense(s) of that removal within ten (10) days' time thereafter, District may, upon ten (10) days' written notice, sell any material at auction or at private sale and shall deduct all costs and expenses incurred by the District and/or District may withhold those amounts from payment(s) to Contractor.

23.2. Correction of Work

23.2.1. Correction of Rejected Work

Pursuant to the notice provisions herein, the Contractor shall immediately correct the Work rejected by the District, the Architect, or the Project Inspector as failing to conform to the requirements of the Contract Documents, whether observed before or after Completion and whether or not fabricated, installed, or completed. The Contractor shall bear costs of correcting the rejected Work, including delay costs, additional testing, inspections, and compensation for the Inspector's or the Architect's services and expenses made necessary thereby.

23.2.2. One-Year Warranty Corrections

If, within one (1) year after the date of Completion of the Work or a designated portion thereof, or after the date for commencement of warranties established hereunder, or by the terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the District to do so. This period of one (1) year shall be extended with respect to portions of the Work first performed after Completion by the period of time between Completion and the actual performance of the Work. This obligation hereunder shall survive acceptance of the Work under the Contract and termination of the Contract. The District shall give such notice promptly after discovery of the condition.

23.3. District's Right to Perform Work

23.3.1. If the Contractor should neglect to prosecute the Work properly or fail to perform any provisions of this contract, the District, after **FORTY-EIGHT (48)** hours written notice to the Contractor, may, without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.

23.3.2. If it is found at any time, before or after completion of the Work, that Contractor has varied from the Drawings and/or Specifications, including, but not limited to, variation in material, quality, form, or finish, or in the amount or value of the materials and labor used, District may require at its option:

23.3.2.1. That all such improper Work be removed, remade or replaced, and all work disturbed by these changes be made good by Contractor at no additional cost to the District;

23.3.2.2. 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; or

23.3.2.3. That the District exercise any other remedy it may have at law or under the Contract Documents, including but not limited to the District hiring its own forces or another contractor to replace the Contractor's nonconforming Work, in which case the District shall either issue a deductive Change Order, a Construction Change Directive, or invoice the Contractor for the cost of that work. Contractor shall pay any invoices within thirty (30) days of receipt of same or District may withhold those amounts from payment(s) to Contractor.

24. TERMINATION AND SUSPENSION

24.1. District's Right to Terminate Contractor for Cause

24.1.1. Grounds for Termination The District, in its sole discretion, may terminate the Contract and/or terminate the Contractor's right to perform the work of the Contract based upon the following:

24.1.1.1. Contractor refuses or fails to execute the Work or any separable part thereof with sufficient diligence as will ensure its completion within the time specified or any extension thereof, or

24.1.1.2. Contractor fails to complete said Work within the time specified or any extension thereof, or

24.1.1.3. Contractor persistently fails or refused to perform Work or provide material of sufficient quality as to be in compliance with Contract Documents; or

24.1.1.4. Contractor files a petition for relief as a debtor, or a petition is filed against the Contractor without its consent, and the petition not dismissed within sixty (60) days; or

24.1.1.5. Contractor makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency; or

24.1.1.6. Contractor persistently or repeatedly refuses fails, except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials to complete the Work in the time specified; or

24.1.1.7. Contractor fails to make prompt payment to Subcontractors, or for material, or for labor; or

24.1.1.8. Contractor persistently disregards laws, or ordinances, or instructions of District; or

24.1.1.9. Contractor fails to supply labor, including that of Subcontractors, that can work in harmony with all other elements of labor employed or to be employed on the Work; or

24.1.1.10. Contractor or its Subcontractor(s) is/are otherwise in breach, default, or in substantial violation of any provision of this Contract, including but not limited to a lapse in licensing or registration.

24.1.2. Notification of Termination

24.1.2.1. Upon the occurrence at District's sole determination of any of the above conditions, District may, without prejudice to any other right or remedy, serve written notice upon Contractor and its Surety of District's termination of this Contract and/or the Contractor's right to perform the work of the Contract. This notice will contain the reasons for termination. Unless, within three (3) days after the service of the notice, any and all condition(s) shall cease, and any and all violation(s) shall cease, or arrangement satisfactory to District for the correction of the condition(s) and/or violation(s) be made, this Contract shall cease and terminate. Upon Determination, Contractor shall not be entitled to receive any further payment until the entire Work is finished.

24.1.2.2. Upon Termination, District may immediately serve written notice of tender upon Surety whereby Surety shall have the right to take over and perform this Contract only if Surety:

24.1.2.2.1. Within three (3) days after service upon it of the notice of tender, gives District written notice of Surety's intention to take over and perform this Contract; and

24.1.2.2.2. Commences performance of this Contract within (three (3) days from date of serving of its notice to District.

24.1.2.3. Surety shall not utilize Contractor in completing the Project if the District notifies Surety of the District's objection to Contractor's further participation in the completion of the Project. Surety expressly agrees that any contractor which Surety proposes to fulfill Surety's obligations is subject to District's approval. District's approval shall not be unreasonably withheld, conditioned or delayed.

24.1.2.4. If Surety fails to notify District or begin performance as indicated herein, District may take over the Work and execute the Work to completion by any method it may deem advisable at the expense of Contractor and/or its Surety. Contractor and/or its Surety shall be liable to District for any excess cost or other damages the District incurs thereby. Time is of the essence in this Contract. If the District takes over the Work as herein provided, District may, without liability for so doing, take possession of and utilize in completing the Work such materials, appliances, plan, and other property belonging to Contractor as may be on the Site of the Work, in bonded storage, or previously paid for.

24.1.3. Effect of Termination

24.1.3.1. Contractor shall, only if ordered to do so by the District, immediately remove from the Site all or any materials and personal property belonging to Contractor that have not been incorporated in the construction of the Work, or which are not in place in the Work. The District retains the right, but not the obligation, to keep and use any materials and personal property belonging to Contractor that have not been incorporated in the construction of the Work, or which are not in place in the Work. The Contractor and its Surety shall be liable upon the performance bond for all damages caused the District by reason of the Contractor's failure to complete the Contract.

24.1.3.2. In the event that the District shall perform any portion of, or the whole of the Work, pursuant to the provisions of the General Conditions, the District shall not be liable nor account to the Contractor in any way for the time within which, or the manner in which, the Work is performed by the District or for any changes the District may make in the Work or for the money expended by the District in satisfying claims and/or suits and/or other obligations in connection with the Work.

24.1.3.3. In the event that the Contract is terminated for any reason, no allowances or compensation will be granted for the loss of any anticipated profit by the Contractor or any impact or impairment of Contractor's bonding capacity.

24.1.3.4. If the expense to the District to finish the Work exceeds the unpaid Contract Price, Contractor and Surety shall pay difference to District within twenty-one (21) days of District's request.

24.1.3.5. The District shall have the right (but shall have no obligation) to assume and/or assign to a general contractor or construction manager or other third party who is qualified and has sufficient resources to complete the Work, the rights of the Contractor under its subcontracts with any or all Subcontractors. In the event of an assumption or assignment by the District, no Subcontractor shall have any claim against the District or third party for Work performed by Subcontractor or other matters arising prior to termination of the Contract. The District or any third party, as the case may be, shall be liable only for obligations to the Subcontractor arising after assumption or assignment. Should the District so elect, the Contractor shall execute and deliver all documents and take all steps, including the legal assignment of its contractual rights, as the District may require, for the purpose of fully vesting in the District the rights and benefits of it Subcontractor under Subcontracts or other obligations or commitments. All payments due the Contractor hereunder shall be subject to a right of offset by the District for expenses and damages suffered by the District as a result of any default, acts, or omissions of the Contractor. Contractor must include this assignment provision in all of its contracts with its Subcontractors.

24.1.3.6. The foregoing provisions are in addition to and not in limitation of any other rights or remedies available to District.

24.1.4. Emergency Termination of Public Contracts Act of 1949

24.1.4.1. This Contract is subject to termination as provided by sections 4410 and 4411 of the Government Code of the State of California, being a portion of the Emergency Termination of Public Contracts Act of 1949.

24.1.4.1.1. Section 4410 of the Government Code states:

In the event a national emergency occurs, and public work, being performed by contract, is stopped, directly or indirectly, because of the freezing or diversion of materials, equipment or labor, as the result of an order or a proclamation of the President of the United States, or of an order of any federal authority, and the circumstances or conditions are such that it is impracticable within a reasonable time to proceed with a substantial portion of the work, then the public agency and the contractor may, by written agreement, terminate said contract.

24.1.4.1.2. Section 4411 of the Government Code states:

Such an agreement shall include the terms and conditions of the termination of the contract and provision for the payment of compensation or money, if any, which either party shall pay to the other or any other person, under the facts and circumstances in the case.

24.1.4.2. Compensation to the Contractor shall be determined at the sole discretion of District on the basis of the reasonable value of the Work done, including preparatory work. As an exception to the foregoing and at the District's discretion, in the case of any fully completed separate item or portion of the Work for which there is a separate previously submitted unit price or item on the accepted schedule of values, that price shall control. The District, at its sole

discretion, may adopt the Contract Price as the reasonable value of the work done or any portion thereof.

24.2. Termination of Contractor for Convenience

24.2.1. District in its sole discretion may terminate the Contract upon three (3) days written notice to the Contractor. Under a termination for convenience, the District retains the right to all the options available to the District if there is a termination for cause. In case of a termination for convenience, the Contractor shall have no claims against the District except:

24.2.1.1. The actual cost for labor, materials, and services performed that is unpaid and can be documented through timesheets, invoices, receipts, or otherwise, and

24.2.1.2. Five percent (5%) of the total cost of work performed as of the date of termination, or five percent (5%) of the value of the Work yet to be performed, whichever is less. This five percent (5%) amount shall be full compensation for all Contractor's and Subcontractor(s)' mobilization and/or demobilization costs and any anticipated loss profits resulting from termination of the Contractor for convenience.

24.3. Suspension of Work

24.3.1. District in its sole discretion may suspend, delay or interrupt the Work in whole or in part for such period of time as the District may determine upon three (3) days written notice to the Contractor.

24.3.1.1. An adjustment may be made for changes in the cost of performance of the Work caused by any such suspension, delay or interruption. No adjustment shall be made to the extent:

24.3.1.1.1. That performance is, was or would have been so suspended, delayed or interrupted by another cause for which Contractor is responsible; or

24.3.1.1.2. That an equitable adjustment is made or denied under another provision of the Contract; or

24.3.1.1.3. That the suspension of Work was the direct or indirect result of Contractor's failure to perform any of its obligations hereunder.

24.3.1.2. Any adjustments in cost of performance may have a fixed or percentage fee as provided in the section on Format for Proposed Change Order herein. This amount shall be full compensation for all Contractor's and its Subcontractor(s)' changes in the cost of performance of the Contract caused by any such suspension, delay or interruption.

25. CLAIMS AND DISPUTES

25.1. Performance During Dispute or Claim Process

Contractor shall continue to perform its Work under the Contract and shall not cause a delay of the Work during any dispute, claim, negotiation, mediation, or arbitration proceeding, except by written agreement by the District.

25.2. Definition of Dispute

25.2.1. The term "Dispute" means a separate demand by the Contractor for:

25.2.1.1. A time extension;

25.2.1.2. Payment of money or damages arising from Work done by or on behalf of the Contractor pursuant to the Contract and payment of which is not otherwise expressly provided for or Contractor is not otherwise entitled to; or

25.2.1.3. An amount of payment disputed by the District.

25.3. Dispute Presentation

25.3.1. If Contractor intends to apply for an increase in the Contract Price or Contract Time for any reason including, without limitation, the acts of District or its agents, Contractor shall, within ten (10) days after the event giving rise to the Dispute, give notice of the Dispute in writing and submit to the District a written statement of the damage sustained or time requested. On or before twenty (20) days after Contractor's written Notice of Dispute, Contractor shall file with the District an itemized statement of the details and amounts of its Dispute for any increase in the Contract Price or Contract Time. Otherwise, Contractor shall have waived and relinquished its dispute against the District and Contractor's claims for compensation or an extension of time shall be forfeited and invalidated. Contractor shall not be entitled to consideration for payment or time on account.

25.3.2. The Notice of Dispute shall identify:

25.3.2.1. The issues, events, conditions, circumstances and/or causes giving rise to the dispute;

25.3.2.2. The pertinent dates and/or durations and actual and/or anticipated effects on the Contract Price, Contract Schedule milestones and/or Contract Time adjustments; and

25.3.2.3. The line-item costs for labor, material, and/or equipment, if applicable.

25.3.3. The Notice of Dispute shall include the following certification by the Contractor:

25.3.3.1. The undersigned Contractor certifies under penalty of perjury that the attached dispute is made in good faith; that the supporting data is accurate and complete to the best of my knowledge and belief; that the amount requested

accurately reflects the adjustment for which Contractor believes the District is liable; and that I am duly authorized to certify the dispute on behalf of the Contractor.

25.3.3.2. Furthermore, Contractor understands that the value of the attached dispute expressly includes any and all of the Contractor's costs and expenses, direct and indirect, resulting from the Work performed on the Project, additional time required on the Project and/or resulting from delay to the Project. Any costs, expenses, damages, or time extensions not included are deemed waived.

25.3.4. If a Dispute, or any portion thereof, remains unresolved upon satisfaction of all applicable Dispute Resolution requirements, the Contractor shall comply with all claim resolution requirements as provided in Public Contract Code section 20104.

25.3.5. Contractor shall bind its Subcontractors to the provisions of this section and will hold the District harmless against disputes by Subcontractors.

25.4. Dispute Resolution

25.4.1. Contractor shall file with the District the Notice of Dispute, including the documents necessary to substantiate it, on or before the day of submitting the application for final payment.

25.4.2. District shall respond in writing within forty-five (45) days of receipt of the Dispute or may request in writing within thirty (30) days of receipt of the Dispute any additional documentation supporting the Dispute or relating to defenses or claims District may have against the Contractor.

25.4.2.1. If additional information is required, it shall be requested and provided by mutual agreement of the parties.

25.4.2.2. District's written response to the documented Dispute shall be submitted to the Contractor within fifteen (15) days after receipt of the further documentation or within a period of time no greater than that taken by the Contractor to produce the additional information, whichever is greater.

25.4.3. If Contractor disputes the District's written response, Contractor may file a claim pursuant to the Claim Resolution requirements provided herein.

25.5. Definition of Claim

25.5.1. The term "Claim" means a dispute that remains unresolved at the conclusion of the Dispute Resolution requirements as provided herein.

25.6. Claim Presentations

25.6.1. Contractor must timely submit the Notice of Claim and all documents necessary to substantiate any Claim. Otherwise, Contractor shall have waived and relinquished its Claim against the District and Contractor's Claims for compensation or an extension of time shall be forfeited and invalidated, and Contractor shall not be entitled to consideration for payment or time on account of the instant matter. No Claim shall be presented prior to Project completion. Any statute that might

otherwise govern the presentation of an unresolved Dispute, including but not limited to Government Code section 900 et seq. and Public Contract Code section 20104 et seq. shall be tolled for all purposes during the course of construction on the Project.

25.6.1.1. All Claims shall include the following certification by the Contractor:

25.6.1.1.1. The undersigned Contractor certifies under penalty of perjury that the attached claim is made in good faith; that the supporting data is accurate and complete to the best of my knowledge and belief; that the amount requested accurately reflects the adjustment for which Contractor believes the District is liable; and that I am duly authorized to certify the claim on behalf of the Contractor.

25.6.1.1.2. Furthermore, Contractor understands that the value of the attached claim expressly includes any and all of the Contractor's costs and expenses, direct and indirect, resulting from the Work performed on the Project, additional time required on the Project and/or resulting from delay to the Project. Any costs, expenses, damages, or time extensions not included are deemed waived.

25.6.2. The attention of the Contractor is drawn to Government Code section 12650, et seq. regarding penalties for false claims.

25.6.3. If a Claim, or any portion thereof, remains in dispute upon satisfaction of all applicable Dispute and Claim Resolution requirements, the Contractor shall comply with all claims presentation requirements as provided in Chapter 1 (commencing with section 900) and Chapter 2 (commencing with section 910) of Part 3 of Division 3.6 of Title 1 of Government Code as a condition precedent to the Contractor's right to bring a civil action against the District. For purposes of those provisions, the running of the time within which a Dispute or Claim must be presented to the District shall be tolled from the time the Contractor submits its written Dispute or Claim until the time the Dispute or Claim is denied, including any time utilized by any applicable meet and confer process.

25.6.4. The Contractor shall bind all its Subcontractors to the provisions of this section and will hold the District harmless against claims by Subcontractors.

25.7. Claim Resolution

25.7.1. In the event of a disagreement between the parties as to performance of the Work, the interpretation of this Contract, or payment or nonpayment for Work performed or not performed, the parties shall, after the conclusion of the Dispute Resolution requirements, attempt to resolve the Claim by those procedures set forth herein.

25.7.2. Claims of \$375,000 or Less

25.7.2.1. For all Claims of three hundred seventy-five thousand dollars (\$375,000) or less which arise between Contractor and District, the procedure set forth in Public Contract Code section 20104 et seq. shall apply:

25.7.2.1.1. Contractor shall file with the District any written Claim, including the documents necessary to substantiate it, upon the application for final payment.

25.7.2.1.2. For claims of less than fifty thousand dollars (\$50,000), the District shall respond in writing within forty-five (45) days of receipt of the Claim or may request in writing within thirty (30) days of receipt of the Claim any additional documentation supporting the claim or relating to defenses or claims the District may have against the Contractor.

25.7.2.1.2.1. If additional information is required, it shall be requested and provided by mutual agreement of the parties.

25.7.2.1.2.2. District's written response to the documented Claim shall be submitted to the Contractor within fifteen (15) days after receipt of the further documentation or within a period of time no greater than that taken by the Contractor to produce the additional information, whichever is greater.

25.7.2.1.3. For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the District shall respond in writing to all written Claims within sixty (60) days of receipt of the claim, or may request, in writing, within thirty (30) days of receipt of the Claim any additional documentation supporting the Claim or relating to defenses or claims the District may have against the Contractor.

25.7.2.1.3.1. If additional information is required, it shall be requested and provided upon mutual agreement of the District and the Contractor.

25.7.2.1.3.2. The District's written response to the claim, as further documented, shall be submitted to the Contractor within thirty (30) days after receipt of the further documentation, or within a period of time no greater than that taken by the Contractor to produce the additional information or requested documentation, whichever is greater.

25.7.2.2. If Contractor disputes the District's written response, or the District fails to respond within the time prescribed, Contractor may so notify the District, in writing, either within fifteen (15) days of receipt of the District's response or within fifteen (15) days of the District's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the District shall schedule a meet and confer conference within thirty (30) days for settlement of the dispute.

25.7.2.3. Following the meet and confer conference, if the claim or any portion of it remains in dispute, the Contractor may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions the running of the time within which a claim must be filed shall be tolled from the time the Contractor submits its written Claim until the time the Claim is denied, including any period of time utilized by the meet and confer process.

25.7.2.4. For any civil action filed to resolve claims filed pursuant to this section, within sixty (60) days, but no earlier than thirty (30) days, following the filing of responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within fifteen (15) days by both parties of a disinterested third person as mediator, shall be commenced within thirty (30) days of the submittal, and shall be concluded within fifteen (15) days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

25.7.2.5. If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of the Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act of 1986, (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

25.7.2.6. The District shall not fail to pay money as to any portion of a Claim which is undisputed except as otherwise provided in the Contract Documents. In any suit filed pursuant to this section, the District shall pay interest at the legal rate on any arbitration award or judgment. Interest shall begin to accrue on the date the suit is filed in a court of law.

25.7.3. Claims Over \$375,000

25.7.3.1. For all Claims of over three hundred seventy-five thousand dollars (\$375,000) which arise between a Contractor and the District, the following procedure shall apply:

25.7.3.1.1. The parties agree to first endeavor to settle the dispute in an amicable manner by mediation before having recourse to a judicial forum. The Claim shall be identified in writing to the District within thirty (30) days from the date of Contractor's application for final payment of all Contract balances not in dispute and shall be mediated within one hundred and twenty (120) days from the submission of the Claim to the District. For purposes of filing a Claim to mediation, the running of the time within which mediation must be filed shall be tolled from the time the Contractor submits its written Claim until the time the Claim is denied. Mediator fees and administrative costs of the mediation shall be shared equally by the parties.

25.7.3.1.2. District may assert any counter-claims it has for damages against Contractor, including, but not limited to, defective Work, delay damages, and liquidated damages.

25.7.4. Contractor shall bind its Subcontractors to the provisions of this section and will hold the District harmless against disputes by Subcontractors.

25.8. Dispute and Claim Resolution Non-Applicability

25.8.1. The procedures for dispute and claim resolutions set forth in this Article shall not apply to the following:

25.8.1.1. Personal injury, wrongful death or property damage claims;

25.8.1.2. Latent defect or breach of warranty or guarantee to repair;

25.8.1.3. Stop payment notices;

25.8.1.4. District's rights set forth in the Article on Suspension and Termination;

25.8.1.5. Disputes arising out of State labor compliance, if applicable; or

25.8.1.6. District rights and obligations as a public entity set forth in applicable statutes; provided, however, that penalties imposed against a public entity by statutes, including, but not limited to, Public Contract Code sections 20104.50 and 7107, shall be subject to the Dispute and Claim Resolution requirements provided in this Article.

25.9. Contractor's costs incurred in seeking relief under this Article are not recoverable from the District.

26. STATE LABOR, WAGE & HOUR, APPRENTICE, AND RELATED PROVISIONS

26.1. Labor Compliance and Enforcement

Since this Project is subject to labor compliance and enforcement by the Department of Industrial Relations ("DIR"), Contractor specifically acknowledges and understands that it shall perform the Work of this Agreement while complying with all the applicable provisions of Division 2, Part 7, Chapter 1, of the Labor Code and Title 8 of the California Code of Regulations, including, without limitation, the requirement that the Contractor and all Subcontractors shall timely furnish complete and accurate electronic certified payroll records directly to the DIR. The District may not issue payment if this requirement is not met.

26.2. Wage Rates, Travel, and Subsistence

26.2.1. Pursuant to the provisions of article 2 (commencing at section 1770), chapter 1, part 7, division 2, of the Labor Code of California, 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 work is to be performed for each craft, classification, or type of worker needed to execute this Contract are on file at the District's principal office and copies will be made available to any interested party on request. Contractor shall obtain and post a copy of these wage rates at the job site.

26.2.2. Holiday and overtime work, when permitted by law, shall be paid for at the general prevailing rate of per diem wages for holiday and overtime work on file with the Director of the Department of Industrial Relations, unless otherwise specified. The holidays upon which those rates shall be paid need not be specified by

the District, but shall be all holidays recognized in the applicable collective bargaining agreement. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code.

26.2.3. Contractor shall pay and shall cause to be paid each worker engaged in Work on the Project the general prevailing rate of per diem wages determined by the Director of the Department of Industrial Relations, regardless of any contractual relationship which may be alleged to exist between Contractor or any Subcontractor and such workers.

26.2.4. If during the period this bid is required to remain open, the Director of the Department of Industrial Relations determines that there has been a change in any prevailing rate of per diem wages in the locality in which the Work under the Contract is to be performed, such change shall not alter the wage rates in the Notice to Bidders or the Contract subsequently awarded.

26.2.5. Pursuant to Labor Code section 1775, Contractor shall, as a penalty to District, forfeit the statutory amount (believed by the District to be currently up to two hundred dollars (\$200) for each calendar day, or portion thereof, for each worker paid less than the prevailing rates, determined by the District and/or the Director, for the work or craft in which that worker is employed for any public work done under Contract by Contractor or by any Subcontractor under it. The difference between such prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the prevailing wage rate shall be paid to each worker by Contractor.

26.2.6. Any worker employed to perform Work on the Project, which Work is not covered by any classification listed in the general prevailing wage rate of per diem wages determined by the Director, shall be paid not less than the minimum rate of wages specified therein for the classification which most nearly corresponds to Work to be performed by him, and such minimum wage rate shall be retroactive to time of initial employment of such person in such classification.

26.2.7. Pursuant to Labor Code section 1773.1, per diem wages are deemed to include employer payments for health and welfare, pension, vacation, travel time, subsistence pay, and apprenticeship or other training programs authorized by Labor Code section 3093, and similar purposes.

26.2.8. Contractor shall post at appropriate conspicuous points on the Site of Project, a schedule showing all determined minimum wage rates and all authorized deductions, if any, from unpaid wages actually earned. In addition, Contractor shall post a sign-in log for all workers and visitors to the Site, a list of all subcontractors of any tier on the Site, and the required Equal Employment Opportunity poster(s).

26.3. Hours of Work

26.3.1. As provided in article 3 (commencing at section 1810), chapter 1, part 7, division 2, of the Labor Code, eight (8) hours of labor shall constitute a legal days work. The time of service of any worker employed at any time by Contractor or by any Subcontractor on any subcontract under this Contract upon the Work or upon any part of the Work contemplated by this Contract shall be limited and restricted by Contractor to eight (8) hours per day, and forty (40) hours during any one week, except as hereinafter provided. Notwithstanding the provisions hereinabove set forth, Work performed by employees of Contractor in excess of eight (8) hours per day and forty (40) hours during any one week, shall be permitted upon this public work upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half times the basic rate of pay.

26.3.2. Contractor shall keep and shall cause each Subcontractor to keep an accurate record showing the name of and actual hours worked each calendar day and each calendar week by each worker employed by Contractor in connection with the Work or any part of the Work contemplated by this Contract. The record shall be kept open at all reasonable hours to the inspection of District and to the Division of Labor Standards Enforcement of the DIR.

26.3.3. Pursuant to Labor Code section 1813, Contractor shall as a penalty to the District forfeit the statutory amount (believed by the District to be currently twenty-five dollars (\$25)) for each worker employed in the execution of this Contract by Contractor or by any Subcontractor for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week in violation of the provisions of article 3 (commencing at section 1810), chapter 1, part 7, division 2, of the Labor Code.

26.3.4. Any Work necessary to be performed after regular working hours, or on Sundays or other holidays shall be performed without additional expense to the District.

26.4. Payroll Records

26.4.1. Contractor shall upload, and shall cause each Subcontractor performing any portion of the Work under this Contract to upload, an accurate and complete certified payroll record ("CPR") using the Public Works Payroll Reporting Form, including certification (DIR [Form A-1-131](#) or current version), and Statement of Employer Payments (DIR Form PW 26) through the eCPR application using PDF to the DIR at <https://apps.dir.ca.gov/ecpr/DAS/AltLogin> or current application and URL, showing the name, address, social security number, work classification, 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 the Contractor and/or each Subcontractor in connection with the Work.

26.4.1.1. The CPRs enumerated hereunder shall be filed directly with the DIR on a weekly basis or to the requesting party, whether the District or DIR, within ten (10) days after receipt of each written request. The CPRs from the Contractor and each Subcontractor for each week shall be provided on or before Wednesday of the week following the week covered by the CPRs. District may not make any payment to Contractor until:

26.4.1.1.1. Contractor and/or its Subcontractor(s) provide CPRs acceptable to the DIR; and

26.4.1.1.2. Any delay in Contractor and/or its Subcontractor(s) providing CPRs to the DIR in a timely manner may directly delay Contractor's payment.

26.4.2. All CPRs shall be available for inspection at all reasonable hours at the principal office of Contractor on the following basis:

26.4.2.1. A certified copy of an employee's CPR shall be made available for inspection or furnished to the employee or his/her authorized representative on request.

26.4.2.2. CPRs shall be made available for inspection or furnished upon request to a representative of District, Division of Labor Standards Enforcement, Division of Apprenticeship Standards, and/or the DIR.

26.4.2.3. CPRs shall be made available upon request by the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through the District, Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested CPRs have not been provided pursuant to the provisions herein, the requesting party shall, prior to being provided the records reimburse the costs of preparation by Contractor, Subcontractors, and the entity through which the request was made. The public shall not be given access to the records at the principal office of Contractor.

26.4.3. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by District, Division of Apprenticeship Standards, or Division of Labor Standards Enforcement shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address, and social security number. The name and address of Contractor awarded Contract or performing Contract shall not be marked or obliterated.

26.4.4. Contractor shall inform District of the location of the records enumerated hereunder, including the street address, city, and county, and shall, within five (5) working days, provide a notice of change of location and address.

26.4.5. In the event of noncompliance with the requirements of this section, Contractor shall have ten (10) days in which to comply subsequent to receipt of written notice specifying in what respects Contractor must comply with this section. Should noncompliance still be evident after the ten (10) day period, Contractor shall, as a penalty to District, forfeit up to one hundred dollars (\$100) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of Division of Apprenticeship Standards or Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

26.5. [RESERVED]

26.6. Apprentices

26.6.1. Contractor acknowledges and agrees that, if this Contract involves a dollar amount greater than or a number of working days greater than that specified in Labor Code section 1777.5, then this Contract is governed by the provisions of Labor Code Section 1777.5. It shall be the responsibility of Contractor to ensure compliance with this Article and with Labor Code section 1777.5 for all apprenticeship occupations.

26.6.2. Apprentices of any crafts or trades may be employed and, when required by Labor Code section 1777.5, shall be employed provided they are properly registered in full compliance with the provisions of the Labor Code.

26.6.3. Every such apprentice shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he/she is employed, and shall be employed only at the work of the craft or trade to which she/he is registered.

26.6.4. Only apprentices, as defined in section 3077 of the Labor Code, who are in training under apprenticeship standards and written apprentice agreements under chapter 4 (commencing at section 3070), division 3, of the Labor Code, are eligible to be employed. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which he/she is training.

26.6.5. Pursuant to Labor Code section 1777.5, if that section applies to this Contract as indicated above, Contractor and any Subcontractors employing workers in any apprenticeable craft or trade in performing any Work under this Contract shall apply to the applicable joint apprenticeship committee for a certificate approving the Contractor or Subcontractor under the applicable apprenticeship standards and fixing the ratio of apprentices to journeymen employed in performing the Work.

26.6.6. Pursuant to Labor Code section 1777.5, if that section applies to this Contract as indicated above, Contractor and any Subcontractor may be required to make contributions to the apprenticeship program.

26.6.7. If Contractor or Subcontractor willfully fails to comply with Labor Code section 1777.5, then, upon a determination of noncompliance by the Administrator of Apprenticeship, it shall:

26.6.7.1. Be denied the right to bid on any subsequent project for one (1) year from the date of such determination;

26.6.7.2. Forfeit as a penalty to District the full amount as stated in Labor Code section 1777.7. Interpretation and enforcement of these provisions shall be in accordance with the rules and procedures of the California Apprenticeship Council and under the authority of the Chief of the Division of Apprenticeship Standards.

26.6.8. Contractor and all Subcontractors shall comply with Labor Code section 1777.6, which section forbids certain discriminatory practices in the employment of apprentices.

26.6.9. Contractor shall become fully acquainted with the law regarding apprentices prior to commencement of the Work. Special attention is directed to sections 1777.5, 1777.6, and 1777.7 of the Labor Code, and title 8, California Code

of Regulations, section 200 et seq. Questions may be directed to the State Division of Apprenticeship Standards, 455 Golden Gate Avenue, San Francisco, California 94102.

26.7. Non-Discrimination

26.7.1. Contractor herein agrees not to discriminate in its recruiting, hiring, promotion, demotion, or termination practices on the basis of race, religious creed, national origin, ancestry, sex, age, or physical handicap in the performance of this Contract and to comply with the provisions of the California Fair Employment and Housing Act as set forth in part 2.8 of division 3 of the California Government Code, commencing at section 12900; the Federal Civil Rights Act of 1964, as set forth in Public Law 88-352, and all amendments thereto; Executive Order 11246, and all administrative rules and regulations found to be applicable to Contractor and Subcontractor.

26.7.2. Special requirements for Federally Assisted Construction Contracts: During the performance of this Contract, Contractor agrees to incorporate in all subcontracts the provisions set forth in Chapter 60-1.4(b) of Title 41 published in Volume 33 No. 104 of the Federal Register dated May 28, 1968.

26.8. Labor First Aid

Contractor shall maintain emergency first aid treatment for Contractor's workers on the Project which complies with the Federal Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 et seq.) and the California Occupational Safety and Health Act of 1973 (8 Cal. Code of Regs., §1 et seq.).

27. [RESERVED]

28. MISCELLANEOUS

28.1. Assignment of Antitrust Actions

28.1.1. Section 7103.5(b) of the Public Contract Code states:

In entering into a public works contract or subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or subcontractor offers and agrees to assign to the awarding body 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. Sec. 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 purchases of goods, made and become effective at the time the awarding body tenders final payment to the Contractor, without further acknowledgment by the parties.

28.1.2. Section 4552 of the Government Code states:

In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body 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. Sec. 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 purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder.

28.1.3. Section 4553 of the Government Code states:

If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

28.1.4. Section 4554 of the Government Code states:

Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action.

28.1.5. Under this Article, "public purchasing body" is District and "bidder" is Contractor.

28.2. 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 Contract Price.

28.3. Taxes

Contract 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 code that may be applicable.

28.4. Shipments

All shipments must be F.O.B. destination to Site or sites, as indicated in the Contract Documents. There must be no charge for containers, packing, unpacking, drayage, or insurance. The total Contract Price shall be all inclusive (including sales tax) and no additional costs of any type will be considered.

28.5. Compliance with Government Reporting Requirements

If this Contract is subject to federal or other governmental reporting requirements because of federal or other governmental financing in whole or in part for the Project of which it is part, or for any other reason, Contactor shall comply with those reporting requirements at the request of the District at no additional cost.

END OF DOCUMENT

SPECIAL CONDITIONS

THIS DOCUMENT MUST BE ADAPTED FOR EACH PROJECT – Delete any provision that is not applicable or if no change from the provision in the General Conditions.

*** THIS LIST OF SPECIAL CONDITION PROVISIONS IS FOR REFERENCE ONLY. REMOVE THIS PAGE BEFORE USING THIS DOCUMENT. ***

1. Mitigation Measures
2. Modernization projects
3. Badge Policy for Contractors
4. Substitution for Specified Items
5. Weather Days
6. Owner-Controlled or Wrap-Up Insurance Program
7. Insurance Policy Limits
8. Permits, Certificates, Licenses, Fees, Approval
9. As-Builts and Record Drawings
10. Disabled Veterans Business Enterprises
11. Construction Manager
12. Program Manager
13. Federal Funds
14. Preliminary Schedule of Values

SPECIAL CONDITIONS

1. Mitigation Measures

Contractor shall comply with all applicable mitigation measures, if any, adopted by any public agency with respect to this Project pursuant to the California Environmental Quality Act. (Public Resources Code section 21000 et seq.)

2. Modernization Projects

2.1. Access. Access to the school buildings and entry to buildings, classrooms, restrooms, mechanical rooms, electrical rooms, or other rooms, for construction purposes, must be coordinated with District and onsite District personnel before Work is to start. Unless agreed to otherwise in writing, only a school custodian will be allowed to unlock and lock doors in existing building(s). The custodian will be available only while school is in session. If a custodian is required to arrive before 7:00 a.m. or leave after 3:30 p.m. to accommodate Contractor's Work, the overtime wages for the custodian will be paid by the Contractor, unless at the discretion of the District, other arrangements are made in advance.

2.2. Master Key. Upon request, the District may, at its own discretion, provide a master key to the school site for the convenience of the Contractor. The Contractor agrees to pay all expenses to re-key the entire school site and all other affected District buildings if the master key is lost or stolen or if any unauthorized party obtains a copy of the key or access to the school.

2.3. Maintaining Services. The Contractor is advised that Work is to be performed in spaces regularly scheduled for instruction. Interruption and/or periods of shutdown of public access, electrical service, water service, lighting, or other utilities shall be only as arranged in advance with the District. Contractor shall provide temporary services to all facilities interrupted by Contractor's Work.

2.4. Maintaining Utilities. The Contractor shall maintain in operation during duration of Contract, drainage lines, storm drains, sewers, water, gas, electrical, steam, and other utility service lines within working area.

2.5. Confidentiality. Contractor shall maintain the confidentiality of all information, documents, programs, procedures and all other items that Contractor encounters while performing the Work. This requirement shall be ongoing and shall survive the expiration or termination of this Contract and specifically includes, without limitation, all student, parent, and employee disciplinary information and health information.

2.6. Work During Instructional Time. By submitting its bid, Contractor affirms that Work may be performed during ongoing instruction in existing facilities. If so, Contractor agrees to cooperate to the best of its ability to minimize any disruption to the school up to, and including, rescheduling specific work activities, at no additional cost to District.

2.7. No Work During Student Testing. Contractor shall, at no additional cost to the District and at the District's request, coordinate its Work to not disturb District students including, without limitation, not performing any Work when students at the Site are taking State-required tests.

3. Badge Policy For Contractors

All Contractors doing work for the District will provide their workers with identification badges. These badges will be worn by all members of the Contractor's staff who are working in a District facility.

3.1. Badges must be filled out in full and contain the following information:

3.1.1. Name of Contractor

3.1.2. Name of Employee

3.1.3. Contractor's address and phone number

3.2. Badges are to be worn when the Contractor or his/her employees are on site and must be visible at all times. Contractors must inform their employees that they are required to allow District employees, the Architect, the Construction Manager, the Program Manager, or the Project Inspector to review the information on the badges upon request.

3.3. Failure to display identification badges as required by this policy may result in the assessment of fines against the Contractor.

4. Substitution for Specified Items

4.1. Whenever in the Specifications any materials, process, or article is indicated or specified by grade, patent, or proprietary name, or by name of manufacturer, that Specification shall be deemed to be followed by the words "or equal." Contractor may, unless otherwise stated, offer any material, process, or article that shall be substantially equal or better in every respect to that so indicated or specified.

4.1.1. If the material, process, or article offered by Contractor is not, in the opinion of the District, substantially equal or better in every respect to that specified, then Contractor shall furnish the material, process, or article specified in the Specifications without any additional compensation or change order.

4.1.2. This provision shall not be applicable with respect to any material, product, thing or service for which District made findings and gave notice in accordance with Public Contract Code section 3400(c); therefore, Contractor shall not be entitled to request a substitution with respect to those materials, products or services.

4.2. A request for a substitution shall be submitted as follows:

4.2.1. Contractor shall notify the District in writing of any request for a substitution at least ten (10) days prior to bid opening as indicated in the Instructions to Bidders.

4.2.2. [OPTIONAL – DELETE IF NOT CHOSEN] Requests for Substitutions after award of the Contract shall be submitted within thirty-five (35) days of the date of the Notice of Award.

4.3. Within 35 days after the date of the Notice of Award, Contractor shall provide data substantiating a request for substitution of “an equal” item, including but not limited to the following:

4.3.1. All variations of the proposed substitute from the material specified including, but not limited to, principles of operation, materials, or construction finish, thickness or gauge of materials, dimensions, weight, and tolerances;

4.3.2. Available maintenance, repair or replacement services;

4.3.3. Increases or decreases in operating, maintenance, repair, replacement, and spare parts costs;

4.3.4. Whether or not acceptance of the substitute will require other changes in the Work (or in work performed by the District or others under Contract with the District); and

4.3.5. The time impact on any part of the Work resulting directly or indirectly from acceptance of the proposed substitute.

4.4. No substitutions shall be made until approved, in writing, by the District. The burden of proof as to equality of any material, process, or article shall rest with Contractor. The Contractor warrants that if substitutes are approved:

4.4.1. The proposed substitute is equal or superior in all respects to that specified, and that such proposed substitute is suitable and fit for the intended purpose and will perform adequately the function and achieve the results called for by the general design and the Contract Documents;

4.4.2. The Contractor provides the same warranties and guarantees for the substitute that would be provided for that specified;

4.4.3. The Contractor shall be fully responsible for the installation of the substitute and any changes in the Work required, either directly or indirectly, because of the acceptance of such substitute, with no increase in Contract Price or Contract Time. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the Contract Price or Contract Time;

4.4.4. The Contractor shall be responsible for any re-design costs occasioned by District's acceptance and/or approval of any substitute; and

4.4.5. The Contractor shall, in the event that a substitute is less costly than that specified, credit the District with one hundred percent (100%) of the net difference between the substitute and the originally specified material. In this event, the Contractor agrees to execute a deductive Change Order to reflect that credit.

4.5. In the event Contractor furnishes a material, process, or article more expensive than that specified, the difference in the cost of that material, process, or article so furnished shall be borne by Contractor.

4.6. In no event shall the District be liable for any increase in Contract Price or Contract Time due to any claimed delay in the evaluation of any proposed substitute or in the acceptance or rejection of any proposed substitute.

4.7. Contractor shall be responsible for any costs the District incurs for professional services and/or DSA fees or delay to the Project Schedule, if applicable, while DSA reviews changes for the convenience of Contractor and/or to accommodate Contractor's means and methods. District may deduct those costs from any amounts owing to the Contractor for the review of the request for substitution, even if the request for substitution is not approved. District, at its sole discretion, shall deduct from the payments due to and/or invoice Contractor for all the professional services and/or DSA fees or delay to the Project Schedule, if applicable, while DSA reviews changes for the convenience of Contractor and/or to accommodate Contractor's means and methods arising herein.

5. Weather Days

Delays due to Adverse Weather conditions will only be permitted in compliance with the provisions in the General Conditions and only if the number of days of Adverse Weather exceeds the following parameters and Contractor can verify that the excess days of Adverse Weather caused delays: **[ADJUST NUMBER OF DAYS FOR YOUR LOCATION]**

January	<u>11</u>	July	<u>0</u>
February	<u>10</u>	August	<u>0</u>
March	<u>10</u>	September	<u>1</u>
April	<u>6</u>	October	<u>4</u>
May	<u>3</u>	November	<u>7</u>
June	<u>1</u>	December	<u>10</u>

6. Owner-Controlled or Wrap-Up Insurance Program

Contractor and all Subcontractors under the Contractor shall participate in and comply with the owner-controlled or wrap-up insurance program (OCIP). In addition, Contractor shall procure and maintain, at its own expense, until completion and final acceptance of the Work at least the following insurance from insurance companies with an A.M. Best rating of no less than **A: VII**, except for those coverages provided by the OCIP as described in the OCIP Manual: **[CHECK WITH OCIP ADMINISTRATOR AND SPECIFY COVERAGES AND LIMITS BELOW]**

[Commercial General Liability]	Personal Injury Liability, Broad Form Property Damage including completed operations, and Explosion, Collapse and Underground Hazards	[E.G. \$5,000,000]
[Automobile Liability – Any Auto]	Bodily Injury and Property Damage	[E.G. \$5,000,000]
[Workers Compensation]		Statutory limits pursuant to State law
[Employers’ Liability]		[E.G. \$1,000,000]

7. Insurance Policy Limits [CHECK WITH DISTRICT’S RISK MANAGER OR INSURANCE ADVISOR. COVERAGES AND AMOUNTS BELOW ARE PLACEHOLDERS ONLY.]

All of Contractor’s insurance shall be with insurance companies with an A.M. Best rating of no less than _____ [E.G. **A: IX.**] The limits of insurance shall not be less than:

Commercial General Liability	Product Liability and Completed Operations, Fire Damage Liability – Split Limit	[E.G.] Low Risk: \$1,000,000 per occurrence; \$2,000,000 aggregate
		Intermediate Risk: \$2,000,000 per occurrence; \$4,000,000 aggregate
		High Risk: \$5,000,000 per occurrence; \$10,000,000 aggregate]
Automobile Liability – Any Auto	Combined Single Limit	[E.G.] Personal vehicles: \$500,000 Commercial vehicles: \$1,000,000
		Personal vehicles: \$100,000 per person/ \$300,000 per accident]
Workers Compensation		Statutory limits pursuant to State law
Employers’ Liability		[E.G. \$0]
Builders Risk (Course of Construction)		Issued for the value and scope of Work indicated herein.
Pollution Liability		[E.G. \$0]

8. Permits, Certificates, Licenses, Fees, Approval

8.1. Payment of Fees for Permits, Certificates, Licenses, and Registrations.

As required in the General Conditions, the Contractor shall secure and pay for all permits, licenses, registrations, and certificates necessary for the prosecution of the Work with the exception of the following:

8.1.1. [E.G. (WATER CONNECTION FEES)]

8.1.2. [E.G. (SEWER CONNECTION FEES)]

With respect to the above listed items, Contractor shall be responsible for securing such items; however, District will be responsible for payment of these charges or

fees. Contractor shall notify the District of the amount due with respect to such items and to whom the amount is payable. Contractor shall provide the District with an invoice and receipt with respect to such charges or fees.

8.2. General Permit For Storm Water Discharges Associated With Construction and Land Disturbance Activities

8.2.1. Contractor acknowledges that all California community college districts are obligated to develop and implement the following requirements for the discharge of storm water to surface waters from its construction and land disturbance activities (storm water requirements), without limitation:

8.2.1.1. Municipal Separate Storm Sewer System (MS4) is a system of conveyances used to collect and/or convey storm water, including, without limitation, catch basins, curbs, gutters, ditches, man-made channels, and storm drains.

8.2.1.2. Storm Water Pollution Prevention Plan (SWPPP) contains specific best management practices (BMPs) and establishes numeric effluent limitations at:

8.2.1.2.1. Sites where the District engages in maintenance (e.g., fueling, cleaning, repairing) for transportation activities.

8.2.1.2.2. Construction sites where:

8.2.1.2.2.1. One (1) or more acres of soil will be disturbed, or

8.2.1.2.2.2. The project is part of a larger common plan of development that disturbs more than one (1) acre of soil.

8.2.2. Contractor shall comply with any District storm water requirements that are approved by the District and applicable to the Project, at no additional cost to the District.

8.2.3. At no additional cost to the District, Contractor shall provide a Qualified Storm Water Practitioner who shall be onsite and implement and monitor any and all SWPPP requirements applicable to the Project, including but not limited to:

8.2.3.1. At least forty eight (48) hours prior to a forecasted rain event, implementing the Rain Event Action Plan (REAP) for any rain event requiring implementation of the REAP, including any erosion and sediment control measures needed to protect all exposed portions of the site; and

8.2.3.2. Monitoring any Numeric Action Levels (NALs), if applicable.

9. As-Builts and Record Drawings

9.1. When called for by Division 1, Contractor shall submit As Built Drawings pursuant to the Contract Documents [**SPECIFY** on vellum or mylar]; **OR** [consisting of one set of computer-aided design and drafting ("CADD") files in the following format (describe), plus one set of As Built Drawings on [**SPECIFY** vellum or mylar]; **OR** [consisting of one set of Building Information Modeling ("BIM") files utilizing the

following platform and in the following format (describe), plus one set of As Built Drawings on [**SPECIFY** vellum or mylar].

- 9.2.** Contractor shall submit Record Drawings pursuant to the Contract Documents [**SPECIFY** on vellum or mylar]; **OR** [consisting of one set of computer-aided design and drafting ("CADD") files in the following format (describe), plus one set of Record Drawings on [**SPECIFY** vellum or mylar]; **OR** [consisting of one set of Building Information Modeling ("BIM") files utilizing the following platform and in the following format (describe), plus one set of Record Drawings on [**SPECIFY** vellum or mylar].

10. Disabled Veterans Business Enterprise [INSERT IF PROJECT FUNDED IN PART OR IN WHOLE BY THE STATE SCHOOL FACILITY PROGRAM.]

This Project uses funds allocated pursuant to the State of California School Facility Program ("Program") for the construction and/or modernization of school buildings. Therefore, Section 71028 of the Education Code and Public Contract Code section 10115 require the District to have a participation goal for disabled veteran business enterprises ("DVBE") of at least three percent (3%), per year, of the overall dollar amount expended each year by the District on projects that receive state funding and the Contractor must submit the Disabled Veteran Business Enterprise Participation Certification to the District with its executed Agreement, identifying the steps contractor took to solicit DVBE participation in conjunction with this Contract.

11. Construction Manager

The District will use a Construction Manager on the Project that is the subject of this Contract. [**INSERT NAME AND CONTACT INFORMATION**] is the Construction Manager for this Project.

12. Program Manager

[**INSERT NAME AND CONTACT INFORMATION**] is the Program Manager designated for the Project that is the subject of this Contract.

13. Federal Funds

As this Project is funded in whole or in part by federal funds, Contractor and all Subcontractors are subject to civil or criminal prosecution for any violation of the federal False Claims Act set forth under section 1001 of title 18 and section 231 of title 31 of the United States Code.

The following provisions are added as Section 27:

27. FEDERAL LABOR, WAGE & HOUR, APPRENTICE, AND RELATED PROVISIONS

27.1 Minimum Wages

The Davis-Bacon Act and 29 CFR parts 1 through 7 shall apply if the Project is financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution.

27.1.1 All laborers and mechanics employed or working upon the Site of the Work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the Project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account, except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3) , the full amount of wages and bona fide fringe benefits, or cash equivalents thereof, due at time of payment computed at rates not less than those contained in the applicable wage determination of the Secretary of Labor regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of this section, including but not limited to paragraph 27.1.7; also, regular contributions made or costs incurred for more than a weekly period, but not less often than quarterly, under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of Work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing Work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, That the employer's payroll records accurately set forth the time spent in each classification in which Work is performed. The wage determination including any additional classification and wage rates conformed under this section, including but not limited to paragraph 27.1.6 and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its Subcontractors at the Site of the Work in a prominent and accessible place where it can be easily seen by the workers.

27.1.2 Any class of laborers or mechanics, including helpers, and which is to be employed under the Contract which is not listed in the wage determination shall be classified in conformance with the wage determination. An additional classification and wage rate and fringe benefits will not be approved unless when the following criteria have been met:

27.1.2.1 The Work to be performed by the classification requested is not performed by a classification in the wage determination; and

27.1.2.2 The classification is utilized in the area by the construction industry; and

27.1.2.3 The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

27.1.3 If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the District agree

on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the Contractor to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210.

27.1.4 In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the District do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contractor shall provide the questions, including the views of all interested parties and the recommendation of the District, to the District for the District's review and referral to the Administrator for determination.

27.1.5 The wage rate (including fringe benefits where appropriate) determined pursuant to this section, shall be paid to all workers performing Work in the classification under this Contract from the first day on which Work is performed in the classification.

27.1.6 Whenever the minimum wage rate prescribed in any applicable wage determination for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

27.1.7 If the Contractor does not make payments to a trustee or other third person, the Contractor may consider, as part of the wages of any laborer or mechanic, the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. If the Secretary of Labor so requires, the Contractor shall set aside in a separate account sufficient assets to meet obligations under the plan or program.

27.2 Withholding. District may, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this Contract or any other Federal contract with the same Contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any Subcontractor the full amount of wages required by the Contract. In the event of Contractor's or any Subcontractors' failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the Site of the Work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the Contract, the District may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as it deems necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

27.3 Payrolls and basic records.

27.3.1 Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the Work and preserved for a period of three years thereafter for all laborers and mechanics working at the Site of the Work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records that show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

27.3.2 The Contractor shall submit weekly for each week in which any Contract Work is performed a copy of all payrolls to the District. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information shall be submitted on a form acceptable to the District. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. Contractor is responsible for the submission of copies of payrolls by all Subcontractors. Contractor and Subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the District, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. Contractor may require a Subcontractor to provide addresses and social security numbers to the Contractor for its own records, without weekly submission to the District or other government agency

27.3.3 Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or Subcontractor or his or her agent who pays or supervises the payment of the persons employed under the Contract and shall certify the following:

27.3.3.1 That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5,

27.3.3.2 That the appropriate information is being maintained under 29 CFR 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and

27.3.3.3 That such information is correct and complete;

27.3.3.4 That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the Contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and

27.3.3.5 That no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

27.3.3.6 That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of Work performed, as specified in the applicable wage determination incorporated into or applicable to the Contract.

27.3.3.7 The weekly submission of a properly executed certification in the form set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 27.3.3 of this section.

27.3.3.8 The falsification of any of the above certifications may subject the Contractor or one or more Subcontractors to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

27.3.3.9 The Contractor or Subcontractor shall make the records required under this section available for inspection, copying, or transcription by authorized representatives of the District or the federal Department of Labor, and shall permit representatives to interview employees during working hours on the job. If the Contractor or Subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

27.4 Apprentices and trainees

27.4.1 Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the Work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training

Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first ninety (90) days of probationary employment as an apprentice in an eligible apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job Site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of Work actually performed. In addition, any apprentice performing Work on the job Site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the Work actually performed. Where a Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or Subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the Work performed until an acceptable program is approved.

27.4.2 Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to Work at less than the predetermined rate for the Work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job Site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the

wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of Work actually performed. In addition, any trainee performing Work on the job Site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the Work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the Work performed until an acceptable program is approved.

27.4.3 Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

27.5 Compliance with Copeland Act requirements. Contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this Contract.

27.6 Subcontracts. The Contractor or Subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the Federal agency may by appropriate instructions require, and also a clause requiring the Subcontractors to include these clauses in any lower tier subcontracts. The Contractor shall be responsible for the compliance by any Subcontractor or lower tier Subcontractor with all the Contract clauses in 29 CFR 5.5.

27.7 Contract termination: debarment. A breach of the Contract clauses in 29 CFR 5.5 may be grounds for termination of the Contract, and for debarment as a Contractor and a Subcontractor as provided in 29 CFR 5.12.

27.8 Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this Contract.

27.9 Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its Subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

27.10 Certification of eligibility.

27.10.1 By entering into this Contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR

5.12(a)(1).

27.10.2 No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

27.10.3 Contractor shall be subject to the penalty for making false statements prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

27.11 Clauses Mandated by Contract Work Hours and Safety Standards Act.

As used in the following paragraphs, the terms laborers and mechanics include watchmen and guards.

27.11.1 Overtime requirements. No Contractor or Subcontractor contracting for any part of the Contract Work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such Work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

27.11.2 Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in the foregoing paragraph the Contractor and any Subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and Subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the foregoing paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to Work in excess of the standard workweek of forty hours without payment of the overtime wages required by the foregoing paragraph.

27.11.3 Withholding for unpaid wages and liquidated damages. The District may upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of Work performed by the Contractor or Subcontractor under the Contract or any other Federal contract with the same Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or Subcontractor for unpaid wages and liquidated damages as provided in the foregoing paragraph .

27.11.4 Subcontracts. The Contractor or Subcontractor shall insert in any subcontracts the foregoing paragraphs concerning Overtime Requirements and Violation: Liability for Unpaid Wages and Liquidated Damages and also a clause requiring each Subcontractor to include these clauses in any lower tier subcontracts. Contractor shall be responsible for compliance by any

Subcontractor or lower tier Subcontractor with the clauses set forth in paragraphs 27.11.1 through 27.11.4 of this section.

14. Preliminary Schedule of Values

The preliminary schedule of values shall include, at a minimum, the following information and the following structure:

Replace provision in the General Conditions with the following provisions:

10.1.1.2.3. The preliminary schedule of values shall not provide for values any greater than the following percentages of the Contract value:

- 10.1.1.2.3.1.** Mobilization and layout combined to equal not more than **[1]**%;
- 10.1.1.2.3.2.** Submittals, samples and shop drawings combined to equal not more than **[3]**%;
- 10.1.1.2.3.3.** Bonds and insurance combined to equal not more than **[2]**%.

END OF DOCUMENT

**HAZARDOUS MATERIALS
PROCEDURES & REQUIREMENTS**

1. Summary

This document includes information applicable to hazardous materials and hazard waste abatement.

2. Notice of Hazardous Waste or Materials Conditions

- a. Contractor shall give notice in writing to the District, the Construction Manager, and the Architect promptly, before any of the following conditions are disturbed, and in no event later than twenty-four (24) hours after first observance, of any:
 - (1) Material that Contractor believes may be material that is hazardous waste or hazardous material, as defined in section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law;
 - (2) Other material that may present a substantial danger to persons or property exposed thereto in connection with Work at the site.
- b. Contractor's written notice shall indicate whether the hazardous waste or material was shown or indicated in the Contract Documents to be within the scope of Work, and whether the materials were brought to the site by Contractor, its Subcontractors, suppliers, or anyone else for whom Contractor is responsible. As used in this section the term "hazardous materials" shall include, without limitation, asbestos, lead, Polychlorinated biphenyl (PCB), petroleum and related hydrocarbons, and radioactive material.
- c. In response to Contractor's written notice, the District shall investigate the identified conditions.
- d. If the District determines that conditions do not involve hazardous materials or that no change in terms of Contract is justified, the District shall so notify Contractor in writing, stating reasons. If the District and Contractor cannot agree on whether conditions justify an adjustment in Contract Price or Contract Time, or on the extent of any adjustment, Contractor shall proceed with the Work as directed by the District.
- e. If after receipt of notice from the District, Contractor does not agree to resume Work based on a reasonable belief it is unsafe, or does not agree to resume Work under special conditions, then District may order such portion of Work that is in connection with such hazardous condition or such affected area to be deleted from the Work, or performed by others, or District may invoke its rights to terminate the Contract in whole or in part. District will determine entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Time as a result of deleting such portion of Work, or performing the Work by others.

- f. If Contractor stops Work in connection with any hazardous condition and in any area affected thereby, Contractor shall immediately redeploy its workers, equipment, and materials, as necessary, to other portions of the Work to minimize delay and disruption.

3. Additional Warranties and Representations

- a. Contractor represents and warrants that it, its employees, and its subcontractors and their employees, shall at all times have the required levels of familiarity with the Site and the Work, training, and ability to comply fully with all applicable law and contract requirements for safe and expeditious performance of the Work, including whatever training is or may be required regarding the activities to be performed (including, but not limited to, all training required to address adequately the actual or potential dangers of Contract performance).
- b. Contractor represents and warrants that it, its employees, and its subcontractors and their employees, shall at all times have and maintain in good standing any and all certifications and licenses required by applicable federal, state, and other governmental and quasi-governmental requirements applicable to the Work.
- c. Contractor represents and warrants that it has studied carefully all requirements of the Specifications regarding procedures for demolition, hazardous waste abatement, or safety practices, specified in the Contract, and prior to submitting its bid, has either (a) verified to its satisfaction that the specified procedures are adequate and sufficient to achieve the results intended by the Contract Documents, or (b) by way of approved "or equal" request or request for clarification and written Addenda, secured changes to the specified procedures sufficient to achieve the results intended by the Contract Documents. Contractor accepts the risk that any specified procedure will result in a completed Project in full compliance with the Contract Documents.

4. Monitoring and Testing

- a. District reserves the right, in its sole discretion, to conduct air monitoring, earth monitoring, Work monitoring, and any other tests (in addition to testing required under the agreement or applicable law), to monitor Contract requirements of safe and statutorily compliant work methods and (where applicable) safe re-entry level air standards under state and federal law upon completion of the job, and compliance of the work with periodic and final inspection by public and quasi-public entities having jurisdiction.
- b. Contractor acknowledges that District has the right to perform, or cause to be performed, various activities and tests including, but not limited to, pre-abatement, during abatement, and post-abatement air monitoring, that District shall have no obligation to perform said activities and tests, and that a portion of said activities and tests may take place prior to the completion of the Work by Contractor. In the event District elects to perform these activities and tests, Contractor shall afford District ample access to the Site

and all areas of the Work as may be necessary for the performance of these activities and tests. Contractor will include the potential impact of these activities or tests by District in the Contract Price and the Scheduled Completion Date.

- c. Notwithstanding District's rights granted by this paragraph, Contractor may retain its own industrial hygiene consultant at Contractor's own expense and may collect samples and may perform tests including, but not limited to, pre-abatement, during abatement, and post-abatement personal air monitoring, and District reserves the right to request documentation of all such activities and tests performed by Contractor relating to the Work and Contractor shall immediately provide that documentation upon request.

5. Compliance with Laws

- a. Contractor shall perform safe, expeditious, and orderly work in accordance with the best practices and the highest standards in the hazardous waste abatement, removal, and disposal industry, the applicable law, and the Contract Documents, including, but not limited to, all responsibilities relating to the preparation and return of waste shipment records, all requirements of the law, delivering of all requisite notices, and obtaining all necessary governmental and quasi-governmental approvals.
- b. Contractor represents that it is familiar with and shall comply with all laws applicable to the Work or completed Work including, but not limited to, all federal, state, and local laws, statutes, standards, rules, regulations, and ordinances applicable to the Work relating to:
 - (1) The protection of the public health, welfare and environment;
 - (2) Storage, handling, or use of asbestos, PCB, lead, petroleum based products or other hazardous materials;
 - (3) The generation, processing, treatment, storage, transport, disposal, destruction, or other management of asbestos, PCB, lead, petroleum, or hazardous waste materials or other waste materials of any kind; and
 - (4) The protection of environmentally sensitive areas such as wetlands and coastal areas.

6. Disposal

- a. Contractor has the sole responsibility for determining current waste storage, handling, transportation, and disposal regulations for the job Site and for each waste disposal facility. Contractor must comply fully at its sole cost and expense with these regulations and any applicable law. District may, but is not obligated to, require submittals with this information for it to review consistent with the Contract Documents.
- b. Contractor shall develop and implement a system acceptable to District to track hazardous waste from the Site to disposal, including appropriate

"Hazardous Waste Manifests" on the EPA form, so that District may track the volume of waste it put in each landfill and receive from each landfill a certificate of receipt.

- c. Contractor shall provide District with the name and address of each waste disposal facility prior to any disposal, and District shall have the express right to reject any proposed disposal facility. Contractor shall not use any disposal facility to which District has objected. Contractor shall document actual disposal or destruction of waste at a designated facility by completing a disposal certificate or certificate of destruction forwarding the original to the District.

7. Permits

- a. Before performing any of the Work, and at such other times as may be required by applicable law, Contractor shall deliver all requisite notices and obtain the approval of all governmental and quasi-governmental authorities having jurisdiction over the Work. Contractor shall submit evidence satisfactory to District that it and any disposal facility
 - (1) have obtained all required permits, approvals, and the like in a timely manner both prior to commencement of the Work and thereafter as and when required by applicable law, and
 - (2) are in compliance with all such permits, approvals and the regulations.

For example, before commencing any work in connection with the Work involving asbestos-containing materials, or PCBs, or other hazardous materials subject to regulation, Contractor agrees to provide the required notice of intent to renovate or demolish to the appropriate state or federal agency having jurisdiction, by certified mail, return receipt requested, or by some other method of transmittal for which a return receipt is obtained, and to send a copy of that notice to District. Contractor shall not conduct any Work involving asbestos-containing materials or PCBs unless Contractor has first confirmed that the appropriate agency having jurisdiction is in receipt of the required notification. All permits, licenses, and bonds that are required by governmental or quasi-governmental authorities, and all fees, deposits, tap fees, offsite easements, and asbestos and PCB disposal facilities expenses necessary for the prosecution of the Work, shall be procured and paid for by Contractor. Contractor shall give all notices and comply with the all applicable laws bearing on the conduct of the Work as drawn and specified. If Contractor observes or reasonably should have observed that Plans and Specifications and other Contract Documents are at variance therewith, it shall be responsible for promptly notifying District in writing of such fact. If Contractor performs any Work contrary to applicable laws, it shall bear all costs arising therefrom.

- b. In the case of any permits or notices held in District's name or of necessity to be made in District's name, District shall cooperate with Contractor in securing the permit or giving the notice, but the Contractor shall prepare for District review and execution upon approval, all necessary applications, notices, and other materials.

8. Indemnification

To the extent permitted by law, the indemnities and limitations of liability expressed throughout the Contract Documents apply with equal force and effect to any claims or liabilities imposed or existing by virtue of the removal, abatement, and disposal of hazardous waste. This includes, but is not limited to, liabilities connected to the selection and use of a waste disposal facility, a waste transporter, personal injury, property damage, loss of use of property, damage to the environment or natural resources, or "disposal" and "release" of materials associated with the Work (as defined in 42 U.S.C. § 9601 et seq.).

9. Termination

District shall have an absolute right to terminate for default immediately without notice and without an opportunity to cure should Contractor knowingly or recklessly commit a material breach of the terms of the Contract Documents, or any applicable law, on any matter involving the exposure of persons or property to hazardous waste. However, if the breach of contract exposing persons or property to hazardous waste is due solely to an ordinary, unintentional, and non-reckless failure to exercise reasonable care, then the procedures for termination for cause shall apply without modification.

END OF DOCUMENT

**PREVAILING WAGE AND
RELATED LABOR REQUIREMENTS CERTIFICATION**

PROJECT/CONTRACT NO.: _____ between Marin Community College District ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

I hereby certify that I will conform to the State of California Public Works Contract requirements regarding prevailing wages, benefits, on-site audits with 48-hours notice, payroll records, and apprentice and trainee employment requirements, for all Work on the above Project including, without limitation, labor compliance monitoring and enforcement by the Department of Industrial Relations.

[IF THIS PROJECT USES FEDERAL FUNDS, DISTRICT SHOULD INCLUDE THE FOLLOWING] I hereby certify that I will also conform to the Federal Labor Standards Provisions regarding minimum wages, withholding, payrolls and basic records, apprentice and trainee employment requirements, equal employment opportunity requirements, Copeland Act requirements, Davis-Bacon and Related Act requirements, Contract Work Hours and Safety Standards Act requirements, and any and all other applicable requirements for federal funding for all Work on the above Project.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Access Conditions and Requirements;
- B. Special Conditions.

1.02 SUMMARY OF WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of this Contract may consist of the following:

[FILL IN OR MODIFY AS APPROPRIATE]

Selective demolition and construction necessary for the Modernization to existing school buildings, including associated civil, architectural, structural, plumbing, mechanical and/or electrical work as indicated in the Drawings and Specifications. Generally, these categories of work involve new finishes, adaptive re-use and modification of certain selected areas, new cabinetry, handicap accessibility retrofits, re-roofing, and adding HVAC to instructional areas, library and administrative areas and pertain to changing and expanding selected infrastructure utilities, and extensive modifications. The Project will involve the "phasing" and barricading of work areas as indicated on the Plans and enumerated in these Specifications.

1.03 CONTRACTS

- A. Perform the Work under a single, fixed-price Contract.

1.04 WORK BY OTHERS

- A. Work on the Project that will be performed and completed prior to the start of the Work of this Contract:

[FILL IN OR MODIFY AS APPROPRIATE]

- (1) Asbestos removal/abatement.
- (2) Lead paint removal/abatement.

- B. Work on the Project that will be performed by others concurrent with the Work of this Contract:

[FILL IN OR MODIFY AS APPROPRIATE]

- (1) _____
- (2) _____

1.05 CODES, REGULATIONS, AND STANDARDS

- A. The codes, regulations, and standards adopted by the state and federal agencies having jurisdiction shall govern minimum requirements for this project. Where codes, regulations, and standards conflict with the Contract Documents, these conflicts shall be brought to the immediate attention of the District and the Architect.
- B. Codes, regulations, and standards shall be as published effective as of date of bid opening, unless otherwise specified or indicated.

1.06 PROJECT RECORD DOCUMENTS:

- A. Contractor shall maintain on Site one set of the following record documents; Contractor shall record actual revisions to the Work:
 - (1) Contract Drawings.
 - (2) Specifications.
 - (3) Addenda.
 - (4) Change Orders and other modifications to the Contract.
 - (5) Reviewed shop drawings, product data, and samples.
 - (6) Field test records.
 - (7) Inspection certificates.
 - (8) Manufacturer's certificates.
- B. Contractor shall store Record Documents separate from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples.
- C. Contractor shall record information concurrent with construction progress.
- D. Specifications: Contractor shall legibly mark and record at each product section of the Specifications the description of the actual product(s) installed, including the following:
 - (1) Manufacturer's name and product model and number.
 - (2) Product substitutions or alternates utilized.
 - (3) Changes made by Addenda and Change Orders and written directives.

1.07 EXAMINATION OF EXISTING CONDITIONS

- A. Contractor shall be held to have examined the Project Site and acquainted itself with the conditions of the Site or of the streets or roads approaching the Site.
- B. Prior to commencement of Work, Contractor shall survey the Site and existing buildings and improvements to observe existing damage and defects such as cracks, sags, broken, missing or damaged glazing, other building elements and Site improvements, and other damage.
- C. Should Contractor observe cracks, sags, and other damage to and defects of the Site and adjacent buildings, paving, and other items not indicated in the Contract Documents, Contractor shall immediately report same to the District and the Architect.

1.08 CONTRACTOR'S USE OF PREMISES

- A. If unoccupied and only with District's prior written approval, Contractor may use the building(s) at the Project Site without limitation for its operations, storage, and office facilities for the performance of the Work. If the District chooses to beneficially occupy any building(s), Contractor must obtain the District's written approval for Contractor's use of spaces and types of operations to be performed within the building(s) while so occupied. Contractor's access to the building(s) shall be limited to the areas indicated.
- B. If the space at the Project Site is not sufficient for Contractor's operations, storage, office facilities and/or parking, Contractor shall arrange and pay for any additional facilities needed by Contractor.
- C. Contractor shall not interfere with use of or access to occupied portions of the building(s) or adjacent property.
- D. Contractor shall maintain corridors, stairs, halls, and other exit-ways of building clear and free of debris and obstructions at all times.
- E. No one other than those directly involved in the demolition and construction, or specifically designated by the District or the Architect shall be permitted in the areas of work during demolition and construction activities.
- F. The Contractor shall install the construction security fence and maintain that it will be locked when not in use. Keys to this fencing will be provided to the District.

1.09 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. The Drawings show above-grade and below-grade structures, utility lines, and other installations that are known or believed to exist in the area of the Work. Contractor shall locate these existing installations before proceeding with excavation and other operations that could damage same; maintain them in service, where appropriate; and repair damage to them caused by the performance of the Work. Should damage occur to these existing installations, the costs of repair shall be at the Contractor's expense and made to the District's satisfaction.

- B. Contractor shall be alert to the possibility of the existence of additional structures and utilities. If Contractor encounters additional structures and utilities, Contractor will immediately report to the District for disposition of same as indicated in the General Conditions.

1.10 UTILITY SHUTDOWNS AND INTERRUPTIONS

- A. Contractor shall give the District a minimum of three (3) days written notice in advance of any need to shut off existing utility services or to effect equipment interruptions. The District will set exact time and duration for shutdown, and will assist Contractor with shutdown. Work required to re-establish utility services shall be performed by the Contractor.
- B. Contractor shall obtain District's written approval as indicated in the General Conditions in advance of deliveries of material or equipment or other activities that may conflict with District's use of the building(s) or adjacent facilities.

1.11 STRUCTURAL INTEGRITY

- A. Contractor shall be responsible for and supervise each operation and work that could affect structural integrity of various building elements, both permanent and temporary.
- B. Contractor shall include structural connections and fastenings as indicated or required for complete performance of the Work.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

ALTERNATES AND UNIT PRICING

PART 1 – ALTERNATES

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions;
- C. Bid Form and Proposal;
- D. Instruction to Bidders.

1.02 DESCRIPTION

The items of work indicated below propose modifications to, substitutions for, additions to and/or deletions from the various parts of the Work specified in other Sections of the Specifications. The acceptance or rejection of any of the alternates is strictly at the option of the District subject to District's acceptance of Contractor's stated prices contained in this Proposal.

1.03 GENERAL

Where an item is omitted, or scope of Work is decreased, all Work pertaining to the item whether specifically stated or not, shall be omitted and where an items is added or modified or where scope of Work is increased, all Work pertaining to that required to render same ready for use on the Project in accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

1.04 BASE BID

The Base Bid includes all work required to construct the Project completely and in accordance with the Contract Documents.

1.05 ALTERNATES

[FILL IN OR MODIFY AS APPROPRIATE]

A. [Add Alternate 1.]

B. [Add Alternate 2.]

The above Alternate descriptions are general in nature and for reference purposes only. The Contract Documents, including, without limitation, the Drawings and Specifications, must be referred to for the complete scope of Work.

PART 2 - UNIT PRICING

2.01 GENERAL

Contractor shall completely state all required figures based on Unit Prices listed below. Where scope of Work is decreased, all Work pertaining to the item, whether specifically stated or not, shall be omitted and where scope of Work is increased, all work pertaining to that item required to render same ready for use on the Project in accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

2.02 UNIT PRICES

Furnish unit prices for each of the named items on a square foot, lineal foot, or per each basis, as applies. Unit prices shall include all labor, materials, services, profit, overhead, insurance, bonds, taxes, and all other incidental costs of Contractor, subcontractors, and supplier(s).

[FILL IN OR MODIFY AS APPROPRIATE]

END OF DOCUMENT

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. Instructions to Bidders;
- B. General Conditions, including, without limitation, Substitutions For Specified Items;
- C. Special Conditions.

1.02 SUBSTITUTIONS OF MATERIALS AND EQUIPMENT:

- A. Catalog numbers and specific brands or trade names followed by the designation "or equal" are used in conjunction with material and equipment required by the Specifications to establish the standards of quality, utility, and appearance required. Substitutions which are equal in quality, utility, and appearance to those specified may be reviewed subject to the provisions of the General Conditions.
- B. Wherever more than one manufacturer's product is specified, the first-named product is the basis for the design used in the work and the use of alternative-named manufacturers' products or substitutes may require modifications in that design. If such alternatives are proposed by Contractor and are approved by the District and/or the Architect, Contractor shall assume all costs required to make necessary revisions and modifications of the design resulting from the substitutions requested by the Contractor.
- C. When materials and equipment are specified by first manufacturer's name and product number, second manufacturer's name and "or approved equal," supporting data for the second product, if proposed by Contractor, shall be submitted in accordance with the requirements for substitutions.
- D. If the District and/or Architect, in reviewing proposed substitute materials and equipment, require revisions or corrections to be made to previously accepted Shop Drawings and supplemental supporting data to be resubmitted, Contractor shall promptly do so. If any proposed substitution is judged by the District and/or Architect to be unacceptable, the specified material or equipment shall be provided.
- E. Samples may be required. Tests required by the District and/or Architect for the determination of quality and utility shall be made at the expense of Contractor, with acceptance of the test procedure first given by the District.
- F. In reviewing the supporting data submitted for substitutions, the District and/or Architect will use for purposes of comparison all the characteristics of the

specified material or equipment as they appear in the manufacturer's published data even though all the characteristics may not have been particularly mentioned in the Contract Documents. If more than two (2) submissions of supporting data are required, the cost of reviewing the additional supporting data shall be borne by Contractor, and the District will deduct the costs from the Contract Price.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 26 00

CHANGES IN THE WORK

**CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE PROVISIONS IN THE
GENERAL CONDITIONS RELATED TO CHANGES AND/OR REQUESTS FOR CHANGES**

END OF DOCUMENT

PROJECT MEETINGS

PART I – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions;
- C. Summary of Work; and
- D. Submittals.

1.02 SECTION INCLUDES:

- A. Scheduling of Work under this Contract shall be performed by Contractor in accordance with requirements of this Section.
 - (1) Development of schedule, cost and resource loading of the schedule, monthly payment requests, and project status reporting requirements of the Contract shall employ computerized Critical Path Method ("CPM") scheduling ("CPM Schedule").
 - (2) CPM Schedule shall be cost loaded based on Schedule of Values as approved by District.
 - (3) Submit schedules and reports as specified in the General Conditions.
- B. Upon Award of Contract, Contractor shall immediately commence development of Initial and Original CPM Schedules to ensure compliance with CPM Schedule submittal requirements.

1.03 CONSTRUCTION SCHEDULE:

- A. Within ten (10) days of being awarded the Contract and before request for first progress payment, the Contractor shall prepare and submit to the Project Manager a construction progress schedule conforming to the Milestone Schedule below.
- B. The Construction Schedule shall be continuously updated, and an updated schedule shall be submitted with each application for progress payment. Each revised schedule shall indicate the work actually accomplished during the previous period and the schedule for completion of the remaining work.

C. Milestone Schedule:

<u>ACTIVITY DESCRIPTION</u>	<u>REQUIRED COMPLETION</u>
[FILL IN ACTIVITIES AND DATES]	
CONSTRUCTION STARTS	[DATE]
FINAL PROJECT COMPLETION	[DATE]

1.04 QUALIFICATIONS

- A. Contractor shall employ experienced scheduling personnel qualified to use the latest version of **[i.e., Primavera Project Planner]**. Experience level required is set forth below. Contractor may employ such personnel directly or may employ a consultant for this purpose.
- (1) The written statement shall identify the individual who will perform CPM scheduling.
 - (2) Capability and experience shall be verified by description of construction projects on which individual has successfully applied computerized CPM.
 - (3) Required level of experience shall include at least two (2) projects of similar nature and scope with value not less than three-fourths ($\frac{3}{4}$) of the Total Bid Price of this Project. The written statement shall provide contact persons for referenced projects with current telephone and address information.
- B. District reserves the right to approve or reject Contractor's scheduler or consultant at any time. District reserves the right to refuse replacing Contractor's scheduler or consultant, if District believes replacement will negatively affect the scheduling of Work under this Contract.

1.05 GENERAL

- A. Progress Schedule shall be based on and incorporate milestone and completion dates specified in Contract Documents.
- B. Overall time of completion and time of completion for each milestone shown on Progress Schedule shall adhere to times in the Contract, unless an earlier (advanced) time of completion is requested by Contractor and agreed to by District. Any such agreement shall be formalized by a Change Order.
- (1) District is not required to accept an early completion schedule, i.e., one that shows earlier completion date than the Contract Time.
 - (2) Contractor shall not be entitled to extra compensation in event agreement is reached on an early completion schedule and Contractor completes its Work, for whatever reason, beyond completion date shown in its early completion schedule but within the Contract Time.

- (3) A schedule showing the work completed in less than the Contract Time, and that has been accepted by District, shall be considered to have Project Float. The Project Float is the time between the scheduled completion of the work and the Completion Date. Project Float is a resource available to both District and the Contractor.
- C. Ownership Project Float: Neither the District nor Contractor owns Project Float. The Project owns the Project Float. As such, liability for delay of the Completion Date rests with the party whose actions, last in time, actually cause delay to the Completion Date.
- (1) For example, if Party A uses some, but not all of the Project Float and Party B later uses remainder of the Project Float as well as additional time beyond the Project Float, Party B shall be liable for the time that represents a delay to the Completion Date.
 - (2) Party A would not be responsible for the time since it did not consume the entire Project Float and additional Project Float remained; therefore, the Completion Date was unaffected by Party A.
- D. Progress Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. Responsibility for developing Contract CPM Schedule and monitoring actual progress as compared to Progress Schedule rests with Contractor.
- E. Failure of Progress Schedule to include any element of the Work, or any inaccuracy in Progress Schedule, will not relieve Contractor from responsibility for accomplishing the Work in accordance with the Contract. District's acceptance of schedule shall be for its use in monitoring and evaluating job progress, payment requests, and time extension requests and shall not, in any manner, impose a duty of care upon District, or act to relieve Contractor of its responsibility for means and methods of construction.
- F. Software: Use **[i.e., District Project Planner for Windows, latest version]**. Such software shall be compatible with Windows operating system. Contractor shall transmit contract file to District on compact disk at times requested by District.
- G. Transmit each item under the form approved by District.
- (1) Identify Project with District Contract number and name of Contractor.
 - (2) Provide space for Contractor's approval stamp and District's review stamps.
 - (3) Submittals received from sources other than Contractor will be returned to the Contractor without District's review.

1.06 INITIAL CPM SCHEDULE

- A. Initial CPM Schedule submitted for review at the pre-construction conference shall serve as Contractor's schedule for up to ninety (90) calendar days after the Notice to Proceed.
- B. Indicate detailed plan for the Work to be completed in first ninety (90) days of the Contract; details of planned mobilization of plant and equipment; sequence of early operations; procurement of materials and equipment. Show Work beyond ninety (90) calendar days in summary form.
- C. Initial CPM Schedule shall be time-scaled.
- D. Initial CPM Schedule shall be cost and resource loaded. Accepted cost and resource loaded schedule will be used as basis for monthly progress payments until acceptance of the Original CPM Schedule. Use of Initial CPM Schedule for progress payments shall not exceed ninety (90) calendar days.
- E. District and Contractor shall meet to review and discuss the Initial CPM Schedule within seven (7) calendar days after it has been submitted to District.
 - (1) District's review and comment on the schedule shall be limited to Contract conformance (with sequencing, coordination, and milestone requirements).
 - (2) Contractor shall make corrections to schedule necessary to comply with Contract requirements and shall adjust schedule to incorporate any missing information requested by District. Contractor shall resubmit Initial CPM Schedule if requested by District.
- F. If, during the first ninety (90) days after Notice to Proceed, the Contractor is of the opinion that any of the Work included on its Initial CPM Schedule has been impacted, the Contractor shall submit to District a written Time Impact Evaluation ("TIE") in accordance with Article 1.12 of this Section. The TIE shall be based on the most current update of the Initial CPM Schedule.

1.07 ORIGINAL CPM SCHEDULE

- A. Submit a detailed proposed Original CPM Schedule presenting an orderly and realistic plan for completion of the Work in conformance with requirements as specified herein.
- B. Progress Schedule shall include or comply with following requirements:
 - (1) Time scaled, cost and resource (labor and major equipment) loaded CPM schedule.

- (2) No activity on schedule shall have duration longer than fifteen (15) work days, with exception of submittal, approval, fabrication and procurement activities, unless otherwise approved by District.
 - (a) Activity durations shall be total number of actual work days required to perform that activity.
- (3) The start and completion dates of all items of Work, their major components, and milestone completion dates, if any.
- (4) District -furnished materials and equipment, if any, identified as separate activities.
- (5) Activities for maintaining Project Record Documents.
- (6) Dependencies (or relationships) between activities.
- (7) Processing/approval of submittals and shop drawings for all material and equipment required per the Contract. Activities that are dependent on submittal acceptance or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.
 - (a) Include time for submittals, re-submittals and reviews by District. Coordinate with accepted schedule for submission of Shop Drawings, samples, and other submittals.
 - (b) Contractor shall be responsible for all impacts resulting from re-submittal of Shop Drawings and submittals.
- (8) Procurement of major equipment, through receipt and inspection at jobsite, identified as separate activity.
 - (a) Include time for fabrication and delivery of manufactured products for the Work.
 - (b) Show dependencies between procurement and construction.
- (9) Activity description; what Work is to be accomplished and where.
- (10) The total cost of performing each activity shall be total of labor, material, and equipment, excluding overhead and profit of Contractor. Overhead and profit of the General Contractor shall be shown as a separate activity in the schedule. Sum of cost for all activities shall equal total Contract value.
- (11) Resources required (labor and major equipment) to perform each activity.
- (12) Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.

- (13) Identify the activities which constitute the controlling operations or critical path. No more than twenty-five (25%) of the activities shall be critical or near critical. Near critical is defined as float in the range of one (1) to (10) days.
 - (14) Twenty (20) workdays for developing punch list(s), completion of punch-list items, and final clean up for the Work or any designated portion thereof. No other activities shall be scheduled during this period.
 - (15) Interface with the work of other contractors, District, and agencies such as, but not limited to, utility companies.
 - (16) Show detailed Subcontractor Work activities. In addition, furnish copies of Subcontractor schedules upon which CPM was built.
 - (a) Also furnish for each Subcontractor, as determined by District, submitted on Subcontractor letterhead, a statement certifying that Subcontractor concurs with Contractor's Original CPM Schedule and that Subcontractor's related schedules have been incorporated, including activity duration, cost and resource loading.
 - (b) Subcontractor schedules shall be independently derived and not a copy of Contractor's schedule.
 - (c) In addition to Contractor's schedule and resource loading, obtain from electrical, mechanical, and plumbing Subcontractors, and other Subcontractors as required by District, productivity calculations common to their trades, such as units per person day, feet of pipe per day per person, feet of wiring per day per person, and similar information.
 - (d) Furnish schedule for Contractor/Subcontractor CPM schedule meetings which shall be held prior to submission of Original CPM schedule to District. District shall be permitted to attend scheduled meetings as an observer.
 - (17) Activity durations shall be in Work days.
 - (18) Submit with the schedule a list of anticipated non-Work days, such as weekends and holidays. The Progress Schedule shall exclude in its Work day calendar all non-Work days on which Contractor anticipates critical Work will not be performed.
- C. Original CPM Schedule Review Meeting: Contractor shall, within sixty (60) days from the Notice to Proceed date, meet with District to review the Original CPM Schedule submittal.
- (1) Contractor shall have its Project Manager, Project Superintendent, Project Scheduler, and key Subcontractor representatives, as required by District, in attendance. The meeting will take place over a continuous one (1) day period.

- (2) District's review will be limited to submittal's conformance to Contract requirements including, but not limited to, coordination requirements. However, review may also include:
 - (a) Clarifications of Contract Requirements.
 - (b) Directions to include activities and information missing from submittal.
 - (c) Requests to Contractor to clarify its schedule.
- (3) Within five (5) days of the Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by District at the Meeting.

1.08 ADJUSTMENTS TO CPM SCHEDULE

- A. Adjustments to Original CPM Schedule: Contractor shall have adjusted the Original CPM Schedule submittal to address all review comments from original CPM Schedule review meeting and resubmit network diagrams and reports for District's review.
 - (1) District, within ten (10) days from date that Contractor submitted the revised schedule, will either:
 - (a) Accept schedule and cost and resource loaded activities as submitted, or
 - (b) Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for District to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.
 - (2) District may accept schedule with conditions that the first monthly CPM Schedule update be revised to correct deficiencies identified.
 - (3) When schedule is accepted, it shall be considered the "Original CPM Schedule" which will then be immediately updated to reflect the current status of the work.
 - (4) District reserves right to require Contractor to adjust, add to, or clarify any portion of schedule which may later be discovered to be insufficient for monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.

- B. Acceptance of Contractor's schedule by District will be based solely upon schedule's compliance with Contract requirements.
 - (1) By way of Contractor assigning activity durations and proposing sequence of Work, Contractor agrees to utilize sufficient and necessary management and other resources to perform work in accordance with the schedule.
 - (2) Upon submittal of schedule update, updated schedule shall be considered "current" CPM Schedule.
 - (3) Submission of Contractor's schedule to District shall not relieve Contractor of total responsibility for scheduling, sequencing, and pursuing Work to comply with requirements of Contract Documents, including adverse effects such as delays resulting from ill-timed Work.
- C. Submittal of Original CPM Schedule, and subsequent schedule updates, shall be understood to be Contractor's representation that the Schedule meets requirements of Contract Documents and that Work shall be executed in sequence indicated on the schedule.
- D. Contractor shall distribute Original CPM Schedule to Subcontractors for review and written acceptance, which shall be noted on Subcontractors' letterheads to Contractor and transmitted to District for the record.

1.09 MONTHLY CPM SCHEDULE UPDATE SUBMITTALS

- A. Following acceptance of Contractor's Original CPM Schedule, Contractor shall monitor progress of Work and adjust schedule each month to reflect actual progress and any anticipated changes to planned activities.
 - (1) Each schedule update submitted shall be complete, including all information requested for the Original CPM Schedule submittal.
 - (2) Each update shall continue to show all Work activities including those already completed. These completed activities shall accurately reflect "as built" information by indicating when activities were actually started and completed.
- B. A meeting will be held on approximately the twenty-fifth (25th) of each month to review the schedule update submittal and progress payment application.
 - (1) At this meeting, at a minimum, the following items will be reviewed: Percent (%) complete of each activity; Time Impact Evaluations for Change Orders and Time Extension Request; actual and anticipated activity sequence changes; actual and anticipated duration changes; and actual and anticipated Contractor delays.
 - (2) These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate

personnel attend. At a minimum, these meetings shall be attended by Contractor's General Superintendent and Scheduler.

- (3) Contractor shall plan on the meeting taking no less than four (4) hours.
- C. Within five (5) working days after monthly schedule update meeting, Contractor shall submit the updated CPM Schedule update.
- D. Within five (5) work days of receipt of above noted revised submittals, District will either accept or reject monthly schedule update submittal.
 - (1) If accepted, percent (%) complete shown in monthly update will be basis for Application for Payment by the Contractor. The schedule update shall be submitted as part of the Contractor's Application for Payment.
 - (2) If rejected, update shall be corrected and resubmitted by Contractor before the Application for Payment is submitted.
- E. Neither updating, changing or revising of any report, curve, schedule, or narrative submitted to District by Contractor under this Contract, nor District's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying in any way the Completion Date or milestone dates or of modifying or limiting in any way Contractor's obligations under this Contract.

1.10 SCHEDULE REVISIONS

- A. Updating the Schedule to reflect actual progress shall not be considered revisions to the Schedule. Since scheduling is a dynamic process, revisions to activity durations and sequences are expected on a monthly basis.
- B. To reflect revisions to the schedule, the Contractor shall provide District with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of work, the Contractor shall provide a schedule diagram which compares the original sequence to the revised sequence of work. The Contractor shall provide the written narrative and schedule diagram for revisions two (2) working days in advance of the monthly schedule update meeting.
- C. Schedule revisions shall not be incorporated into any schedule update until the revisions have been reviewed by District. District may request further information and justification for schedule revisions and Contractor shall, within three (3) days, provide District with a complete written narrative response to District's request.
- D. If the Contractor's revision is still not accepted by District, and the Contractor disagrees with District's position, the Contractor has seven (7) calendar days from receipt of District's letter rejecting the revision to provide a written narrative providing full justification and explanation for the revision. The Contractor's failure to respond in writing within seven (7) calendar days of

District's written rejection of a schedule revision shall be contractually interpreted as acceptance of District's position, and the Contractor waives its rights to subsequently dispute or file a claim regarding District's position.

- E. At District's discretion, the Contractor can be required to provide Subcontractor certifications of performance regarding proposed schedule revisions affecting said Subcontractors.

1.11 RECOVERY SCHEDULE

- A. If the Schedule Update shows a completion date twenty-one (21) calendar days beyond the Contract Completion Date, or individual milestone completion dates, the Contractor shall submit to District the proposed revisions to recover the lost time within seven (7) calendar days. As part of this submittal, the Contractor shall provide a written narrative for each revision made to recapture the lost time. If the revisions include sequence changes, the Contractor shall provide a schedule diagram comparing the original sequence to the revised sequence of work.
- B. The revisions shall not be incorporated into any schedule update until the revisions have been reviewed by District.
- C. If the Contractor's revisions are not accepted by District, District and the Contractor shall follow the procedures in paragraph 1.09.C, 1.09.D and 1.09.E above.
- D. At District's discretion, the Contractor can be required to provide Subcontractor certifications for revisions affecting said Subcontractors.

1.12 TIME IMPACTS EVALUATION ("TIE") FOR CHANGE ORDERS, AND OTHER DELAYS

- A. When Contractor is directed to proceed with changed Work, the Contractor shall prepare and submit within fourteen (14) calendar days from the Notice to Proceed a TIE which includes both a written narrative and a schedule diagram depicting how the changed Work affects other schedule activities. The schedule diagram shall show how the Contractor proposes to incorporate the changed Work in the schedule and how it impacts the current schedule-update critical path. The Contractor is also responsible for requesting time extensions based on the TIE's impact on the critical path. The diagram must be tied to the main sequence of schedule activities to enable District to evaluate the impact of changed Work to the scheduled critical path.
- B. Contractor shall be required to comply with the requirements of Paragraph 1.09.A for all types of delays such as, but not limited to, Contractor/Subcontractor delays, adverse weather delays, strikes, procurement delays, fabrication delays, etc.
- C. Contractor shall be responsible for all costs associated with the preparation of TIEs, and the process of incorporating them into the current schedule update. The Contractor shall provide District with four (4) copies of each TIE.

- D. Once agreement has been reached on a TIE, the Contract Time will be adjusted accordingly. If agreement is not reached on a TIE, the Contract Time may be extended in an amount District allows, and the Contractor may submit a claim for additional time claimed by contractor.

1.13 TIME EXTENSIONS

- A. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, impact the critical path of the current schedule update. Notice of time impacts shall be given in accord with the General Conditions.
- B. Where an event for which District is responsible impacts the projected Completion Date, the Contractor shall provide a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor, equipment, and material the Contractor would expend to mitigate District-caused time impact. The Contractor shall submit its mitigation plan to District within fourteen (14) calendar days from the date of discovery of the impact. The Contractor is responsible for the cost to prepare the mitigation plan.
- C. Failure to request time, provide TIE, or provide the required mitigation plan will result in Contractor waiving its right to a time extension and cost to mitigate the delay.
- D. No time will be granted under this Contract for cumulative effect of changes.
- E. District will not be obligated to consider any time extension request unless the Contractor complies with requirements of Contract Documents.
- F. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.
- G. If the Contractor does not submit a TIE within the required fourteen (14) calendar days for any issue, it is mutually agreed that the Contractor does not require a time extension for said issue.

1.14 SCHEDULE REPORTS

- A. Submit four (4) copies of the following reports with the Initial CPM Schedule, the Original CPM Schedule, and each monthly update.
- B. Required Reports:
 - (1) Two activity listing reports: one sorted by activity number and one by total Project Float. These reports shall also include each activity's early/late and actual start and finish dates, original and remaining duration, Project Float, responsibility code, and the logic relationship of activities.

- (2) Cost report sorted by activity number including each activity's associated cost, percentage of Work accomplished, earned value- to-date, previous payments, and amount earned for current update period.**Error! Bookmark not defined.**
- (3) Schedule plots presenting time-scaled network diagram showing activities and their relationships with the controlling operations or critical path clearly highlighted.
- (4) Cash flow report calculated by early start, late start, and indicating actual progress. Provide an exhibit depicting this information in graphic form.
- (5) Planned versus actual resource (i.e., labor) histogram calculated by early start and late start.

C. Other Reports

In addition to above reports, District may request, from month-to-month, any two of the following reports. Submit four (4) copies of all reports.

- (1) Activities by early start.
- (2) Activities by late start.
- (3) Activities grouped by Subcontractors or selected trades.
- (4) Activities with scheduled early start dates in a given time frame, such as fifteen (15) or thirty (30) day outlook.

D. Furnish District with report files on compact disks containing all schedule files for each report generated.

1.15 PROJECT STATUS REPORTING

- A. In addition to submittal requirements for CPM scheduling identified in this Section, Contractor shall provide a monthly project status report (i.e., written narrative report) to be submitted in conjunction with each CPM Schedule as specified herein. Status reporting shall be in form specified below.
- B. Contractor shall prepare monthly written narrative reports of status of Project for submission to District. Written status reports shall include:
 - (1) Status of major Project components (percent (%) complete, amount of time ahead or behind schedule) and an explanation of how Project will be brought back on schedule if delays have occurred.
 - (2) Progress made on critical activities indicated on CPM Schedule.
 - (3) Explanations for any lack of work on critical path activities planned to be performed during last month.

- (4) Explanations for any schedule changes, including changes to logic or to activity durations.
- (5) List of critical activities scheduled to be performed next month.
- (6) Status of major material and equipment procurement.
- (7) Any delays encountered during reporting period.
- (8) Contractor shall provide printed report indicating actual versus planned resource loading for each trade and each activity. This report shall be provided on weekly and monthly basis.
 - (a) Actual resource shall be accumulated in field by Contractor, and shall be as noted on Contractor's daily reports. These reports will be basis for information provided in computer-generated monthly and weekly printed reports.
 - (b) Contractor shall explain all variances and mitigation measures.
- (9) Contractor may include any other information pertinent to status of Project. Contractor shall include additional status information requested by District at no additional cost.
- (10) Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation.

1.16 WEEKLY SCHEDULE REPORT

At the Weekly Progress Meeting, the Contractor shall provide and present a time-scaled three (3) week look-ahead schedule that is based and correlated by activity number to the current schedule (i.e., Initial, Original CPM, or Schedule Update).

1.17 DAILY CONSTRUCTION REPORTS

On a daily basis, Contractor shall submit a daily activity report to District for each workday, including weekends and holidays when worked. Contractor shall develop the daily construction reports on a computer-generated database capable of sorting daily Work, manpower, and manhours by Contractor, Subcontractor, area, sub-area, and Change Order Work. Upon request of District, furnish computer disk of this data base. Obtain District's written approval of daily construction report data base format prior to implementation. Include in report:

- A. Project name and Project number.
- B. Contractor's name and address.
- C. Weather, temperature, and any unusual site conditions.

- D. Brief description and location of the day's scheduled activities and any special problems and accidents, including Work of Subcontractors. Descriptions shall be referenced to CPM scheduled activities.
- E. Worker quantities for its own Work force and for Subcontractors of any tier.
- F. Equipment, other than hand tools, utilized by Contractor and Subcontractors.

1.18 PERIODIC VERIFIED REPORTS

Contractor shall complete and verify construction reports on a form prescribed by the Division of the State Architect and file reports on the first day of February, May, August, and November during the preceding quarter year; at the completion of the Contract; at the completion of the Work; at the suspension of Work for a period of more than one (1) month; whenever the services of Contractor or any of Contractor's Subcontractors are terminated for any reason; and at any time a special verified report is required by the Division of the State Architect. Refer to section 4-336 and section 4-343 of Part 1, Title 24 of the California Code of Regulations.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

SUBMITTALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Contractor's Submittals and Schedules, Drawings and Specifications;
- B. Special Conditions.

1.02 SECTION INCLUDES:

- A. Definitions:
 - (1) Shop Drawings and Product Data are as indicated in the General Conditions and include, but are not limited to, fabrication, erection, layout and setting drawings, formwork and falsework drawings, manufacturers' standard drawings, descriptive literature, catalogues, brochures, performance and test data, wiring and control diagrams. In addition, there are other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment or systems and all positions conform to the requirement of the Contract Documents, including, without limitation, the Drawings.
 - (2) "Manufactured" applies to standard units usually mass-produced; "fabricated" means specifically assembled or made out of selected materials to meet design requirements. Shop Drawings shall establish the actual detail of manufactured or fabricated items, indicated proper relation to adjoining work and amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure.
 - (3) Manufacturer's Instructions: Where any item of Work is required by the Contract Documents to be furnished, installed, or performed, at a minimum, in accordance with a specified product manufacturer's instructions, the Contractor shall procure and distribute copies of these to the District, the Architect, and all other concerned parties and shall furnish, install, or perform the work, at a minimum, in accordance with those instructions.
- B. Samples, Shop Drawings, Product Data, and other items as specified, in accordance with the following requirements:

- (1) Contractor shall submit all Shop Drawings, Product Data, and Samples to the District, the Architect, the Project Inspector, and the Construction Manager.
- (2) Contractor shall comply with all time frames herein and in the General Conditions and, in any case, shall submit required information in sufficient time to permit proper consideration and action before ordering any materials or items represented by such Shop Drawings, Product Data, and/or Samples.
- (3) Contractor shall comply with all time frames herein and in the General Conditions and, in any case, shall allow sufficient time so that no delay occurs due to required lead time in ordering or delivery of any item to the Site. Contractor shall be responsible for any delay in progress of Work due to its failure to observe these requirements.
- (4) Time for completion of Work shall not be extended on account of Contractor's failure to promptly submit Shop Drawings, Product Data, and/or Samples.
- (5) Reference numbers on Shop Drawings shall have Architectural and/or Engineering Contract Drawings reference numbers for details, sections, and "cuts" shown on Shop Drawings. These reference numbers shall be in addition to any numbering system that Contractor chooses to use or has adopted as standard.
- (6) When the magnitude or complexity of submittal material prevents a complete review within the stated time frame, Contractor shall make this submittal in increments to avoid extended delays.
- (7) Contractor shall certify on submittals for review that submittals conform to Contract requirements. In event of any variance, Contractor shall specifically state in transmittal and on Shop Drawings, portions vary and require approval of a substitute. Also certify that Contractor-furnished equipment can be installed in allocated space.
- (8) Unless specified otherwise, sampling, preparation of samples, and tests shall be in accordance with the latest standard of the American Society for Testing and Materials.
- (9) Upon demand by Architect or District, Contractor shall submit samples of materials and/or articles for tests or examinations and consideration before Contractor incorporates same in Work. Contractor shall be solely responsible for delays due to sample(s) 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 that are of value after testing will remain the property of Contractor.

C. Submittal Schedule:

- (1) Contractor shall prepare its proposed submittal schedule that is coordinated with the its proposed construction schedule and submit both

to the District within ten (10) days after the date of the Notice to Proceed. Contractor's proposed schedules shall become the Project Construction Schedule and the Project Submittal Schedule after each is approved by the District.

- (2) Contractor is responsible for all lost time should the initial submittal be rejected, marked "revised and resubmit", etc.
- (3) All Submittals shall be forwarded to the District by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those Submittals shall be forwarded to the District so as not to delay the Construction Schedule..

1.03 SHOP DRAWINGS:

- A. Contractor shall submit one reproducible transparency and six (6) opaque reproductions. The District will review and return the reproducible copy and one (1) opaque reproduction to Contractor.
- B. Before commencing installation of any Work, the Contractor shall submit and receive approval of all drawings, descriptive data, and material list(s) as required to accomplish Work.
- C. Review of Shop Drawings is regarded as a service to assist Contractor and in all cases original Contract Documents shall take precedence as outlined under General Conditions.
- D. No claim for extra time or payment shall be based on work shown on Shop Drawings unless the claim is (1) noted on Contractor's transmittal letter accompanying Shop Drawings and (2) Contractor has complied with all applicable provisions of the General Conditions, including, without limitation, provisions regarding changes and payment, and all required written approvals.
- E. District shall not review Shop Drawings for quantities of materials or number of items supplied.
- F. District's and/or Architect's review of Shop Drawing will be general. District and/or Architect review does not relieve Contractor of responsibility for accuracy, proper fitting, construction of Work, furnishing of materials, or Work required by Contract Documents and not indicated on Shop Drawings. Shop Drawing reviewed by District and/or Architect is not to be construed as approving departures from Contract Documents.
- G. Review of Shop Drawings and Schedules does not relieve Contractor from responsibility for any aspect of those Drawings or Schedules that is a violation of local, County, State, or Federal laws, rules, ordinances, or rules and regulations of commissions, boards, or other authorities or utilities having jurisdiction.
- H. Before submitting Shop Drawings for review, Contractor shall check Shop Drawings of its subcontractors for accuracy, and confirm that all Work

contiguous with and having bearing on other work shown on Shop Drawings is accurately drawn and in conformance with Contract Documents.

I. Submitted drawings and details must bear stamp of approval of Contractor:

- (1) Stamp and signature shall clearly certify that Contractor has checked Shop Drawings for compliance with Drawings.
- (2) If Contractor submits a Shop Drawing without an executed stamp of approval, or whenever it is evident (despite stamp) that Drawings have not been checked the District and/or Architect will not consider them and will return them to the Contractor for revision and resubmission. In that event, it will be deemed that Contractor has not complied with this provision and Contractor shall bear risk of all delays to same extent as if it had not submitted any Shop Drawings or details.

J. Submission of Shop Drawings (in either original submission or when resubmitted with correction) constitutes evidence that Contractor has checked all information thereon and that it accepts and is willing to perform Work as shown.

K. Contractor shall pay for cost of any changes in construction due to improper checking and coordination. Contractor shall be responsible for all additional costs, including coordination. Contractor shall be responsible for costs incurred by itself, the District, the Architect, the Project Inspector, the Construction Manager, any other Subcontractor or contractor, etc., due to improperly checked and/or coordination of submittals.

L. Shop Drawings must clearly delineate the following information:

- (1) Project name and address.
- (2) Architect's name and project number.
- (3) Shop Drawing title, number, date, and scale.
- (4) Names of Contractor, Subcontractor(s) and fabricator.
- (5) Working and erection dimensions.
- (6) Arrangements and sectional views.
- (7) Necessary details, including complete information for making connections with other Work.
- (8) Kinds of materials and finishes.
- (9) Descriptive names of materials and equipment, classified item numbers, and locations at which materials or equipment are to be installed in the Work. Contractor shall use same reference identification(s) as shown on Contract Drawings.

- M. Contractor shall prepare composite drawings and installation layouts when required to solve tight field conditions.
 - (1) Shop Drawings shall consist of dimensioned plans and elevations and must give complete information, particularly as to size and location of sleeves, inserts, attachments, openings, conduits, ducts, boxes, structural interferences, etc.
 - (2) Contractor shall coordinate these composite Shop Drawings and installation layouts in the field between itself and its Subcontractor(s) for proper relationship to the Work, the work of other trades, and the field conditions. The Contractor shall check and approve all submittal(s) before submitting them for final review.

1.04 PRODUCT DATA OR NON REPRODUCIBLE SUBMITTALS:

- A. Contractor shall submit manufacturer's printed literature in original form. Any fading type of reproduction will not be accepted. Contractor must submit a minimum of six (6) each, to the District. District shall return one (1) to the Contractor, who shall reproduce whatever additional copies it requires for distribution.
- B. Contractor shall submit six (6) copies of a complete list of all major items of mechanical, plumbing, and electrical equipment and materials in accordance with the approved Submittal Schedule, except as required earlier to comply with the approved Construction Schedule. Other items specified are to be submitted prior to commencing Work. Contractor shall submit items of like kind at one time in a neat and orderly manner. Partial lists will not be acceptable.
- C. Submittals shall include manufacturer's specifications, physical dimensions, and ratings of all equipment. Contractor shall furnish performance curves for all pumps and fans. Where printed literature describes items in addition to that item being submitted, submitted item shall be clearly marked on sheet and superfluous information shall be crossed out. If highlighting is used, Contractor shall mark all copies.
- D. Equipment submittals shall be complete and include space requirements, weight, electrical and mechanical requirements, performance data, and supplemental information that may be requested.

1.05 SAMPLES:

- A. Contractor shall submit for approval Samples as required and within the time frame in the Contract Documents. Materials such as concrete, mortar, etc., which require on-site testing will be obtained from Project Site.
- B. Contractor shall submit four (4) samples except where greater or lesser number is specifically required by Contract Documents including, without limitation, the Specifications.

- (1) Samples must be of sufficient size and quality to clearly illustrate functional characteristics, with integrally related parts and attachment devices.
- (2) Samples must show full range of texture, color, and pattern.
- C. Contractor shall make all Submittals, unless it has authorized Subcontractor(s) to submit and Contractor has notified the District in writing to this effect.
- D. Samples to be shipped prepaid or hand-delivered to the District.
- E. Contractor shall mark samples to show name of Project, name of Contractor submitting, Contract number and segment of Work where representative Sample will be used, all applicable Specifications Sections and documents, Contract Drawing Number and detail, and ASTM or FS reference, if applicable.
- F. Contractor shall not deliver any material to Site prior to receipt of District's and/or Architect's completed written review and approval. Contractor shall furnish materials equal in every respect to approved Samples and execute Work in conformance therewith.
- G. District's and/or Architect's review, acceptance, and/or approval of Sample(s) will not preclude rejections of any material upon discovery of defects in same prior to final acceptance of completed Work.
- H. After a material has been approved, no change in brand or make will be permitted.
- I. Contractor shall prepare its Submittal Schedule and submit Samples of materials requiring laboratory tests to specified laboratory for testing not less than ninety (90) days before such materials are required to be used in Work.
- J. Samples which are rejected must be resubmitted promptly after notification of rejection and be marked "Resubmitted Sample" in addition to other information required.
- K. Field Samples and Mock-Ups are to be removed by Contractor at District's direction:
 - (1) Size: As Specified.
 - (2) Furnish catalog numbers and similar data, as requested.

1.06 REVIEW AND RESUBMISSION REQUIREMENTS:

- A. The District will arrange for review of Sample(s), Shop Drawing(s), Product Data, and other submittal(s) by appropriate reviewer and return to Contractor as provided below within twenty-one (21) days after receipt or within twenty-one (21) days after receipt of all related information necessary for such review, whichever is later.

- B. One (1) copy of product or materials data will be returned to Contractor with the review status.
- C. Samples to be incorporated into the Work will be returned to Contractor, together with a written notice designating the Sample with the appropriate review status and indicating errors discovered on review, if any. Other Samples will not be returned, but the same notice will be given with respect thereto, and that notice shall be considered a return of the Sample.
- D. Contractor shall revise and resubmit any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) as required by the reviewer. Such resubmittals will be reviewed and returned in the same manner as original Sample(s), Shop Drawing(s), Product Data, and other submittal(s), within fourteen (14) days after receipt thereof or within fourteen (14) days after receipt of all related information necessary for such review.
- E. Contractor may proceed with any of the Work covered by Sample(s), Shop Drawing(s), Product Data, and other submittal(s) upon its return if designated as no exception taken, or revise as noted, provided the Contractor proceeds in accordance with the District and/or the Architect's notes and comments.
- F. Contractor shall not begin any of the work covered by a Sample(s), Shop Drawing(s), Product Data, and other submittal(s), designated as revise and resubmit or rejected, until a revision or correction thereof has been reviewed and returned to Contractor.
- G. Sample(s), Shop Drawing(s), Product Data, and other submittal(s) designated as revise and resubmit or rejected and requiring resubmittal, shall be revised or corrected and resubmitted to the District no later than fourteen (14) days or a shorter period as required to comply with the approved Construction Schedule, after its return to Contractor.
- H. Neither the review nor the lack of review of any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) shall waive any of the requirements of the Contract Documents, or relieve Contractor of any obligation thereunder.
- I. District's and/or Architect's review of Shop Drawings does not relieve the Contractor of responsibility for any errors that may exist. Contractor is responsible for the dimensions and design of adequate connections and details and for satisfactory construction of all the Work.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

SITE STANDARDS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including without limitation, Site Access, Conditions, and Regulations;
- B. Special Conditions;
- C. Drug-Free Workplace Certification;
- D. Tobacco-Free Environment Certification;
- E. Criminal Background Investigation/Fingerprinting Certification;
- F. Temporary Facilities and Controls.

1.02 REQUIREMENTS OF THE DISTRICT:

- A. Drug-Free Schools and Safety Requirements:
 - (1) All school sites and other District Facilities have been declared "Drug-Free Zones." No drugs, alcohol and/or smoking are allowed at any time in any buildings and/or grounds on District property. No students, staff, visitors, or contractors are to use drugs on these sites.
 - (2) Smoking and the use of tobacco products by all persons is prohibited on or in District property. District property includes school buildings, school grounds, school owned vehicles and vehicles owned by others while on District property. Contractor shall be post: "Non-Smoking Area" in a highly visible location on Site. Contractor may designate a smoking area outside of District property within the public right-of-way, provided that this area remains quiet and unobtrusive to adjacent neighbors. This smoking area is to be kept clean at all times.
 - (3) Contractor shall ensure that no alcohol, firearms, weapons, or controlled substances enter or are used at the Site. Contractor shall immediately remove from the Site and terminate the employment of any employee(s) found in violation of this provision.
- B. Language: Unacceptable and/or loud language will not be tolerated, "Cat calls" or other derogatory language toward students or public will not be allowed.
- C. Disturbing the Peace (Noise and Lighting):

- (1) Contractor shall observe the noise ordinance of the Site at all times including, without limitation, all applicable local, city, and/or state laws, ordinances, and/or regulations regarding noise and allowable noise levels.
- (2) The use of radios, etc., shall be controlled to keep all sound at a level that cannot be heard beyond the immediate area of use. District reserves the right to prohibit the use of radios at the Site, except for handheld communication radios (e.g., Nextel phones or radios).
- (3) If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

D. Traffic:

- (1) Driving on the Premises shall be limited to periods when students and public are not present. If driving or deliveries must be made during the school hours, two (2) or more ground guides shall lead the vehicle across the area of travel. In no case shall driving take place across playgrounds or other pedestrian paths during recess, lunch, and/or class period changes. The speed limit on-the Premises shall be five (5) miles per hour (maximum) or less if conditions require.
- (2) All paths of travel for deliveries, including without limitation, material, equipment, and supply deliveries, shall be reviewed and approved by District in advance. Any damage will be repaired to the pre-damaged condition by the Contractor.
- (3) District shall designate a construction entry to the Site. If Contractor requests, District determines it is required, and to the extent possible, District shall designate a staging area so as not to interfere with the normal functioning of school facilities. Location of gates and fencing shall be approved in advance with District and at Contractor's expense.
- (4) Parking areas shall be reviewed and approved by District in advance. No parking is to occur under the drip line of trees or in areas that could otherwise be damaged.

- E. All of the above shall be observed and complied with by the Contractor and all workers on the Site. Failure to follow these directives could result in individual(s) being suspended or removed from the work force at the discretion of the District. The same rules and regulations shall apply equally to delivery personnel, inspectors, consultants, and other visitors to the Site.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Obtaining of Permits and Licenses and Work to Comply with All Applicable Regulations;
- B. Special Conditions;
- C. Quality Control.

1.02 DESCRIPTION:

This section covers the general requirements for regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

1.03 REQUIREMENTS OF REGULATORY AGENCIES:

- A. All statutes, ordinances, laws, rules, codes, regulations, standards, and the lawful orders of all public authorities having jurisdiction of the Work, are hereby incorporated into these Contract Documents as if repeated in full herein and are intended to be included in any reference to Code or Building Code, unless otherwise specified, including, without limitation, the references in the list below. Contractor shall make available at the Site copies of all the listed documents applicable to the Work as the District and/or Architect may request, including, without limitation, applicable portions of the California Code of Regulations ("CCR").
- B. This Project shall be governed by applicable regulations, including, without limitation, the State of California's Administrative Regulations for the Division of the State Architect-Structural Safety (DSA/SS), Chapter 4, Part 1, Title 24, CCR, and the most current version on the date the bids are opened and as it pertains to school construction including, without limitation:
 - (1) Test and testing laboratory per Section 4-335 (District shall pay for the testing laboratory.)
 - (2) Special inspections per Section 4-333(c).
 - (3) Verified reports per Section 4-365 & 4-343(c).
 - (4) Duties of the Architect & Engineers shall be per Section 4-333(a) and 4-341.

- (5) Duties of the Contractor shall be per Section 4-343.
- (6) Addenda and Change Orders per Section 4-338.

Contractor shall keep and make available a copy of Part 1 and 2 of the most current version of Title 24 at the Site during construction.

C. Items of deferred approval shall be clearly marked on the first sheet of the Architect's and/or Engineer's approved Drawings. All items later submitted for approval shall be per Title 24 requirements to the DSA.

- (1) Building Standards Administrative Code, Part 1, Title 24, CCR
- (2) California Building Code (CBC), Part 2, Title 24, CCR; (Uniform Building code volumes 1-3 and California Amendments).
- (3) California Electrical Code (CEC), Part 3, Title 24, CCR; (National Electrical Code and California Amendments).
- (4) California Mechanical Code (CMC), Part 4, Title 24, CCR; (Uniform Mechanical Code and California Amendments).
- (5) California Plumbing Code (CPC), Part 5, Title 24, CCR; (Uniform Plumbing Code and California Amendments).
- (6) California Fire Code (CFC), Part 9, Title 24, CCR; (Fire Plumbing Code and California Amendments).
- (7) California Referenced Standards Code, Part 12, Title 24, CCR.
- (8) State Fire Marshal Regulations, Public Safety, Title 19, CCR.
- (9) Partial List of Applicable NFPA Standards:
 - (a) NFPA 13 - Automatic Sprinkler System.
 - (b) NFPA 14 - Standpipes Systems.
 - (c) NFPA 17A - Wet Chemical System
 - (d) NFPA 24 - Private Fire Mains.
 - (e) (California Amended) NFPA 72 - National Fire Alarm Codes.
 - (f) NFPA 253 - Critical Radiant Flux of Floor Covering System.
 - (g) NFPA 2001 - Clean Agent Fire Extinguishing Systems.
- (10) California Division of the State Architect interpretation of Regulations.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

ABBREVIATIONS AND ACRONYMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions including without limitation, Definitions;
- B. Special Conditions.

1.02 DOCUMENT INCLUDES:

- A. Abbreviations used throughout the Contract Documents.
- B. Reference to a technical society, organization, or body is by abbreviation, as follows:

1.	AA	Aluminum Association
2.	AAMA	Architectural Aluminum Manufacturers Association
3.	AASHTO	American Association of State Highway and Transportation Officials
4.	ABPA	Acoustical and Board Products Association
5.	ACI	American Concrete Institute
6.	AGA	American Gas Association
7.	AGC	Associated General Contractors
8.	AHC	Architectural Hardware Consultant
9.	AI	Asphalt Institute
10.	AIA	American Institute of Architects
11.	AIEE	American Institute of Electrical Engineers
12.	AISC	American Institute of Steel Construction
13.	AISI	American Iron and Steel Institute
14.	AMCA	Air Moving and Conditioning Association
15.	ANSI	American National Standards Institute
16.	APA	American Plywood Association
17.	ARI	Air Conditioning and Refrigeration Institute
18.	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
19.	ASME	American Society of Mechanical Engineers
20.	ASSE	American Society of Structural Engineers
21.	ASTM	American Society of Testing and Materials
22.	AWPB	American Wood Preservers Bureau
23.	AWPI	American Wood preservers Institute
24.	AWS	American Welding Society
25.	AWSC	American Welding Society Code
26.	AWI	Architectural Woodwork Institute
27.	AWWA	American Water Works Association

28.	BIA	Brick Institute of America
29.	CCR	California Code of Regulations
30.	CLFMI	Chain Link Fence Manufacturers Institute
31.	CMG	California Masonry Guild
32.	CRA	California Redwood Association
33.	CRSI	Concrete Reinforcing Steel Institute
34.	CS	Commercial Standards
35.	CSI	Construction Specifications Institute
36.	CTI	Cooling Tower Institute
37.	FGMA	Flat Glass Manufacturer's Association
38.	FIA	Factory Insurance Association
39.	FM	Factory Mutual
40.	FS	Federal Specification
41.	FTI	Facing Title Institute
42.	GA	Gypsum Association
43.	ICC	International Code Council
44.	IEEE	Institute of Electrical and Electronic Engineers
45.	IES	Illumination Engineering Society
46.	LIA	Lead Industries Association
47.	MIA	Marble Institute of America
48.	MLMA	Metal Lath Manufacturers Association
49.	MS	Military Specifications
50.	NAAMM	National Association of Architectural Metal Manufacturers
51.	NBHA	National Builders Hardware Association
52.	NBFU	National Board of Fire Underwriters
53.	NBS	National Bureau of Standards
54.	NCMA	National Concrete Masonry Association
55.	NEC	National Electrical Code
56.	NEMA	National Electrical Manufacturers Association
57.	NFPA	National Fire Protection Association/National Forest Products Association
58.	NMWIA	National Mineral Wool Insulation Association
59.	NTMA	National Terrazzo and Mosaic Association
60.	NWMA	National Woodwork Manufacturer's Association
61.	ORS	Office of Regulatory Services (California)
62.	OSHA	Occupational Safety and Health Act
63.	PCI	Precast Concrete Institute
64.	PCA	Portland Cement Association
65.	PDCA	Painting and Decorating Contractors of America
66.	PDI	Plumbing Drainage Institute
67.	PEI	Porcelain Enamel Institute
68.	PG&E	Pacific Gas & Electric Company
69.	PS	Product Standards
70.	SDI	Steel Door Institute; Steel Deck Institute
71.	SJI	Steel Joist Institute
72.	SSPC	Steel Structures Painting Council
73.	TCA	Tile Council of America
74.	TPI	Truss Plate Institute
75.	UBC	Uniform Building Code
76.	UL	Underwriters Laboratories Code
77.	UMC	Uniform Mechanical Code

78.	USDA	United States Department of Agriculture
79.	VI	Vermiculite Institute
80.	WCLA	West Coast Lumberman's Association
81	WCLB	West Coast Lumber Bureau
82.	WEUSER	Western Electric Utilities Service Engineering Requirements
83.	WIC	Woodwork Institute of California
84.	WPOA	Western Plumbing Officials Association

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

DEFINITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISION

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions including without limitation, Definitions;
- B. Special Conditions.

1.02 QUALITY ASSURANCE:

- A. For products or workmanship specified by association, trade, or Federal Standards, Contractor shall comply with requirements of the standard, except when more rigid requirements are specified in the Contract Documents, or are required by applicable codes.
- B. Contractor shall conform to current reference standard publication date in effect on the date of bid opening.
- C. Contractor shall obtain copies of standards unless specifically required not to by the Contract Documents.
- D. Contractor shall maintain a copy of all standards at jobsite during submittals, planning, and progress of the specific Work, until final completion, unless specifically required not to by the Contract Documents.
- E. Should specified reference standards conflict with Contract Documents, Contractor shall request clarification from the District and./or the Architect before proceeding.
- F. The contractual relationship of the parties to the Contract shall not be altered from the contractual relationship as indicated in the Contract Documents by mention or inference otherwise in any referenced document.
- G. Governing Codes shall be as shown in the Contract Documents including, without limitation, the Specifications.

END OF DOCUMENT

REFERENCES**PART 1 - GENERAL****1.01 SCHEDULE OF REFERENCES:**

The following information is intended only for the general assistance of the Contractor, and the District does not represent that all of the information is current. It is the Contractor's responsibility to verify the correct information for each of the entities listed.

AA	Aluminum Association 1525 Wilson Blvd., Suite 600 Arlington, VA 22209 www.aluminum.org	703/358-2960
AABC	Associated Air Balance Council 1518 K Street, NW, Suite 503 Washington, DC 20005 www.aabchq.com	202/737-0202
AAMA	American Architectural Manufacturers Association 1827 Walden Office Sq., Suite 550 Schaumburg, IL 60173-4268 www.aamanet.org	847/303-5664
AASHTO	American Association of State Highway and Transportation Officials 444 N Capitol St. NW - Suite 249 Washington, DC 20001 www.transportation.org	202/624-5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 One Davis Drive Research Triangle Park, NC 27709 2215 www.aatcc.org	919/549-8141
ACA	American Coatings Association 1500 Rhode Island Ave., NW Washington DC, 20005 www.paint.org	202/462-6272
ACI	American Concrete Institute 38800 Country Club Dr. Farmington Hills, MI 48331-3439 www.aci-int.org	248/848-3700
ACPA	American Concrete Pipe Association 8445 Freeport Parkway, Suite 350 Irving, TX 75063-2595 www.concrete-pipe.org	972/506-7216

ADC	Air Diffusion Council 1901 N. Roselle Road, Suite 800 Schaumburg, Illinois 60195 www.flexibleduct.org	847/706-6750
AF&PA	American Forest and Paper Association 1111 Nineteenth Street, NW, Suite 800 Washington, DC 20036 www.afandpa.org	202/463-2700
AGA	American Gas Association 400 North Capitol Street, NW Washington, DC 20001 www.aga.org	202/824-7000
AGC	Associate General Contractors of America 2300 Wilson Blvd., Suite 400 Arlington, VA 22201 www.agc.org	703/548-3118
AHA	American Hardboard Association 1210 West Northwest Highway Palatine, IL 60067 domensino.com/AHA/default.htm	847/934-8800
AI	Asphalt Institute 2696 Research Park Drive Lexington, KY 40511-8480 www.asphaltinstitute.org	859/288-4960
AIA	The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006-5292 www.aia.org	202/626-7300
AISC	American Institute of Steel Construction One East Wacker Drive Suite 700 Chicago, IL 60601-1802 www.aisc.org	312.670.2400
AIA	American Insurance Association (formerly the National Board of Fire Underwriters) 2101 L Street, NW, Suite 400 Washington, DC 20037 www.aiadc.org	202/828-7100
AISI	American Iron and Steel Institute 25 Massachusetts Ave., NW, Suite 800 Washington, DC 20001 www.steel.org	202/452.7100
AITC	American Institute of Timber Construction 7012 S. Revere Parkway Suite 140 Centennial, CO 80112 www.aitc-glulam.org	303/792.9559

ALI	Associated Laboratories, Inc. P.O. Box 152837 Dallas, TX 75315 www.assoc-labs.com	214/565-0593
ALSC	American Lumber Standards Committee, Inc. P.O. Box 210 Germantown, MD 20875 www.alsc.org	301/972-1700
AMCA	Air Movement and Control Association International, Inc. 30 W. University Drive Arlington Heights, IL 60004 www.amca.org	847/394-0150
ANLA	American Nursery & Landscape Association 1200 G Street NW, Suite 800 Washington, DC 20005 www.anla.org	202/789-2900
ANSI	American National Standards Institute 1899 L Street, NW, 11th Floor Washington, DC, 20036 www.ansi.org	202/293.8020
APA	APA-The Engineered Wood Association 7011 S. 19th Street Tacoma, WA 98466-5333 www.apawood.org	253/565-6600
APA	Architectural Precast Association 6710 Winkler Road, Suite 8 Fort Myers, Florida 33919 www.archprecast.org	239/454-6989
ARI	Air Conditioning and Refrigeration Institute 4100 N. Fairfax Drive, Suite 200 Arlington, VA 22203 www.lightindustries.com/ARI	703/524-8800
ARMA	Asphalt Roofing Manufacturers Association Public Information Department 750 National Press Building 529 14th Street, NW Washington, DC 20045 www.asphaltroofing.org	202/591-2450
ASA	The Acoustical Society of America ASA Office Manager Suite 1NO1 2 Huntington Quadrangle Melville, NY 11747-4502 http://asa.aip.org	516/576-2360

ASCE	American Society of Civil Engineers 1801 Alexander Bell Drive Reston, VA 20191 www.asce.org	800/548-2723 703/295-6300
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329-2305 www.ashrae.org	800/527-4723 404/636-8400
ASLA	American Society of Landscape Architects 636 Eye Street, NW Washington, DC 20001-3736 www.asla.org	202/898-2444
ASME	American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990 www.asme.org	800/434-2763
ASPE	American Society of Plumbing Engineers 2980 S River Rd. Des Plaines, IL 60018 http://aspe.org	847/296-0002
ASQ	American Society for Quality P.O. Box 3005 Milwaukee, WI 53201-3005 or 600 North Plankinton Avenue Milwaukee, WI 53203 http://asq.org	800/248-1946 414/272-8575
ASSE	American Society of Sanitary Engineering 901 Canterbury, Suite A Westlake, Ohio 44145 www.asse-plumbing.org	440/835-3040
ASTM	ASTM International 100 Barr Harbor Drive PO Box C700 West Conshohocken, PA, 19428-2959 www.astm.org	610/832-9500
AWCI	Association of the Wall and Ceiling Industry 513 West Broad Street, Suite 210 Falls Church, VA 22046 www.awci.org	703/538-1600
AWPA	American Wood Protection Association P.O. Box 361784 Birmingham, AL 35236-1784 www.awpa.com	205/733-4077

AWPI	American Wood Preservers Institute 2750 Prosperity Ave. Suite 550 Fairfax, VA 22031-4312 www.arcat.com	800/356-AWPI 703/204-0500
AWS	American Welding Society 8669 Doral Boulevard, Suite 130 Doral, Florida 33166 www.aws.org	800/443-9353 305/443-9353
AWI	Architectural Woodwork Institute 46179 Westlake Drive, Suite 120 Potomac Falls, VA 20165-5874 www.awinet.org	571/323-3636
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 www.awwa.org	800/926-7337 303/794 7711
BHMA	Builders Hardware Manufacturers Association 355 Lexington Avenue, 15th floor New York, NY 10017 www.buildershardware.com	212/297-2122
BIA	The Brick Industry Association 1850 Centennial Park Drive, Suite 301 Reston, VA 20191 www.gobrick.com	703/620-0010
CGA	Compressed Gas Association 14501 George Carter Way, Suite 103 Chantilly VA 20151-2923 www.cganet.com	703/788-2700
CISCA	Ceilings & Interior Systems Construction Association 1010 Jorie Blvd, Suite 30 Oak Brook, IL 60523 www.cisca.org	630/584-1919
CISPI	Cast Iron Soil Pipe Institute 1064 Delaware Avenue SE Atlanta, GA 30316 www.cispi.org	404/622-0073
CLFMI	Chain Link Fence Manufacturers Institute 10015 Old Columbia Road, Suite B-215 Columbia, MD 21046 www.associationsites.com/main- pub.cfm?usr=clfma	410/290-6267
CPA	Composite Panel Association 19465 Deerfield Avenue, Suite 306 Leesburg, VA 20176 www.compositepanel.org	703/724-1128

CPSC	Consumer Product Safety Commission 4330 East West Highway Bethesda, MD 20814 www.cpsc.gov	301/504-7923 800/638-2772
CRA	California Redwood Association 405 Enfrente Drive, Suite 200 Novato, CA 94949 www.calredwood.org	415/382-0662
CRI	Carpet and Rug Institute P.O. Box 2048 Dalton, Georgia 30722-2048 www.carpet-rug.org	706/278-3176
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, IL 60173 4758 www.crsi.org	847/517-1200
CSI	The Construction Specifications Institute 110 South Union Street, Suite 100 Alexandria VA 22314 www.csinet.org	800/689-2900
CTIOA	Ceramic Tile Institute of America 12061 Jefferson Blvd. Culver City, CA 90230-6219 www.ctioa.org	310/574-7800
DHI	Door and Hardware Institute (formerly National Builders Hardware Association) 14150 Newbrook Dr. Chantilly, VA 20151 www.dhi.org	703/222-2010
DIPRA	Ductile Iron Pipe Research Association 2000 2nd Avenue, South Suite 429 Birmingham, AL 35233 www.dipra.org	205/402-8700
DOC	U.S. Department of Commerce 1401 Constitution Ave., NW Washington, D.C. 20230 www.commerce.gov	202/482-2000
DOT	U.S. Department of Transportation 1200 New Jersey Avenue, SE Washington, DC 20590 www.dot.gov	855/368-4200
EJMA	Expansion Joint Manufacturers Association, Inc. 25 North Broadway Tarrytown, NY 10591 www.ejma.org	914/332-0040

EPA	Environmental Protection Agency Ariel Rios Building 1200 Pennsylvania Avenue, N.W. Washington, DC 20460 www.epa.gov	202/272-0167
FCICA	Floor Covering Installation Contractors Association 7439 Millwood Drive West Bloomfield, MI 48322 www.fcica.com	248/661-5015 877/TO-FCICA
FM Global	Factory Mutual Insurance Company Mary Breighner Global Practice Leader Education, Public Entities, Health Care FM Global 9 Woodcrest Court Cincinnati, OH 45246 www.fmglobal.com	513/742-9516
FS	General Services Administration (GSA) Index of Federal Specifications, Standards and Commercial Item Descriptions 470 East L'Enfant Plaza, SW, Suite 8100 Washington, DC 20407 www.gsa.gov	202/619-8925
GA	The Gypsum Association 6525 Belcrest Road, Suite 480 Hyattsville, MD 20782 www.gypsum.org	301/277-8686
GANA	Glass Association of North America 800 SW Jackson St., Suite 1500 Topeka, KS 66612-1200 www.glasswebsite.com	785/271-0208
HMA	Hardwood Manufacturers Association 665 Rodi Road, Suite 305 Pittsburgh, PA 15235 http://hmamembers.org	412/244-0440
HPVA	Hardwood Plywood & Veneer Association 1825 Michael Faraday Drive Reston, Virginia 20190 www.hpva.org	703/435-2900

IAPMO	International Association of Plumbing and Mechanical Officials (formerly the Western Plumbing Officials Association) 4755 E. Philadelphia St. Ontario, CA 91761 www.iapmo.org	909/472-4100
ICC	International Code Council 500 New Jersey Avenue, NW, 6th Floor Washington, DC 20001 www.iccsafe.org	888/422-7233
IEEE	Institute of Electrical and Electronics Engineers 3 Park Avenue, 17th Floor New York, NY 10016-5997 www.ieee.org	212/419-7900
IES	Illuminating Engineering Society 120 Wall Street, Floor 17 New York, NY 10005-4001 www.ies.org	212/248-5000
ITRK	Intertek Testing Services 3933 US Route 11 Cortland, NY 13045 www.intertek.com	607/753-6711
MCAA	Mechanical Contractors Association of America 1385 Piccard Drive Rockville, MD 20850 www.mcaa.org	301/869-5800
MIA	Marble Institute of America 28901 Clemens Rd, Ste 100 Cleveland, OH 44145 www.marble-institute.com	440/250-9222
MMPA (formerly WMMPA)	Moulding & Millwork Producers Association (formerly Wood Moulding & Millwork Producers Association) 507 First Street Woodland, CA 95695 www.wmmpa.com	530/661-9591 800/550-7889
MSS	Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry 127 Park Street, NE Vienna, VA 22180-4602 http://mss-hq.org	703/281-6613
NAAMM	National Association of Architectural Metal Manufacturers 800 Roosevelt Rd. Bldg. C, Suite 312 Glen Ellyn, IL 60137 www.naamm.org	630/942-6591

NAIMA	North American Insulation Manufacturers Association 44 Canal Center Plaza, Suite 310 Alexandria, VA 22314 www.naima.org	703/684-0084
NAPA	National Asphalt Pavement Association 5100 Forbes Blvd. Lanham, MD USA 20706-4407 www.asphaltpavement.org	888/468-6499 301/731-4748
NCSPA	National Corrugated Steel Pipe Association 14070 Proton Road, Suite 100 LB9 Dallas, TX 75244 www.ncspa.org	972/850-1907
NCMA	National Concrete Masonry Association 13750 Sunrise Valley Drive Herndon, VA 20171-4662 www.ncma.org	703/713-1900
NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877 www.nebb.org	301/977-3698
NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814 www.necanet.org	301/657-3110
	National Electrical Manufacturers Association 1300 North 17th Street, Suite 1752 Rosslyn, Virginia 22209 www.nema.org	703/841-3200
NEII	National Elevator Industry, Inc. 1677 County Route 64 P.O. Box 838 Salem, New York 12865-0838 www.neii.org	518/854-3100
NFPA	National Fire Protection Association 1 Batterymarch Park Quincy, Massachusetts USA 02169-7471 www.nfpa.org	617/770-3000
NHLA	National Hardwood Lumber Association PO Box 34518 Memphis, TN 38184 www.nhla.com	901/377-1818

NIA	National Insulation Association 12100 Sunset Hills Road, Suite 330 Reston, VA 20190 www.insulation.org	703/464-6422
NRCA	National Roofing Contractors Association 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018-5607 www.nrca.net	847/299-9070
NSF	NSF International P.O. Box 130140 789 N. Dixboro Road Ann Arbor, MI 48113-0140, USA www.nsf.org	800/673-6275 734/769-8010
NTMA	National Terrazzo and Mosaic Association PO Box 2605 Fredericksburg, TX 78624 www.ntma.com	800/323-9736
OSHA	Occupational Safety and Health Act U.S. Department of Labor Occupational Safety & Health Administration 200 Constitution Ave., NW Washington, D.C. 20210 www.osha.gov	800/321-OSHA (6742)
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077 or 500 New Jersey Ave., N.W. 7 th Floor Washington, D.C. 20001 www.cement.org	847/966-6200 202/408-9494
PCI	Precast/Prestressed Concrete Institute 200 W. Adams St. #2100 Chicago, IL 60606 www.pci.org	312/786-0300
PDCA	Painting and Decorating Contractors of America 2316 Millpark Drive, Ste 220 Maryland Heights, MO 63043 www.pdca.com	800/332-PDCA (7322) 314/514-7322
PDI	Plumbing & Drainage Institute 800 Turnpike Street, Suite 300 North Andover, MA 01845 http://pdionline.org	978/557-0720 800/589-8956
PEI	Porcelain Enamel Institute, Inc. P.O. Box 920220 Norcross, GA 30010 www.porcelainenamel.com	770/676-9366

PG&E	Pacific Gas & Electric Company www.pge.com	800/743-5000
PLANET	Professional Landcare Network 950 Herndon Parkway, Suite 450 Herndon, Virginia 20170 www.landcarenetwork.org	703/736-9666 800/395-2522 703/736-9668
RFCI	Resilient Floor Covering Institute 115 Broad Street, Suite 201 La Grange GA 30240 www.rfci.com	706/882-3833
RIS	Redwood Inspection Service 818 Grayson Road, Suite 201 Pleasant Hill, CA 94523 www.redwoodinspection.com	925/935-1499
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60021 www.sdi.org	847/458-4647
SDI	Steel Door Institute 30200 Detroit Road Westlake, Ohio 44145 www.steeldoor.org	440/899-0010
SJI	Steel Joist Institute 234 W. Cheves Street Florence, SC 29501 http://steeljoist.org	843/407-4091
SMA	Stucco Manufacturers Association 500 East Yale Loop Irvine, CA 92614 www.stuccomfgassoc.com	949/387.7611
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Drive Chantilly, Virginia 20151-1219 www.smacna.org	703/803-2980
SPI	SPI: The Plastics Industry Trade Association, Inc. 1667 K St., NW, Suite 1000 Washington, DC 20006 www.plasticsindustry.org	202/974-5200
SSPC	Society for Protective Coatings (formerly the Steel Structures Painting Council) 40 24th St 6th Fl Pittsburgh, PA 15222 www.sspc.org	412/281-2331 877/281-7772

TCA	The Tile Council of North America 100 Clemson Research Blvd. Anderson, SC 29625 www.tcnatile.com	864/646-8453
TPI	Truss Plate Institute 218 North Lee Street, Suite 312 Alexandria, VA 22314 www.tpinst.org	703/683-1010
TPI	Turfgrass Producers International 2 East Main Street East Dundee, IL 60118 www.turfgrassod.org	800/405-8873 847/649-5555
TCIA	Tree Care Industry Association (formerly the National Arborist Association) 136 Harvey Road, Suite 101 Londonderry, NH 03053 www.tcia.org	800/733-2622
TVI	The Vermiculite Institute c/o The Schundler Company 150 Whitman Avenue Edison, NJ. 08817 www.vermiculiteinstitute.org	732/287-2244
UL	Underwriters Laboratories Inc. 333 Pfingsten Road Northbrook, IL 60062-2096 www.ul.com	847/272-8800 877/854-3577
UNI	Uni-Bell PVC Pipe Association 2711 LBJ Freeway, Suite 1000 Dallas, TX 75234 www.uni-bell.org	972/243-3902
USDA	U.S. Department of Agriculture 1400 Independence Ave., S.W. Washington, DC 20250 www.usda.gov	202/720-2791
WA	Wallcoverings Association 401 North Michigan Avenue Suite 2200 Chicago, IL 60611 www.wallcoverings.org	312/321-5166

WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281 or 6980 S.W. Varns Tigard, OR 97223 www.wclib.org	503/639-0651
WCMA	Window Covering Manufacturers Association 355 Lexington Avenue 15th Floor New York, New York 10017 www.wcmanet.org	212/297-2122
WDMA	Window & Door Manufacturers Association 401 N. Michigan Avenue, Suite 2200 Chicago, IL 60611 or 2025 M Street, NW, Ste. 800 Washington, D.C. 20036-3309 www.wdma.com	312/321-6802 202/367-1157
WI	Woodwork Institute P.O. Box 980247 West Sacramento, CA 95798 www.wicnet.org	916/372-9943
WRI	Wire Reinforcement Institute 942 Main Street Hartford, CT 06103 www.wirereinforcementinstitute.org	860/240-9545
WWCA	Western Wall & Ceiling Contractors Association 1910 N. Lime St. Orange, California 92865 www.wwcca.org	714/221-5520
WWPA	Western Wood Products Association 522 SW Fifth Ave., Suite 500 Portland, OR 97204-2122 www2.wwpa.org	503/224-3930

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Purchase of Materials and Equipment;
- B. Special Conditions;
- C. Imported Materials Certification.

1.02 MATERIAL AND EQUIPMENT

- A. Only items approved by the District and/or Architect shall be used.
- B. Contractor shall submit lists of products and other product information in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

1.03 MATERIAL AND EQUIPMENT COLORS

- A. The District and/or Architect will provide a schedule of colors.
- B. No individual color selections will be made until after approval of all pertinent materials and equipment and after receipt of appropriate samples in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.
- C. Contractor shall request priority in writing for any item requiring advance ordering to maintain the approved Construction Schedule.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall deliver manufactured materials in original packages, containers, or bundles (with seals unbroken), bearing name or identification mark of manufacturer.
- B. Contractor shall deliver fabrications in as large assemblies as practicable; where specified as shop-primed or shop-finished, package or crate as required to preserve such priming or finish intact and free from abrasion.
- C. Contractor shall store materials in such a manner as necessary to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt, or from any other cause will not be accepted.

- D. Materials are not be acceptable that have been warehoused for long periods of time, stored or transported in improper environment, improperly packaged, inadequately labeled, poorly protected, excessively shipped, deviated from normal distribution pattern, or reassembled.
- E. Contractor shall store material so as to cause no obstructions of sidewalks, roadways, and underground services. Contractor shall protect material and equipment furnished under Contract.
- F. Contractor may store materials on Site with prior written approval by the District, all material shall remain under Contractor's control and Contractor shall remain liable for any damage to the materials. Should the Project Site not have storage area available, the Contractor shall provide for off-site storage at a bonded warehouse and with appropriate insurance coverage at no cost to District.
- G. When any room in Project is used as a shop or storeroom, the Contractor shall be responsible for any repairs, patching, or cleaning necessary due to that use. Location of storage space shall be subject to prior written approval by District.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers listed in various sections of Contract Documents are names of those manufacturers that are believed to be capable of supplying one or more of items specified therein.
- B. The listing of a manufacturer does not imply that every product of that manufacturer is acceptable as meeting the requirements of the Contract Documents.

2.02 FACILITIES AND EQUIPMENT

Contractor shall provide, install, maintain, and operate a complete and adequate facility for handling, the execution, disposal, and distribution of material and equipment as required for proper and timely performance of Work connected with Contract.

2.03 MATERIAL REFERENCE STANDARDS

Where material is specified solely by reference to "standard specifications" and if requested by District, Contractor shall submit for review data on actual material proposed to be incorporated into Work of Contract listing name and address of vendor, manufacturer, or producer, and trade or brand names of those materials, and data substantiating compliance with standard specifications.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. Where not more specifically described in any other Contract Documents, workmanship shall conform to methods and operations of best standards and accepted practices of trade or trades involved and shall include items of fabrication, construction, or installation regularly furnished or required for completion (including finish and for successful operation, as intended).
- B. Work shall be executed by tradespersons skilled in their respective lines of Work. When completed, parts shall have been durably and substantially built and present a neat appearance.

3.02 COORDINATION

- A. Contractor shall coordinate installation of Work so as to not interfere with installation of others. Adjustment or rework because of Contractor's failure to coordinate will be at no additional cost to District.
- B. Contractor shall examine in-place work for readiness, completeness, fitness to be concealed or to receive other work, and in compliance with Contract Documents. Concealing or covering Work constitutes acceptance of additional cost which will result should in-place Work be found unsuitable for receiving other Work or otherwise deviating from the requirements of the Contract Documents.

3.03 COMPLETENESS

Contractor shall provide all portions of the Work, unless clearly stated otherwise, installed complete and operational with all elements, accessories, anchorages, utility connections, etc., in manner to assure well-balanced performance, in accordance with manufacturer's recommendations and by Contract Documents. For example, electric water coolers require water, electricity, and drain services; roof drains require drain system; sinks fit within countertop, etc. Terms such as "installed complete," "operable condition," "for use intended," "connected to all utilities," "terminate with proper cap," "adequately anchored," "patch and refinish," "to match similar," should be assumed to apply in all cases, except where completeness of functional or operable condition is specifically stated as not required.

3.04 APPROVED INSTALLER OR APPLICATOR

Installation by a manufacturer's approved installer or applicator is an understood part of Specifications and only approved installer or applicator is to provide on-site Work where specified manufacturer has on-going program of approving (i.e. certifying, bonding, re-warranting) installers or applicators. Newly established relationships between a manufacturer and an installer or applicator who does not have other approved applicator work in progress or completed is not approved for this Project.

3.05 MANUFACTURER'S RECOMMENDATIONS

All installations shall be in accordance with manufacturer's published recommendations and specific written directions of manufacturer's representative. Should Contract Documents differ from recommendations of manufacturer or directions of his representative, Contractor shall analyze differences, make recommendations to the District and the Architect in writing, and shall not proceed until interpretation or clarification has been issued by the District and/or the Architect.

END OF DOCUMENT

QUALITY CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Inspector, Inspections and Tests, Uncovering of Work and Non-conforming of Work and Correction of Work;
- B. Special Conditions.

1.02 RELATED CODES:

- A. The Work is governed by requirements of Title 24, California Code of Regulations ("CCR"), and the Contractor shall keep a copy of these available at the job Site for ready reference during construction.
- B. The Division of the State Architect ("DSA") shall be notified at or before the start of construction.

1.03 OBSERVATION AND SUPERVISION:

- A. The District and Architect or their appointed representatives will review the Work and the Contractor shall provide facilities and access to the Work at all times as required to facilitate this review. Administration by the Architect and any consulting Structural Engineer will be in accordance with applicable regulations, including, without limitation, CCR, Part 1, Title 24, Section 4-341.
- B. One or more Project Inspector(s) approved by DSA and employed by or in contract with the District, referred to hereinafter as the "Project Inspector", will observe the work in accordance with CCR, Part 1, Title 24, Sections 4-333(b) and 4-342:
 - (1) The Project Inspector shall have access to the Work wherever it is in preparation or progress for ascertaining that the Work is in accordance with the Contract Documents and all applicable code sections.. The Contractor shall provide facilities and access as required and shall provide assistance for sampling or measuring materials.
 - (2) The Project Inspector will notify the District and Architect and call the attention of the Contractor to any observed failure of Work or material to conform to Contract Documents.
 - (3) The Project Inspector shall observe and monitor all testing and inspection activities required.

The Contractor shall conform with all applicable laws as indicated in the Contract Documents, including, without limitation, to CCR, Part 1, Title 24, Section 4-343. The Contractor shall supervise and direct the Work and maintain a competent superintendent on the job who is authorized to act in all matters pertaining to the Work. The Contractor's superintendent shall also inspect all materials, as they arrive, for compliance with the Contract Documents. Contractor shall reject defective Work or materials immediately upon delivery or failure of the Work or material to comply with the Contract Documents. The Contractor shall submit verified reports as indicated in the Contract Documents, including, without limitation, the Specifications and as required by Part 1, Title 24, Section 4-336.

1.04 TESTING AGENCIES:

- A. Testing agencies and tests shall be in conformance with the General Documents and the requirements of Part 1, Title 24, Section 4- 335.
- B. Testing and inspection in connection with earthwork shall be under the direction of the District's consulting soils engineer, if any, referred to hereinafter as the "Soils Engineer."
- C. Testing and inspection of construction materials and workmanship shall be performed by a qualified laboratory, referred to hereinafter as the "Testing Laboratory." The Testing Laboratory shall be under direction of an engineer registered in the State of California, shall conform to requirements of ASTM E329, and shall be employed by or in contract with the District.

1.05 TESTS AND INSPECTIONS:

- A. The Contractor shall be responsible for notifying the District and Project Inspector of all required tests and inspections. Contractor shall notify the District and Project Inspector at least seventy-two hours (72) hours in advance of performing any Work requiring testing or inspection.
- B. The Contractor shall provide access to Work to be tested and furnish incidental labor, equipment, and facilities to facilitate all inspections and tests.
- C. The District will pay for first inspections and tests required by the "CCR", and other inspections or tests that the District and/or the Architect may direct to have made, including the following principal items:
 - (1) Tests and observations for earthwork and paving.
 - (2) Tests for concrete mix designs, including tests of trial batches.
 - (3) Tests and inspections for structural steel work.
 - (4) Field tests for framing lumber moisture content.
 - (5) Additional tests directed by the District that establish that materials and installation comply with the Contract Documents.
 - (6) Test and observation of welding and expansion anchors.

- D. The District may at its discretion, pay and back charge the Contractor for:
- (1) Retests or reinspections, if required, and tests or inspections required due to Contractor error or lack of required identifications of material.
 - (2) Uncovering of work in accordance with Contract Documents.
 - (3) Testing done on weekends, holidays, and overtime will be chargeable to the Contractor for the overtime portion.
 - (4) Testing done off Site.
- E. Testing and inspection reports and certifications:
- (1) If initially received by Contractor, Contractor shall provide to each of the following a copy of the agency or laboratory report of each test or inspection or certification.
 - a. The District;
 - b. The Construction Manager, if any;
 - c. The Architect;
 - d. The Consulting Engineer, if any;
 - e. Other engineers on the Project, as appropriate;
 - f. The Project Inspector; and
 - g. The Contractor.
 - (2) When the test or inspection is one required by the CCR, a copy of the report shall also be provided to the DSA.

PART 2 - PRODUCTS

2.01 TYPE OF TEST AND INSPECTIONS:

[THE FOLLOWING ARE EXAMPLES ONLY AND SHOULD BE REVISED AFTER CONSULTATIONS WITH ARCHITECT.]

- A. Slump Test
ASTM C 143

B. Concrete Tests

Testing agency shall test concrete used in the work per the following paragraphs:

- (1) Compressive Strength:
 - a. Minimum number of tests required: One (1) set of three (3) cylinders for each 100 cubic yards (Sec. 2604(h) 01) of concrete or major fraction thereof, placed in one (1) day. See Title 24, Section 2605(g).
 - b. Two cylinders of each set shall be tested at twenty-eight (28) days. One (1) cylinder shall be held in reserve and tested only when directed by the Architect or District.
 - c. Concrete shall test the minimum ultimate compressive strength in 28 days, as specified on the structural drawings.
 - d. In the event that the twenty-eight (28) day test falls below the minimum specified strength, the effective concrete in place shall be tested by taking cores in accordance with UBC Standard No. 26-13 and tested as required for cylinders.
 - e. In the event that the test on core specimens falls below the minimum specified strength, the concrete will be deemed defective and shall be removed and replaced upon such direction of the Architect, and in a manner acceptable to the Division of the State Architect.

C. Reinforcing, Steel

D. Structural Steel Per Title 24 and as noted:

- (1) Material: Steel per Table in Title 24, Section 2712.
- (2) Qualification of Welders (UBC Std. 27-6).
- (3) Shop fabrication (Section 2712(d). Structural steel only).
- (4) Shop and field welding (Section 2712(e)).

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions;
- C. Site Standards.

1.02 TEMPORARY UTILITIES:

- A. Electric Power and Lighting
 - (1) Contractor will pay for power during the course of the Work. To the extent power is available in the building(s) or on the Site, Contractor may use the District's existing utilities by making prearranged payments to the District for the utilities used by Contractor and all Subcontractors. Contractor shall be responsible for providing temporary facilities required to deliver that power service from its existing location in the building(s) or on the Site to point of intended use.
 - (2) Contractor shall verify characteristics of power available in building(s) or on the Site. Contractor shall take all actions required to make modifications where power of higher voltage or different phases of current are required. Contractor shall be fully responsible for providing that service and shall pay all costs required therefor.
 - (3) Contractor shall furnish, wire for, install, and maintain temporary electrical lights wherever it is necessary to provide illumination for the proper performance and/or observation of the Work: a minimum of 20 foot-candles for rough work and 50 foot-candles for finish work.
 - (4) Contractor shall be responsible for maintaining existing lighting levels in the project vicinity should temporary outages or service interruptions occur.

B. Heat and Ventilation

- (1) Contractor shall provide temporary heat to maintain environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation and curing of materials, and to protect materials and finishes from damage due to improper temperature and humidity conditions. Portable heaters shall be standard units complete with controls.
- (2) Contractor shall provide forced ventilation and dehumidification, as required, of enclosed areas for proper installation and curing of materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.
- (3) Contractor shall pay the costs of installation, maintenance, operation, and removal of temporary heat and ventilation, including costs for fuel consumed, required for the performance of the Work.

C. Water

- (1) Contractor will pay for water during the course of the Work. To the extent water is then available in the building(s) or on the Site, Contractor may use the District's existing utilities by making prearranged payments to the District for the utilities used by Contractor and all Subcontractors. Contractor shall be responsible for providing temporary facilities required to deliver such utility service from its existing location in the building(s) or on the Site to point of intended use.
- (2) Contractor shall use backflow preventers on water lines at point of connection to District's water supply. Backflow preventers shall comply with requirements of Uniform Plumbing Code.
- (3) Contractor shall make potable water available for human consumption.

D. Sanitary Facilities

- (1) Contractor shall provide sanitary temporary facilities in no fewer numbers than required by law and such additional facilities as may be directed by the Inspector for the use of all workers. The facilities shall be maintained in a sanitary condition at all times and shall be left at the Site until removal is directed by the Inspector or Contractor completes all other work at the Site.
- (2) Use of toilet facilities in the Work under construction shall not be permitted except by consent of the Inspector and the District.

- E. Telephone Service
 - (1) Contractor shall arrange with local telephone service company for telephone service for the performance of the Work. Contractor shall, at a minimum, provide in its field office one line for telephone and one line for fax machine.
 - (2) Contractor shall pay the costs for telephone and fax lines installation, maintenance, service, and removal.
- F. Fire Protection:
 - (1) Contractor shall provide and maintain fire extinguishers and other equipment for fire protection. Such equipment shall be designated for use for fire protection only and shall comply with all requirements of the California Fire, State Fire Marshall and/or its designee.
 - (2) Where on-site welding and burning of steel is unavoidable, Contractor shall provide protection for adjacent surfaces.
- G. Trash Removal:
 - (1) Contractor shall provide trash removal on a timely basis. **[DISTRICT MAY INDICATE SPECIFIC FREQUENCY FOR PROJECT]**
- H. Temporary Facilities:
 - (1) **[LIST FOR EACH PROJECT]**

1.03 CONSTRUCTION AIDS:

- A. Plant and Equipment:
 - (1) Contractor shall furnish, operate, and maintain a complete plant for fabricating, handling, conveying, installing, and erecting materials and equipment; and for conveyances for transporting workmen. Include elevators, hoists, debris chutes, and other equipment, tools, and appliances necessary for performance of the Work.
 - (2) Contractor shall maintain plant and equipment in safe and efficient operating condition. Damages due to defective plant and equipment, and uses made thereof, shall be repaired by Contractor at no expense to the District.
- B. None of the District's tools and equipment shall be used by Contractor for the performance of the Work.

1.04 BARRIERS AND ENCLOSURES:

- A. Contractor shall obtain the District's written permission for locations and types of temporary barriers and enclosures, including fire-rated materials proposed for use, prior to their installation.
- B. Contractor shall provide and maintain temporary enclosures to prevent public entry and to protect persons using other buildings and portions of the Site and/or Premises, the public, and workers. Contractor shall also protect the Work and existing facilities from the elements, and adjacent construction and improvements, persons, and trees and plants from damage and injury from demolition and construction operations.
- C. Contractor shall provide site access to existing facilities for persons using other buildings and portions of the Site, the public, and for deliveries and other services and activities.
- D. Tree and Plant Protection:
 - (1) Contractor shall preserve and protect existing trees and plants on the Premises that are not designated or required to be removed, and those adjacent to the Premises.
 - (2) Contractor shall provide barriers to a minimum height of 4'-0" around drip line of each tree and plant, around each group of trees and plants, as applicable, in the proximity of demolition and construction operations.
 - (3) Contractor shall not park trucks, store materials, perform Work or cross over landscaped areas. Contractor shall not dispose of paint thinners, water from cleaning, plastering or concrete operations, or other deleterious materials in landscaped areas, storm drain systems, or sewers. Plant materials damaged as a result of the performance of the Work shall, at the option of the District and at Contractor's expense, either be replaced with new plant materials equal in size to those damaged or by payment of an amount representing the value of the damaged materials as determined by the District.
 - (4) Contractor shall remove soil that has been contaminated during the performance of the Work by oil, solvents, and other materials which could be harmful to trees and plants, and replace with good soil, at Contractor's expense.
 - (5) Excavation Around Trees:
 - (a) Excavation within drip lines of trees shall be done only where absolutely necessary and with written permission from the District.
 - (b) Where trenching for utilities is required within drip lines, tunneling under and around roots shall be by hand digging and shall be approved by the District. Main lateral roots and taproots shall not be cut. All roots 2 inches in diameter and

larger shall be tunneled under and heavily wrapped with wet burlap so as to prevent scarring or excessive drying. Smaller roots that interfere with installation of new work may be cut with prior approval by the District. Roots must first be cut with a Vermeer, or equivalent, root cutter prior to any trenching.

- (c) Where excavation for new construction is required within drip line of trees, hand excavation shall be employed to minimize damage to root system. Roots shall be relocated in backfill areas wherever possible. If encountered immediately adjacent to location of new construction, roots shall be cut approximately 6 inches back from new construction.
- (d) Approved excavations shall be carefully backfilled with the excavated materials approved for backfilling. Backfill shall conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities. Do not use mechanical equipment to compact backfill. Tamp carefully using hand tools, refilling and tamping until Final Acceptance as necessary to offset settlement.
- (e) Exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or roots shall be wrapped with four layers of wet, untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill.
- (f) Accidentally broken roots should be sawed cleanly 3 inches behind ragged end.

1.05 SECURITY:

The Contractor shall be responsible for project security for materials, tools, equipment, supplies, and completed and partially completed Work.

1.06 TEMPORARY CONTROLS:

A. Noise Control

- (1) Contractor acknowledges that adjacent facilities may remain in operation during all or a portion of the Work period, and it shall take all reasonable precautions to minimize noise as required by applicable laws and the Contract Documents.
- (2) Notice of proposed noisy operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to the District a minimum of forty-eight (48) hours in advance of their performance.

B. Noise and Vibration

- (1) Equipment and impact tools shall have intake and exhaust mufflers.
- (2) Contractor shall cooperate with District to minimize and/or cease the use of noisy and vibratory equipment if that equipment becomes objectionable by its longevity.

C. Dust and Dirt

- (1) Contractor shall conduct demolition and construction operations to minimize the generation of dust and dirt, and prevent dust and dirt from interfering with the progress of the Work and from accumulating in the Work and adjacent areas including, without limitation, occupied facilities.
- (2) Contractor shall periodically water exterior demolition and construction areas to minimize the generation of dust and dirt.
- (3) Contractor shall ensure that all hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins, and as otherwise required by local and state ordinance.
- (4) Contractor shall prevent dust and dirt from accumulating on walks, roadways, parking areas, and planting, and from washing into sewer and storm drain lines.

D. Water

Contractor shall not permit surface and subsurface water, and other liquids, to accumulate in or about the vicinity of the Premises. Should accumulation develop, Contractor shall 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.

E. Pollution

- (1) No burning of refuse, debris, or other materials shall be permitted on or in the vicinity of the Premises.
- (2) Contractor shall comply with applicable regulatory requirements and anti-pollution ordinances during the conduct of the Work including, without limitation, demolition, construction, and disposal operations.

F. Lighting

- (1) If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

1.07 JOB SIGN(S):

A. General:

- (1) Contractor shall provide and maintain a Project identification sign with the design, text, and colors designated by the District and/or the Architect; locate sign as approved by the District.
- (2) Signs other than the specified Project sign and or signs required by law, for safety, or for egress, shall not be permitted, unless otherwise approved in advance by the District.

B. Materials:

- (1) Structure and Framing: Structurally sound, new or used wood or metal; wood shall be nominal 3/4-inch exterior grade plywood.
- (2) Sign Surface: Minimum 3/4-inch exterior grade plywood.
- (3) Rough Hardware: Galvanized.
- (4) Paint: Exterior quality, of type and colors selected by the District and/or the Architect.

C. Fabrication:

- (1) Contractor shall fabricate to provide smooth, even surface for painting.
- (2) Size: 4'-0" x 8'-0", unless otherwise indicated.
- (3) Contractor shall paint exposed surfaces of supports, framing, and surface material with exterior grade paint: one coat of primer and one coat of finish paint.
- (4) Text and Graphics: As indicated.

1.08 PUBLICITY RELEASES:

- A. Contractor shall not release any information, story, photograph, plan, or drawing relating information about the Project to anyone, including press and other public communications medium, including, without limitation, on website(s).

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF DOCUMENT

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions;
- C. Document 01 50 00.

1.02 SECTION INCLUDES:

- A. Administrative and procedural requirements for the following:
 - (1) Salvaging non-hazardous construction waste.
 - (2) Recycling non-hazardous construction waste.
 - (3) Disposing of non-hazardous construction waste.

1.03 DEFINITIONS:

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.04 PERFORMANCE REQUIREMENTS:

- A. General: Develop waste management plan that results in end-of Project rates for salvage/recycling of fifty percent (50%) by weight (or by volume, but not a combination) of total waste generated by the Work.

1.05 SUBMITTALS:

- A. Waste Management Plan: Submit waste management plan within 30 days of date established for commencement of the Work.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit copies of report. Include the following information:
 - (1) Material category.
 - (2) Generation point of waste.
 - (3) Total quantity of waste in tons or cubic yards.
 - (4) Quantity of waste salvaged, both estimated and actual in tons or cubic yards.
 - (5) Quantity of waste recycled, both estimated and actual in tons or cubic yards.
 - (6) Total quantity of waste recovered (salvaged plus recycled) in tons or cubic yards.
 - (7) Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- C. Waste Reduction Calculations: Before request for final payment, submit copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- H. CHPS Submittal: CHPS letter template for Credit ME2.0 and ME2.1, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
- I. Qualification Data: For Waste Management Coordinator.
- J. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- K. Submittal procedures and quantities are specified in Document 01300.

1.06 QUALITY ASSURANCE:

- A. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements. Review methods and procedures related to waste management including, but not limited to, the following:
 - (1) Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
 - (2) Review requirements for documenting quantities of each type of waste and its disposition.
 - (3) Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - (4) Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - (5) Review waste management requirements for each trade.

1.07 WASTE MANAGEMENT PLAN:

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - (1) Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - (2) Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - (3) Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - (4) Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - (5) Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - (6) Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION

3.01 PLAN IMPLEMENTATION:

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - (1) Comply with Document 01500 for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - (1) Distribute waste management plan to everyone concerned within 3 days of submittal return.
 - (2) Distribute waste management plan to entities when they first begin work on site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - (1) Designate and label specific areas of Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - (2) Comply with Document 01500 for controlling dust and dirt, environmental protection, and noise control.

3.02 RECYCLING CONSTRUCTION WASTE:

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to the Contractor.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

- (1) Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project Site. Include list of acceptable and unacceptable materials at each container and bin.
 - (a) Inspect containers and bins for contamination and remove contaminated materials if found.
 - (2) Stockpile processed materials on site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - (3) Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - (4) Store components off the ground and protect from the weather.
 - (5) Remove recyclable waste off District property and transport to recycling receiver or processor.
- D. Packaging:
- (1) Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - (2) Polystyrene Packaging: Separate and bag material.
 - (3) Pallets: As much as possible, require deliveries using pallets to remove pallets from Project Site. For pallets that remain on Site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - (4) Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- E. Site-Clearing Wastes: Chip brush, branches, and trees on site.
- F. Wood Materials:
- (1) Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - (2) Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
- (1) Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.03 DISPOSAL OF WASTE:

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project Site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - (1) Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on site.
 - (2) Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off District property and legally dispose of them.

END OF SECTION

FIELD OFFICES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions; and
- C. Temporary Facilities and Controls.

1.02 SECTION INCLUDES:

- A. Requirements for Field Offices and Field Office Trailers.

1.03 SUMMARY:

- A. General: Contractor shall provide District's Field Office Trailer and contents, for District's use exclusively, during the term of the Contract.
- B. Property: Trailer, furniture, furnishings, equipment, and the like, supplied by the Contractor with the Office Trailer shall remain the property of the Contractor; District property items installed, delivered, and the like by District within the Office Trailer will remain District's property.
- C. Modifications: District reserves the right to modify the trailer or contents, or both, as may be deemed proper by District.
- D. Condition: Trailer and contents shall be clean, neat, substantially finished, in good, proper, and safe condition for use, operation, and the like; the trailer and contents shall not be required to be new.
- E. Installation Timing: Provide safe, fully furnished, functional, proper, complete, and finished trailer properly ready for entire use, within fourteen (14) calendar days of District's notification of the issuance of Notice to Proceed.

1.04 SUBMITTALS:

- A. General: Submit submittals to District in quantity, format, type, and the like, as specified herein.
- B. Office Trailer Data: One (1) copy of manufacturer's descriptive data, technical descriptions, regulatory compliance, industry standards, installation, removal, and maintenance instructions.

- C. Equipment Data: Two (2) copies of manufacturer data for each type of equipment, if directed by District.
- D. Furniture and Furnishings Data: Two (2) copies of manufacturer data for each type of equipment, if directed by District.
- E. Plans: One (1) reproducible copy of appropriately scaled plans of trailer layout. Plans shall include, but not be limited to: lighting; furniture; equipment; telephone and electrical outlets; and the like.
- F. Product Samples: One (1) complete and entire unit of each type, if directed by District.

1.05 QUALITY ASSURANCE

- A. Standards: In the event that provisions of codes, regulations, safety orders, Contract Documents, referenced manufacturer's specifications, manufacturer's instructions, industry standards, and the like, are in conflict, the more restrictive and higher quality shall govern.
- B. Installer: Installer or Installers engaged by Contractor must have a minimum of five (5) years of documented and properly authenticated successful experience of specialization in the installation of the items or systems, or both, specified herein.
- C. Manufacturer: Contractor shall obtain products from nationally and industry recognized Manufacturer with five (5) years minimum, of immediately recent, continuous, documented and properly authenticated successful experience of specialization in the manufacture of the product specified herein.
- D. State Personnel Training: Provide proper training for maintenance and operations, including emergency procedures, and the like, as directed by District.
- E. Units: Shall be sound and free of defects, and shall not include any damage or defect that will impair the safety, installation, performance, or the durability of the entire Office Trailer and appurtenant systems.

1.06 REGULATORY REQUIREMENTS

- A. General: Work shall be executed in accordance with applicable Codes, Regulations, Statutes, Enactment's, Rulings, Laws, each authority having jurisdiction, and including, but not limited to, Regulatory Requirements specified herein.
- B. California Building Standards Code ("CBSC").
- C. California Code of Regulations, Title 25, Chapter 3, Sub Chapter 2, Article 3 ("CCR").
- D. Coach Insignia: Trailer shall display California Commercial Coach Insignia; such insignia shall be deemed to show that the trailer is in accordance with the Construction and Fire Safety requirements of CCR.

PART 2 – PRODUCTS

2.01 FIELD OFFICE TRAILER

- A. General: Provide entire Field Office Trailer of type, function, operation, capacity, size, complete with controls, safety devices, accessories, and the like, for proper and durable installation. Partitions, walls, ceiling, and other interior and exterior surfaces shall be appropriately finished, including, but not limited to, trim, painting, wall base, floor covering, suspended or similar ceiling, and the like; provide systems, components, units, nuts, bolts, screws, anchoring devices, fastening devices, washers, accessories, adhesives, sealants, and other items of type, grade, and class required for the particular use, not identified but required for a complete, weather-tight, appropriately operating, and finished installation.
- B. Manufacturers: General Electric Capital Modular Space; The Space Place, Inc.; or equal.
- C. Program: Provide a wheel-mounted trailer with stairs, landings, platforms, ramps, stairs, platforms, and the like, in good, proper, safe, clean, and properly finished condition; with proper heavy duty locks, and other proper and effective security at all doors, windows, and the like. Trailer shall be maintained in good, proper, safe, clean, and properly finished condition during the Contract.
- (1) Nominal Trailer Size: Four hundred eighty (480) square feet, minimum.
 - (2) Stairs, Platform: Properly finished stairs, platforms, and ramps.
 - (3) Doors: Two (2), three (3) foot wide exterior doors with locksets; finished ramp, steps, and entry platform at each exterior door.
 - (4) Keys: Submit five (5) keys for each door, window, furniture unit, and the like, there shall be no other key copies or originals available; each key shall be identified for District; and shall be labeled, or tagged or both, as directed by District.
 - (5) HVAC: **[PROVIDE DESCRIPTION OR DELETE]**
 - (6) Lighting: Sixty-five (65) foot-candles illumination minimum at any point, at thirty (30) inches above finished floor throughout from fluorescent light source, exclusively, or as directed by District.
 - (7) Electrical Outlets: One (1) duplex outlet evenly spaced every twelve (12) linear horizontal feet of wall face, and electrical service ready for use.
 - (8) Telephones and Telephone Outlets: Two (2) telephone lines wired, connected to telephone utility service, and ready for use, and two (2) telephone instruments, each with two (2)-line capability, speed dial and hands-free feature. Locate each outlet as directed by District.
 - (9) Answering Machine: One (1) unit, two (2)-line; digital.

2.02 FIELD OFFICE TRAILER ITEMS

- A. General: Provide the Field Office Trailer with the following arranged into two (2) workstations:
- (1) Desks: Two (2) desks: thirty-six (36) inches by sixty (60) inches; steel, laminated plastic top; locking, one (1) or two (2) file drawers single pedestal; steel; provide five (5) keys to District.
 - (2) Tables: Two (2) tables; thirty-six (36) inches by sixty (60) inches; twenty-nine (29) inches high; steel, laminated plastic top tables; one (1) at each desk.
 - (3) Chairs: Two (2) chairs: swivel; steel; with seat cushion and arms; one (1) at each desk.
 - (4) Waste Baskets: Two (2) waste baskets, one at each desk.
- B. Furniture and Equipment: Provide in the space located to effect efficient and logical use.
- (1) File Cabinet: One (1) file cabinet: four (4) drawer; lateral; steel locking.
 - (2) Plan Table: One (1) plan table: thirty-six (36) inches deep by seventy-two (72) inches wide by forty-two (42) inches high; adjustable; wood or steel; with lockable plan and pencil drawers.
 - (3) Drafting Stool: One (1) drafting stool; swiveling; steel; padded; adjustable; with footrest and casters.
 - (4) Bookshelf: One (1) bookshelf: thirty-six (36) inches deep by seventy-two (72) inches wide by forty-two (42) inches high; adjustable; wood or steel; with lockable plan and pencil drawer.
 - (5) Plan Rack: One (1) wheel mounted plan rack.
 - (6) Waste Baskets: One (1) large waste basket.
 - (7) Coat/Hat Hanger: Wall mounted with minimum capacity for four (4) garments and ten (10) hats.
 - (8) Document Management System: Shall include an integrated high-volume printer, copier, and facsimile machine, including stand, base, and storage cabinet; and shall include the following features:
 - (a) Type: Laser, dry electrostatic transfer, plain paper, digital, multi-function imaging system.
 - (b) Network: Ethernet or Token Ring network ready, Plug-and-Play.
 - (c) Print, send/receive facsimile from any connected workstation.
 - (d) Resolution: Six hundred (600) dots per inch by six hundred (600) dots per inch, minimum.

- (e) Print Speed: Twenty (20) pages per minute, minimum.
 - (f) Copies: Twenty (20) copies per minute, minimum.
 - (g) Document Handler: Forty (40) sheet, minimum
 - (h) Collator: Forty (40) bin, minimum, with stapling.
 - (i) Duplexing: Capable.
 - (j) Paper Size: Capable of handling paper sizes to eleven (11) inches by seventeen (17) inches.
 - (k) Paper Cassettes: One (1) each for eight and one half (8.5) inches by eleven (11) inches, eight and one half (8.5) inches by fourteen (14) inches, and eleven (11) inches by seventeen (17) inches paper sizes; minimum two hundred fifty (250) sheets per cassette.
 - (l) Reduction/Enlargement: Capable of reduction to twenty-five percent (25%) and enlargement to two hundred percent (200%).
 - (m) Facsimile Electronic Storage: Capable of storing minimum of fifty (50) speed dial numbers, group faxing and broadcast faxing.
 - (n) Facsimile Scanning: Capable of scanning into memory a minimum of one hundred (100) pages with maximum scan time of three (3) seconds per page.
 - (o) Halftone: Sixty-four (64) levels.
 - (p) Redial: Automatic and Manual.
- (9) Maintenance: Contractor shall purchase service agreements for each unit of equipment for the duration of the project plus two (2) months, and shall maintain all equipment in proper working condition. Service agreements shall include provision for replacement of toner cartridges and other items required to effect proper unit use. Service agreements shall also provide for:
- (a) Unlimited Service Calls.
 - (b) Same Day Response.
 - (c) All parts, labor, preventative maintenance and mileage.
 - (d) All chemicals, such as toner, fixing agent, and the like.
 - (e) System training and setup.
- (10) Portable Toilets: Two (2); each shall include a urinal; each unit shall be a properly enclosed chemical unit conforming to ANSI Z4.3.
- (a) Location: As directed by District.

- (b) Maintenance: Maintain each unit and surrounding areas in a clean, hygienic and orderly manner, at all time. Empty, clean, and sanitize each unit each day at a location and time as directed by District.
- (c) Removal: Relocate, or remove from the site, each Portable Toilet. Upon such directive by District, the Contractor shall forthwith relocate or remove each Portable Toilet and submit the affected areas to a condition which existed prior to the installation of each Portable Toilet, within three (3) calendar days, or as directed by District in writing, at no cost to District.

2.03 UTILITY AND SERVICES

- A. Telephone Service: Contractor shall provide and interface the entire telephone service, and shall properly and timely pay for telephone service for District's non-long-distance use.
- B. Electrical Service: Provide all proper connections and continuously pay for service for the duration of the Work.

2.04 FINISHES

- A. General: Manufacturer standard finish system over surfaces properly cleaned, pretreated, and prepared to obtain proper bond; all visible surfaces shall be coated.
- B. Finish: Color as selected by District from manufacturer standard palette.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. General: Properly prepare area and affected items to receive the Work. Set Work accurately in location, alignment, and elevation; rigidly, securely, and firmly anchor to appropriate structure; install plumb, straight, square, level, true, without racking, rigidly anchored to proper solid blocking, substrate, and the like; provide appropriate type and quantity of reinforcements, fasteners, adhesives, self-adhesive and other tapes; lubricants, coatings, accessories, and the like, as required for a complete, structurally rigid, stable, sound, and appropriately finished installation, in accordance with manufacturer's published instructions, and as indicated. The more restrictive and higher quality requirement shall govern. Moving parts shall be properly secured, without binding, looseness, noise, and the like.
- B. Installation: Install in accordance with 25 CCR 3.2.3 and as directed by District; jack up trailer and level both ways; mount on proper concrete piers with all load off wheels; provide required tie down and accessories per Section 4368 of referenced CCR, and as directed by District.
- C. Rejected Work: Work, materials, unit, items, systems, and the like, not accepted by District shall be deemed rejected, and shall forthwith be removed and replaced with proper and new Work, materials, unit, items, systems, and the like at no cost to District.

- D. Standard: Comply with manufacturer's published instructions, or with instructions as shown or indicated; the more restrictive and higher quality requirement shall govern.
- E. Location: As directed by District.
- F. Fire Resistance: Construct and install in accordance with UL requirements.
- G. Maintenance: Contractor shall maintain trailer and adjacent areas in a safe, clean and hygienic condition throughout the duration of the Work, and as directed by District. Properly repair or replace furniture or other items, as directed by District. Properly remove unsafe, damaged, or broken furniture, or similar items, and replace with safe and proper items. Contractor shall pay cost of all services, repair, and maintenance, or replacement of each item.
- H. Janitorial Service: Provide professional janitorial services, including, but not limited to, trash, waste paper baskets, fill paper dispensers; clean and dust all furniture, files, and the like; sweep and mop resilient and similar flooring; and vacuum carpeting and similar flooring.
 - (1) Frequency: Two (2) times per week, minimum.
- I. Removal: Properly remove the Office Trailer and contents from the Site upon completion of the Contract, or as directed by District in writing. Forthwith properly patch and repair affected areas; replace damaged items with new items. Carefully and properly inventory, clean, pack, store, and protect District property; submit District property to District at a date, time and location as directed by District.

END OF DOCUMENT

DOCUMENT 01 64 00

OWNER-FURNISHED PRODUCTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions;
- B. Special Conditions; and
- C. Materials and Equipment.

1.02 SECTION INCLUDES:

- A. Requirements for the following:
 - (1) Installing Owner-furnished materials and equipment.
 - (2) Providing necessary utilities, connections and rough-ins.

1.03 DEFINITIONS

- A. Owner: District, who is providing/furnishing materials and equipment.
- B. Installer Contactor: Contractor, who is installing the materials and equipment furnished by the Owner.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Receive, store and handle products in accordance with the manufacturer's instructions.
- B. Protect equipment items as required to prevent damage during storage and construction.

PART 2 – PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS:

- A. Installer Contractor's Responsibilities:
 - (1) Verify mounting and utility requirements for Owner-furnished materials and equipment items.

- (2) Provide mounting and utility rough in for all items where required.
 - (a) Rough in locations, sizes, capacities, and similar type items shall be as indicated and required by product manufacturer.

B. Owner and Installer Contractor(s) Responsibilities:

- (1) Owner-Furnished/Contractor Installed ("OFCI"): Furnished by the Owner; installed by the Installer Contractor.
 - (a) General: Owner and Installer Contractor(s) will coordinate deliveries of materials and equipment to coincide with the construction schedule.
 - (b) Owner will furnish specified materials and equipment delivered to the site. Owner/vendor's representative shall be present on Site at the time of delivery to comply with the contract requirements and Specifications Section 01600, Materials and Equipment, Article 1.04.
 - (c) The Owner furnishing specified materials and equipment is responsible to provide manufacturer guarantees as required by the Contract to the Installer Contractor.
 - (d) The Installer Contractor shall:
 - 1) Review, verify and accept the approved manufacturer's submittal/Shop Drawings for all materials and equipment required to be installed by the Installer Contractor and furnished by the Owner. Any discrepancies, including but not limited to possible space conflicts, should be brought to the attention of the Project Manager and/or Program Manager, if applicable.
 - 2) Coordinate timely delivery. Installer Contractor shall receive materials and equipment at Site when delivered and give written receipt at time of delivery, noting visible defects or omissions; if such declaration is not given, the Installer Contractor shall assume responsibility for such defects and omissions.
 - 3) Store materials and equipment until ready for installation and protect from loss and damage. Installer Contractor is responsible for providing adequate storage space.
 - 4) Coordinate with other bid package contractors and field measurement to ensure complete installation.
 - 5) Uncrate, assemble, and set in place.
 - 6) Provide adequate supports.

- 7) Install materials and equipment in accordance with manufacturer's recommendations, instructions, and Shop Drawings, supplying labor and material required and making mechanical, plumbing, and electrical connections required to operate equipment.
- 8) Be certified by equipment manufacturer for installation of the specific equipment supplied by the Owner.
- 9) Provide anchorage and/or bracing as required for seismic restraint per Title 24, UBC Standard 27-11 and all other applicable codes.
- 10) Provide the contract-required warranty/guarantee for all work, materials/equipment and installation upon its completion and acceptance by the District. Guarantee includes all costs associated with the removal, shipping to and from the Site, and re-installation of any equipment found to be defective.

C. Compatibility with Space and Service Requirements:

- (1) Equipment items shall be compatible with space limitations indicated and as shown on the Contract Documents and specified in other sections of the Specifications.
- (2) Modifications to equipment items required to conform to space limitations specified for rough in shall not cause additional cost to the District.

D. Manufacturer's printed descriptions, specifications, and instructions shall govern the Work unless specifically indicated or specified otherwise.

E. OFCI items:

Wall mount door stop
Soap dispenser
Fire extinguisher cabinet
Skylight
Signage package
Toilet paper dispenser
Toilet seat cover dispenser
Trash cans
TV for conference rooms
Furniture
Refrigerator
Microwave
SecureAll hardware locking system

2.02 FURNISHED MATERIALS AND EQUIPMENT

- A. All furnished materials and equipment are indicated or scheduled on the Contract Documents.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install equipment items in accordance with the manufacturer's instructions.
- B. Set equipment items securely in place, rigidly or flexibly mounted in accordance with manufacturers' directions.
- C. Make electrical and mechanical connections as indicated and required.
- D. Touch-up and restore damaged or defaced finishes to the District's satisfaction.

3.02 CLEANING AND PROTECTION

- A. Repair or replace items not acceptable to the Architect.
- B. Upon completion of installation, clean equipment items in accordance with manufacturer's recommendations, and protect from damage until final acceptance of the Work by the District.

END OF DOCUMENT

SECTION 01 66 00

PRODUCT DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Access, Conditions and Requirements;
- B. Special Conditions.

1.02 PRODUCTS

- A. Products are as defined in the General Conditions.
- B. Contractor shall not use and/or reuse materials and/or equipment removed from existing Premises, except as specifically permitted by the Contract Documents.
- C. Contractor shall provide interchangeable components of the same manufacturer, for similar components.

1.03 TRANSPORTATION AND HANDLING

- A. Contractor shall transport and handle Products in accordance with manufacturer's instructions.
- B. Contractor shall promptly inspect shipments to confirm that Products comply with requirements, quantities are correct, and products are undamaged.
- C. Contractor shall provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.04 STORAGE AND PROTECTION

- A. Contractor shall store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Contractor shall store sensitive products in weather-tight, climate controlled enclosures.
- B. For exterior storage of fabricated Products, Contractor shall place on sloped supports, above ground.
- C. Contractor shall provide off-site storage and protection when Site does not permit on-site storage or protection.

- D. Contractor shall cover products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.
- E. Contractor shall store loose granular materials on solid flat surfaces in a well-drained area and prevent mixing with foreign matter.
- F. Contractor shall provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- G. Contractor shall arrange storage of Products to permit access for inspection and periodically inspect to assure Products are undamaged and are maintained under specified conditions.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

FIELD ENGINEERING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Investigation, and Soils Investigation Report;
- B. Special Conditions;
- C. Site-Visit Certification.

1.02 REQUIREMENTS INCLUDED:

- A. Contractor shall provide and pay for field engineering services by a California-registered engineer, required for the project, including, without limitations:
 - (1) Survey work required in execution of the Project.
 - (2) Civil or other professional engineering services specified, or required to execute Contractor's construction methods.

1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEERS:

Contractor shall only use a qualified licensed engineer or registered land surveyor, to whom District makes no objection.

1.04 SURVEY REFERENCE POINTS:

- A. Existing basic horizontal and vertical control points for the Project are those designated on the Drawings.
- B. Contractor shall locate and protect control points prior to starting Site Work and preserve all permanent reference points during construction. In addition Contractor shall:
 - (1) Make no changes or relocation without prior written notice to District and Architect.
 - (2) Report to District and Architect when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
 - (3) Require surveyor to replace Project control points based on original survey control that may be lost or destroyed.

1.05 RECORDS:

Contractor shall maintain a complete, accurate log of all control and survey work as it progresses.

1.06 SUBMITTALS:

- A. Contractor shall submit name and address of Surveyor and Professional Engineer to District and Architect prior to its/their work on the Project.
- B. On request of District and Architect, Contractor shall submit documentation to verify accuracy of field engineering work, at no additional cost to the District.
- C. Contractor shall submit a certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance or nonconformance with Contract Documents.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION

3.01 COMPLIANCE WITH LAWS:

Contractor is responsible for meeting all applicable codes, OSHA, safety and shoring requirements.

3.02 NONCONFORMING WORK:

Contractor is responsible for any re-surveying required by correction of nonconforming work.

END OF DOCUMENT

CUTTING AND PATCHING

1. PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Inspector, Inspections, and Tests, Integration of Work, Nonconforming Work, and Correction of Work, and Uncovering Work;
- B. Special Conditions;
- C. Hazardous Materials Procedures and Requirements;
- D. Hazardous Materials Certification;
- E. Lead-Based Paint Certification;
- F. Imported Materials Certification.

1.02 CUTTING AND PATCHING:

- A. Contractor shall be responsible for all cutting, fitting, and patching, including associated excavation and backfill, required to complete the Work or to:
 - (1) Make several parts fit together properly.
 - (2) Uncover portions of Work to provide for installation of ill-timed Work.
 - (3) Remove and replace defective Work.
 - (4) Remove and replace Work not conforming to requirements of Contract Documents.
 - (5) Remove Samples of installed Work as specified for testing.
 - (6) Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.
 - (7) Attaching new materials to existing remodeling areas – including painting (or other finishes) to match existing conditions.
- B. In addition to Contract requirements, upon written instructions from the District, Contractor shall uncover Work to provide for observations of covered Work in accordance with the Contract Documents; remove samples of installed materials for testing as directed by District; and remove Work to provide for alteration of existing Work.

- C. Contractor shall not cut or alter Work, or any part of it, in such a way that endangers or compromises the integrity of the Work, the Project, or work of others.

1.03 SUBMITTALS:

- A. Prior to any cutting or alterations that may affect the structural safety of Project, or work of others, and well in advance of executing such cutting or alterations, Contractor shall submit written notice to District pursuant to the applicable notice provisions of the Contract Documents, requesting consent to proceed with the cutting or alteration, including the following:
 - (1) The work of the District or other trades.
 - (2) Structural value or integrity of any element of Project.
 - (3) Integrity or effectiveness of weather-exposed or weather-resistant elements or systems.
 - (4) Efficiency, operational life, maintenance or safety of operational elements.
 - (5) Visual qualities of sight-exposed elements.
- B. Contractor's Request shall also include:
 - (1) Identification of Project.
 - (2) Description of affected Work.
 - (3) Necessity for cutting, alteration, or excavations.
 - (4) Affects of Work on District, other trades, or structural or weatherproof integrity of Project.
 - (5) Description of proposed Work:
 - (a) Scope of cutting, patching, alteration, or excavation.
 - (b) Trades that will execute Work.
 - (c) Products proposed to be used.
 - (d) Extent of refinishing to be done.
 - (6) Alternates to cutting and patching.
 - (7) Cost proposal, when applicable.
 - (8) The scheduled date the Contractor intends to perform the Work and the duration of time to complete the Work.

(9) Written permission of other trades whose Work will be affected.

1.04 QUALITY ASSURANCE:

- A. Contractor shall ensure that cutting, fitting, and patching shall achieve security, strength, weather protection, appearance for aesthetic match, efficiency, operational life, maintenance, safety of operational elements, and the continuity of existing fire ratings.
- B. Contractor shall ensure that cutting, fitting, and patching shall successfully duplicate undisturbed adjacent profiles, materials, textures, finishes, colors, and that materials shall match existing construction. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the District's decision shall be final.

1.05 PAYMENT FOR COSTS:

- A. Cost caused by ill-timed or defective Work or Work not conforming to Contract Documents, including costs for additional services of the District, its consultants, including but not limited to the Construction Manager, the Architect, the Project Inspector(s), Engineers, and Agents, will be paid by Contractor and/or deducted from the Contract by the District.
- B. District shall only pay for cost of Work if it is part of the original Contract Price or if a change has been made to the contract in compliance with the provisions of the General Conditions. Cost of Work performed upon instructions from the District, other than defective or nonconforming Work, will be paid by District on approval of written Change Order. Contractor shall provide written cost proposals prior to proceeding with cutting and patching.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Contractor shall provide for replacement and restoration of Work removed. Contractor shall comply with the Contract Documents and with the Industry Standard(s), for the type of Work, and the Specification requirements for each specific product involved. If not specified, Contractor shall first recommend a product of a manufacturer or appropriate trade association for approval by the District.
- B. Materials to be cut and patched include those damaged by the performance of the Work.

PART 3 – EXECUTION

3.01 INSPECTION:

- A. Contractor shall inspect existing conditions of the Site and the Work, including elements subject to movement or damage during cutting and patching,

excavating and backfilling. After uncovering Work, Contractor shall inspect conditions affecting installation of new products.

- B. Contractor shall report unsatisfactory or questionable conditions in writing to District as indicated in the General Conditions and shall proceed with Work as indicated in the General Conditions by District.

3.02 PREPARATION:

- A. Contractor shall provide shoring, bracing and supports as required to maintain structural integrity for all portions of the Project, including all requirements of the Project.
- B. Contractor shall provide devices and methods to protect other portions of Project from damage.
- C. Contractor shall, provide all necessary protection from weather and extremes of temperature and humidity for the Project, including without limitation, any work that may be exposed by cutting and patching Work. Contractor shall keep excavations free from water.

3.03 ERECTION, INSTALLATION AND APPLICATION:

- A. With respect to performance, Contractor shall:
 - (1) Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.
 - (2) Execute cutting and demolition by methods that will prevent damage to other Work, and provide proper surfaces to receive installation of repairs and new Work.
 - (3) Execute cutting, demolition excavating, and backfilling by methods that will prevent damage to other Work and damage from settlement.
- B. Contractor shall employ original installer or fabricator to perform cutting and patching for:
 - (1) Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants, waterproofing, and other trades.
 - (2) Sight-exposed finished surfaces.
- C. Contractor shall execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes as shown or specified in the Contract Documents including, without limitation, the Drawings and Specifications.
- D. Contractor shall fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Contractor shall conform to all Code requirements for penetrations or the Drawings and Specifications, whichever

calls for a higher quality or more thorough requirement. Contractor shall maintain integrity of both rated and non-rated fire walls, ceilings, floors, etc.

- E. Contractor shall restore Work which has been cut or removed. Contractor shall install new products to provide completed Work in accordance with requirements of the Contract Documents and as required to match surrounding areas and surfaces.
- F. Contractor shall refinish all continuous surfaces to nearest intersection as necessary to match the existing finish to any new finish.

END OF DOCUMENT

ALTERATION PROJECT PROCEDURES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Integration of Work, Purchase of Materials and Equipment, Uncovering of Work and Non-conforming Work and Correction of Work and Trenches;
- B. Special Conditions.

PART 2 - PRODUCTS

2.01 PRODUCTS FOR PATCHING AND EXTENDING WORK:

- A. New Materials: As specified in the Contract Documents including, without limitation, in the Specifications, Contractor shall match existing products, conditions, and work for patching and extending work.
- B. Type and Quality of Existing Products: Contractor shall determine by inspection, by testing products where necessary, by referring to existing conditions and to the Work as a standard.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Contractor shall verify that demolition is complete and that areas are ready for installation of new Work.
- B. By beginning restoration Work, Contractor acknowledges and accepts the existing conditions.

3.02 PREPARATION:

- A. Contractor shall cut, move, or remove items as necessary for access to alterations and renovation Work. Contractor shall replace and restore these at completion.
- B. Contractor shall remove unsuitable material not as salvage unless otherwise indicated in the Contract Documents. Unsuitable material may include, without limitation, rotted wood, corroded metals, and deteriorated masonry and concrete. Contractor shall replace materials as specified for finished Work.

- C. Contractor shall remove debris and abandoned items from all areas of the Site and from concealed spaces.
- D. Contractor shall prepare surface and remove surface finishes to provide for proper installation of new Work and finishes.
- E. Contractor shall close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity. Contractor shall insulate ductwork and piping to prevent condensation in exposed areas. Contractor shall insulate building cavities for thermal and/or acoustical protection, as detailed.

3.03 INSTALLATION:

- A. Contractor shall coordinate Work of all alternations and renovations to expedite completion and to accommodate District occupancy.
- B. Designated Areas and Finishes: Contractor shall complete all installations in all respects, including operational, mechanical work and electrical work.
- C. Contractor shall remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to original or specified condition.
- D. Contractor shall refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
- E. Contractor shall install products as specified in the Contract Documents, including without limitation, the Specifications.

3.04 TRANSITIONS:

- A. Where new Work abuts or aligns with existing, Contractor shall perform a smooth and even transition. Patched Work must match existing adjacent work in texture and appearance.
- B. When finished surfaces are cut so that a smooth transition with new Work is not possible, Contractor shall terminate existing surface along a straight line at a natural line of division and make a recommendation for resolution to the District and the Architect for review and approval.

3.05 ADJUSTMENTS:

- A. Where removal of partitions or walls results in adjacent spaces becoming one, Contractor shall rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
- B. Where a change of plane of 1/4 inch or more occurs, Contractor shall submit a recommendation for providing a smooth transition to the District and the Architect for review and approval.

- C. Contractor shall trim existing doors as necessary to clear new floor finish and refinish trim as required.
- D. Contractor shall fit Work at penetrations of surfaces.

3.06 REPAIR OF DAMAGED SURFACES:

- A. Contractor shall patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- B. Contractor shall repair substrate prior to patching finish.

3.07 CULTIVATED AREAS AND OTHER SURFACE IMPROVEMENTS:

- A. Cultivated or planted areas and other surface improvements which are damaged by actions of the Contractor shall be restored by Contractor to their original condition or better, where indicated.
- B. Contractor shall protect and replace, if damaged, all existing guard posts, barricades, and fences.
- C. Contractor shall give special attention to avoid damaging or killing trees, bushes and/or shrubs on the Premises and/or identified the Contract Documents, including without limitation, the Drawings.

3.08 FINISHES:

- A. Contractor shall finish surfaces as specified in the Contract Documents, including without limitations, the provisions of all Divisions of the Specifications.
- B. Contractor shall finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, Contractor shall refinish entire surface to nearest intersections.

3.09 CLEANING:

- A. Contractor shall continually clean the Site and the Premises as indicated in the Contract Documents, including without limitation, the provisions in the General Conditions and the Specifications regarding cleaning.

END OF DOCUMENT

CONTRACT CLOSEOUT AND FINAL CLEANING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Completion of Work;
- B. Special Conditions;
- C. Temporary Facilities and Controls.

1.02 CLOSEOUT PROCEDURES

Contractor shall comply with all closeout provisions as indicated in the General Conditions.

1.03 FINAL CLEANING

- A. Contractor shall execute final cleaning prior to final inspection.
- B. Contractor shall clean interior and exterior glass and surfaces exposed to view; remove temporary labels, tape, stains, and foreign substances, polish transparent and glossy surfaces, wax and polish new vinyl floor surfaces, vacuum carpeted and soft surfaces.
- C. Contractor shall clean equipment and fixtures to a sanitary condition.
- D. Contractor shall replace filters of operating equipment.
- E. Contractor shall clean debris from roofs, gutters, down spouts, and drainage systems.
- F. Contractor shall clean Site, sweep paved areas, and rake clean landscaped surfaces.
- G. Contractor shall remove waste and surplus materials, rubbish, and construction facilities from the Site.

1.04 ADJUSTING

Contractor shall adjust operating products and equipment to ensure smooth and unhindered operation.

1.05 RECORD DOCUMENTS AND SHOP DRAWINGS

- A. Contractor shall legibly mark each item to record actual construction, including:
- (1) Measured depths of foundation in relation to finish floor datum.
 - (2) Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permit surface improvements.
 - (3) Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - (4) Field changes of dimension and detail.
 - (5) Details not on original Contract Drawings
 - (6) Changes made by modification(s).
 - (7) References to related Shop Drawings and modifications.
- B. Contractor will provide one set of Record Drawings to District.
- C. Contractor shall submit all required documents to District and/or Architect prior to or with its final Application for Payment.

1.06 INSTRUCTION OF DISTRICT PERSONNEL

- A. Before final inspection, at agreed upon times, Contractor shall instruct District's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. For equipment requiring seasonal operation, Contractor shall perform instructions for other seasons within six months.
- C. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- D. Contractor shall prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.
- E. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

1.07 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Contractor shall provide products, spare parts, maintenance, and extra materials in quantities specified in the Specifications and in Manufacturer's recommendations.
- B. Contractor shall provide District all required Operation and Maintenance Data.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF DOCUMENT

OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Completion of the Work;
- B. Special Conditions.

1.02 QUALITY ASSURANCE:

Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.03 FORMAT:

- A. Contractor shall prepare data in the form of an instructional manual entitled "OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS" ("Manual").
- B. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.
- C. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS"; and shall list title of Project and identify subject matter of contents.
- D. Contractor shall arrange content by systems process flow under section numbers and sequence of Table of Contents of the Contract Documents.
- E. Contractor shall provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: The content shall include Manufacturer's printed data, or typewritten data on 24 pound paper.
- G. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

1.04 CONTENTS, EACH VOLUME:

- A. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, subconsultants, Subcontractor(s), and Contractor with name of responsible parties; and schedule of products and systems, indexed to content of the volume.

- B. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of Subcontractor(s) and suppliers, including local source of supplies and replacement parts.
- C. Product Data: Contractor shall mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Contractor shall supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.
- E. Text: The Contractor shall include any and all information as required to supplement product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- F. Warranties and Bonds: Contractor shall bind in one copy of each.

1.05 MANUAL FOR MATERIALS AND FINISHES:

- A. Building Products, Applied Materials, and Finishes: Contractor shall include product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture Protection and Weather Exposed Products: Contractor shall include product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.
- D. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.
- E. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS:

- A. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.

- B. Panelboard Circuit Directories: Contractor shall provide electrical service characteristics, controls, and communications.
- C. Contractor shall include color coded wiring diagrams as installed.
- D. Operating Procedures: Contractor shall include start-up, break-in, and routine normal operating instructions and sequences. Contractor shall include regulation, control, stopping, shut-down, and emergency instructions. Contractor shall include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Contractor shall include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Contractor shall provide servicing and lubrication schedule, and list of lubricants required.
- G. Contractor shall include manufacturer's printed operation and maintenance instructions.
- H. Contractor shall include sequence of operation by controls manufacturer.
- I. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Contractor shall provide control diagrams by controls manufacturer as installed.
- K. Contractor shall provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- L. Contractor shall provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- N. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).
- O. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.08 SUBMITTAL:

- A. Contractor shall submit to the District for review two (2) copies of preliminary draft or proposed formats and outlines of the contents of the Manual within thirty (30) days of Contractor's start of Work.
- B. For equipment, or component parts of equipment put into service during construction and to be operated by District, Contractor shall submit draft

content for that portion of the Manual within ten (10) days after acceptance of that equipment or component.

- C. Contractor shall submit two (2) copies of a complete Manual in final form prior to final Application for Payment. Copy will be returned with Architect/Engineer comments. Contractor must revise the content of the Manual as required by District prior to District's approval of Contractor's final Application for Payment.
- D. Contractor must submit two (2) copies of revised Manual in final form within ten (10) days after final inspection.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

WARRANTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Warranty/Guarantee Information;
- B. Special Conditions.

1.02 FORMAT

- A. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.
- B. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list title of Project.
- C. Table of Contents: Contractor shall provide title of Project; name, address, and telephone number of Contractor and equipment supplier, and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the product or work item is specified.
- D. Contractor shall separate each warranty with index tab sheets keyed to the Table of Contents listing, providing full information and using separate typed sheets as necessary. Contractor shall list each applicable and/or responsible Subcontractor(s), supplier(s), and/or manufacturer(s), with name, address, and telephone number of each responsible principal(s).

1.03 PREPARATION:

- A. Contractor shall obtain warranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within ten (10) days after completion of the applicable item or work. Except for items put into use with District's permission, Contractor shall leave date of beginning of time of warranty until the date of completion is determined.
- B. Contractor shall verify that documents are in proper form, contain full information, and are notarized, when required.
- C. Contractor shall co-execute submittals when required.
- D. Contractor shall retain warranties until time specified for submittal.

1.04 TIME OF SUBMITTALS:

- A. For equipment or component parts of equipment put into service during construction with District's permission, Contractor shall submit a draft warranty for that equipment or component within ten (10) days after acceptance of that equipment or component.
- B. Contractor shall submit for District approval all warranties and related documents within ten (10) days after date of completion. Contractor must revise the warranties as required by the District prior to District's approval of Contractor's final Application for Payment.
- C. For items of work delayed beyond date of completion, provide updated submittal within ten days after acceptance, listing the date of acceptance as start of warranty period.

PART 2 - PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Documents on Work;
- B. Special Conditions.

PART 2 - RECORD DRAWINGS

2.01 GENERAL:

- A. As indicated in the Contract Documents, the District will provide Contractor with one set of reproducible (mylars) plans of the original Contract Drawings.
- B. Contractor shall maintain at each Project Site one set of marked-up plans and shall transfer all changes and information to those marked-up plans, as often as required in the Contract Documents, but in no case less than once each month. Contractor shall submit to the Project Inspector one set of reproducible vellums of the Project Record Drawings ("As-Builts") showing all changes incorporated into the Work since the preceding monthly submittal. The As-Builts shall be available at the Project Site. The Contractor shall submit reproducible vellums at the conclusion of the Project following review of the blueline prints.
- C. Label and date each Record Drawing "RECORD DOCUMENT" in legibly printed letters.
- D. All deviations in construction, including but not limited to pipe and conduit locations and deviations caused by without limitation Change Orders, Construction Claim Directives, RFI's, and Addenda, shall be accurately and legibly recorded by Contractor.
- E. Locations and changes shall be done by Contractor in a neat and legible manner and, where applicable, indicated by drawing a "cloud" around the changed or additional information.

2.02 RECORD DRAWING INFORMATION:

- A. Contractor shall record the following information:
 - (1) Locations of Work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines, and conduits.

- (2) Actual numbering of each electrical circuit.
- (3) Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Contract Drawings.
- (4) Locations of all items, not necessarily concealed, which vary from the Contract Documents.
- (5) Installed location of all cathodic protection anodes.
- (6) Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.
- (7) Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stubouts, invert elevations, etc.
- (8) Sufficient information to locate Work concealed in each building with reasonable ease and accuracy.

In some instances, this information may be recorded by dimension. In other instances, it may be recorded in relation to the spaces in the building near which it was installed.

- B. Contractor shall provide additional drawings as necessary for clarification.
- C. Contractor shall provide reproducible record drawings, made from final Shop Drawings marked "No Exceptions Taken" or "Approved as Noted."

PART 3 - RECORD SPECIFICATIONS

3.01 GENERAL:

Contractor shall mark each section legibly to record manufacturer, trade name, catalog number, and supplier of each Product and item of equipment actually installed.

PART 4 - MAINTENANCE OF RECORD DOCUMENTS

4.01 GENERAL

- A. Contractor shall store Record Documents apart from documents used for construction as follows:
 - (1) Provide files and racks for storage of Record Documents.
 - (2) Maintain Record Documents in a clean, dry, legible condition and in good order.
- B. Do not use Record Documents for construction purposes.

PART 5 – PRODUCTS Not Used.

END OF DOCUMENT

SECTION 02 40 00

DEMOLITION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Specifications for the demolition and removal of structures, including backfilling of resultant excavations and depressions, as indicated.
- B. Extent of demolition work shall be as follows:
 - 1. Buildings and structure foundations, footings, and foundation systems shall be completely removed to the base of the foundation.
 - 2. Utility services to facilities to be removed or demolished shall be disconnected, cut, and capped.
- C. Restoration of existing structures and facilities to remain in place which are damaged by demolition and removal operations.

1.02 RELATED SECTIONS

- A. Section 31 10 00 - Site Clearing

1.03 REFERENCES

- A. American National Standards Institute (ANSI)
ANSI A10.6 Safety Requirements for Demolition Operations
- B. California Code of Regulations (CCR)
CCR Title 8, Chapter 4, Subchapter 4 – Construction Safety Orders
CCR Title 24, Part 2, California Building Code, Chapter 33, Section 3303, Protection of Pedestrians during Construction or Demolition

1.04 PERMITS

- A. Obtain all special permits and licenses and give all notices required for performance and completion of the demolition and removal work, hauling, and disposal of debris.

1.05 SUBMITTALS

- A. Demolition Plan
 - 1. Submit a comprehensive demolition plan, describing the proposed sequence, methods, and equipment for demolition, removal, and disposal of structure(s); include salvage if required. Do not proceed with demolition until the designated approval authority has approved the demolition plan.

B. Shop Drawings

1. Include drawings in plan of all structures to be demolished. Indicate stages or phases of the demolition work.

C. Permits

1. Submit copies of demolition, hauling, and debris disposal permits and notices for record purposes. Include description of proposed haul routes.

1.06 WASTE DISPOSAL AND RECYCLING

- A. The Owner has implemented strict recycling and waste management policies for all waste materials removed from his property as a result of construction and demolition activity. These include:

- Asphalt
- Concrete, concrete block, concrete masonry units (CMU), slump stone (decorative concrete block), and rocks
- Asphalt Concrete
- Brick
- Paper, including bond, newsprint, cardboard, mixed paper, packing materials, and packaging
- Cement Fiber Products, including shingles, panels, siding
- Paint
- Rigid Foam
- Glass
- Plastics
- Carpet and Pad
- Beverage Containers
- Insulation
- Gypsum Wallboard
- Porcelain Plumbing Fixtures
- Fluorescent Light Tubes, per local Sanitary Service regulations
- Green materials (i.e., tree trimmings and land clearing debris)

- Metals including, but not limited to, stud trim, ductwork, piping, reinforcing steel (rebar), roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze (ferrous and non-ferrous)
 - Soils
 - Wood, including clean dimensional wood, pallet wood, plywood, oriented strand board (OSB), particleboard
- B. The successful bidder will be required to account for all waste materials removed from the Project, and to recycle, salvage, or reuse, to the maximum practicable extent, all of the materials listed above. If the successful bidder believes that recycling, salvage, or reuse of any of these materials is impracticable, the bidder must so inform the Owner before initiation of the Project, and secure Owner's written authorization for an alternative method of disposal.
- C. The successful bidder will be required to develop and maintain a plan which documents procedures to recycle, salvage, or reuse the materials listed above, including separation and recycling procedures and markets for each material recovered. This plan must also address training and communications, recordkeeping, and reporting requirements to assure that all waste materials are accounted for. As the project proceeds, this plan is to be updated with the quantities of each waste that are actually reused salvaged, recycled, or disposed of, and the markets to which these materials are directed, so that it provides documentation in a single source of waste management performance on the Project.
- D. The Owner retains the right to inspect, and subsequently approve or disapprove any and all recycling end markets, reuse or salvage outlets, and/or waste disposal facilities that are involved in the receipt of recyclables and/or waste materials generated from the Project. Disapproval of such a market or outlet may be based on past or current violations of federal or state environmental, health, or safety laws, improper disposal activities, risk or liability exposure, or any other reason deemed sufficient by the Owner.
- E. The successful bidder shall maintain records for each type of material removed from the job site (including materials that are not recycled), provided the name(s) of specific end destinations for all materials removed (whether recycled or disposed of), and provide weights and measures of all materials removed. Every load of waste material must be weighed and these scale weights must be reported to the Owner on a monthly basis, retailing material types and net weights. The Owner retains the right to certify weights of sample loads of materials leaving the project site, and compare these to the weights submitted by the successful bidder. The Owner retains the right to request copies of original scale tickets for any and all materials removed from the Project up to two (2) years following the project completion.

1.07 SITE CONDITIONS

- A. Erect and maintain temporary bracing, shoring, lights, barricades, signs, and other measures as necessary to protect the public, workers, and adjoining property from damage from demolition work, all in accordance with applicable codes and regulations.
- B. Open depressions and excavations occurring as part of this work shall be barricaded and posted with warning lights when accessible through adjacent property or through public access. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
- C. Protect utilities, pavements, and facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by demolition operations.

- D. Protection of Utilities: Protect active sewer, water, gas, electric, and other utilities; and drainage and irrigation lines indicated or, when not indicated, found or otherwise made known to the Contractor before or during demolition work.
- E. Maintain existing utilities and protect from damage as necessary to satisfy the requirements of jurisdictional utility companies and related codes and regulations.
- F. Make arrangements with affected utility companies and Owners to provide the information and services necessary to coordinate and complete the Work.
- G. Do not disconnect or shut down any part of the existing utilities and services, except by permission of authorities having jurisdiction. Submit schedule of estimated shut-down time in order to obtain such permission, and notify all interested parties, neighbors, utilities, and municipal and county authorities, as required.
- H. Utilities to be removed shall not be removed until shut-down time can be kept to a minimum. Do not remove an existing utility line or service until the replacement line, crossover, or capping is ready to be performed.
- I. Notify the Engineer and utility owners 72 hours before performing any excavation work. Notify affected utilities by calling Underground Service Alert (USA) at 1-800-227-2600. Contact utility owners not covered by USA, by calling the affected utility owners directly.
- J. Protect active underground utilities from damage. If underground utilities are damaged in any way, notify the Engineer and affected utilities immediately for corrective action.
- K. Noise and Dust Abatement: Comply with requirements specified in Section 01 50 00 - Temporary Facilities and Controls. In addition, provide continuous noise and dust abatement as required to prevent disturbance and nuisance to the public and workers and to the occupants of adjacent premises and surrounding areas. Dampen or cover areas affected by demolition operations as necessary to prevent dust nuisance.
- L. The Contract Drawings and related documents may not represent all surface conditions at the site and adjoining areas. The known surface conditions are as indicated, and shall be compared with actual conditions before commencement of work.
- M. Existing utilities and drainage systems below grade are located from existing documents and from surface facilities such as manholes, valve boxes, area drains, and other such surface fixtures.
- N. If existing active services encountered are not indicated or otherwise made known to the Contractor and interfere with the permanent facilities under construction, notify the Engineer in writing, requesting instructions on their disposition. Take immediate steps to ensure that the service provided is not interrupted, and do not proceed with the work until written instructions are received from the Engineer.
- O. Thicknesses of existing pavements are from previous construction documents, and do not imply the actual depth or thickness of the total pavement or base material, where it occurs. Remove pavement of whatever thickness as required.

PART 2 - PRODUCTS

2.01 MATERIALS, EQUIPMENT, AND FACILITIES

- A. Furnish all materials, tools, equipment, devices, appurtenances, facilities, and services as required for performing the demolition and removal work.

PART 3 - EXECUTION

3.01 PRESERVATION OF REFERENCE MARKERS

- A. Record the locations and designation of survey markers and monuments prior to their removal. Provide three reference points for each survey marker and monument removed, established by a licensed civil engineer or land surveyor currently registered in the State of California.
- B. Store removed markers and monuments during demolition work, and replace them upon completion of the work. Re-establish survey markers and monuments in conformance with the recorded reference points. Forward to the Engineer a letter verifying re-establishment of survey markers and monuments, signed by a licensed civil engineer or land surveyor currently registered in the State of California.

3.02 DEMOLITION

- A. Perform demolition in accordance with the approved Demolition Plan.
- B. Operational procedures shall be in accordance with the approved Demolition Plan.
- C. Demolish concrete and masonry in small sections. Perform demolition with small tools as much as possible. Blasting will not be permitted.
- D. Cap or plug sanitary sewer in accordance with the utility owner's standard details and instructions. Cap and plug pipe and other conduits abandoned due to demolition, with approved type caps and plugs as required by the utility owners.
- E. Backfill and compact depressions caused by excavations, demolition, and removal in accordance with the requirements of Section 31 20 00 - Earth Moving.

3.03 RESTORATION OF EXISTING STRUCTURES AND FACILITIES

- A. All damage to existing structures and facilities, including utilities, which are to remain in place, shall be repaired to a condition equal to that existing prior to the beginning of demolition and removal operations. The cost of repairing existing structures and facilities damaged by the Contractor's operations shall be at the Contractor's expense.

3.04 CLEANUP

- A. Provide a clean and orderly site.

END OF SECTION

SECTION 02 41 16
SELECTIVE DEMOLITION

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. Demolition, patching and matching adjacent assemblies.
- B. Scope of Work: College of Marin Representative is not aware of hazardous materials in the building. If the Contractor encounters hazardous materials, the Contractor shall stop work immediately and contact the College of Marin.
- C. Related Sections:
 - 1. Section 01 50 13 "Construction Waste Management and Disposal."

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to College of Marin that may be uncovered during demolition remain the property of College of Marin.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to College of Marin.

1.5 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping of utility services.

C. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

1.7 PROJECT CONDITIONS

A. Buildings immediately adjacent to demolition area will be occupied. Conduct demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

B. College of Marin assumes no responsibility for utilities to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by College of Marin as far as practical.

C. Hazardous Materials:

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify College of Marin. Hazardous materials will be removed by College of Marin under a separate contract.

D. On-site storage or sale of removed items or materials is not permitted.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction provided by College of Marin. College of Marin does not guarantee that existing conditions are same as those indicated in Project Record Documents.

3.2 PREPARATION

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities to be demolished.
 - 1. College of Marin will arrange to shut off indicated utilities when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 - 4. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
- B. Existing Utilities: See plumbing and electrical Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PROTECTION

- A. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."
 - 1. Protect adjacent buildings and facilities from damage due to demolition activities.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 5. Provide protection to ensure safe passage of people around demolition area and to and from occupied portions of adjacent buildings and structures.
 - 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to demolition operations.
 - 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

- B. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

- A. General: Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
- B. Site Access and Temporary Controls: Conduct demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from College of Marin and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 - 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: Use of explosives is not permitted.

3.5 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.
- B. Where existing assemblies are disturbed because of demolition procedures, patch assemblies to match adjacent assemblies.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction. See Section 017419 "Construction Waste Management and Disposal" for recycling and disposal of demolition waste.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.03 INFORMATIONAL SUBMITTALS

- A. Material certificates.
- B. Material test reports.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.05 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1.
 - 1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- B. Hot-Weather Placement: Comply with ACI 301.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301.
 - 2. ACI 117.

2.02 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.03 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.04 CONCRETE MATERIALS

- A. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I/II, gray.
 - 2. Fly Ash: ASTM C 618, Class F or C.
 - 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

- C. Air-Entraining Admixture: ASTM C 260/C 260M.
- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- E. Water: ASTM C 94/C 94M.

2.05 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.06 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Normal-Weight Concrete:
 - 1. Minimum Compressive Strength: 3000 psi at 28 days.
 - 2. Slump Limit: 4 inches, plus or minus 1 inch.
 - 3. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

2.07 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.08 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

3.02 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.03 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.04 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3.05 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

3.06 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

3.07 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.08 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION

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SECTION 03 54 00

GYPSUM UNDERLAYMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Description of Work: Work of this section includes underlayment for interior finish flooring and is not limited to the following:
1. Gypsum Underlayment covering normal project conditions and applications.

1.02 REFERENCES

- | | |
|------------------------------------|--|
| A. Underwriters Laboratory | Fire Resistance Volume 1
www.ul.com |
| B. GREENGUARD Certified | GREENGUARD and GREENGUARD Gold Certified
www.greenguard.org |
| C. ASTM E336 and E1007 | Field Sound Transmission Class (F-STC), Field Impact Insulation Class (F-IIC) |
| D. ASTM C472M | Compressive strength of gypsum concrete |
| E. ASTM F2170 | Standard Test Method for Determining Relative Humidity in Concrete Floor Slab |
| F. ASTM F2419 | Standard Test Method for Installation of Thick Poured Gypsum Concrete and Preparation of Surface to Receive Resilient Flooring |
| G. ASTM F2678 | Standard Practice for Preparing Panel Underlayments, Thick Poured Lightweight Cellular Concrete Underlayments, and Concrete Subfloors with Underlayment Patching Compounds to Receive Resilient Flooring |
| H. Finished Floor Goods Procedures | Maxxon Procedures for Attaching Finished Floor Goods to Maxxon Underlayments
www.maxxon.com |

1.03 SUBMITTALS

- A. Product Data: Submit product data with project materials clearly identified for each required product or system.
- B. UL Directory Fire Resistance Test information.
- C. Acoustical Data: Submit sound tests according to IBC code criteria ASTM E492 (IIC) and ASTM E90 (STC) or ASTM E1007 (F-IIC) and E336 (F-IIC).

1.04 SYSTEM REQUIREMENTS

- A. Performance Requirements:
1. Gyp-Crete Floor Underlayment:
 - i) Compressive strength up to 3,000 psi
 - ii) Density 110 pounds per cubic foot (1,762 kg/m³)

1.05 QUALITY ASSURANCE

- A. Performance Standards:
 - 1. All materials, unless otherwise indicated, shall be manufactured by Maxxon Corporation and shall be installed in accordance with its current printed directions and by a Maxxon Corporation Authorized Applicator.
 - 2. Underlayment mix shall be tested for a slump using a 2" (i.d.) x 4" (50 mm x 101 mm) cylinder resulting in a patty size of 8 1/2" (216 mm) plus or minus 1 inch (25 mm) diameter.
 - 3. Compressive strength tested in accordance with ASTM C 472M.

1.06 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be delivered in their original unopened packages and protected from damage and exposure from the elements. Damaged or deteriorated materials shall be removed from the premises.

1.07 PROJECT CONDITIONS

- A. Before, during and after installation of product, building interior shall be enclosed, with adequate ventilation and heat maintained at a temperature above 50 °F (10 °C) to allow for drying of product.

PART 2 GENERAL

2.01 MATERIALS

- A. Acceptable Manufacturers:
 - 1. Ardex; Bonsal American, an Oldcastle company; ProSpec Level Set G.
 - 2. Conspec by Dayton Superior; Conflow Supreme.
 - 3. Euclid Chemical Company (The); Flo-Top.
 - 4. Maxxon Corporation Gyp-Crete Floor Underlayment.
 - 5. USG Corporation.
 - 6. Or equal.
- B. Maxxon Floor Primer:
 - 1. Material Standard: Comply with specifications outlined in manufacturer's Design and Installation Guide for wood.
- C. Mix Water:
 - 1. Material Standard: Potable, free from impurities and from a domestic source.
- D. Sand Aggregate:
 - 1. Sand shall meet Maxxon Sand Specification 101.
- E. Maxxon Overspray Primer Sealer:
 - 1. Seal all areas that receive glue down floor goods with Maxxon Overspray according to manufacturer's specifications.
- F. Maxxon Acrylic Primer Sealer (Alternate to Overspray):
 - 1. Seal all areas that receive glue down floor goods with Maxxon Acrylic according to manufacturer's specifications.
- G. Maxxon Reinforcement or Maxxon CSM (Crack Suppression Mat):
 - 1. Install approved reinforcement as per manufacturer recommendations.
- H. Sound Mat: Install per the Project Acoustical Report. Gypsum based underlayment to be installed over:
 - 1. ¼ inch Quiet Curl 55-025 MC, or Acousti-Mat II, or equal and 1 in. Gyp-crete at hard surface finish flooring.
 - 2. 1 ¼ in. gyp-crete at carpet areas.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Site Verification of Conditions:

1. Installation shall not begin until the building is enclosed, including roof, windows, doors, and any other apertures.
2. Wood substrate shall be structurally sound, properly fastened, and dry. Contractor shall clean subfloor to remove mud, oil, grease, and other contaminating factors before arrival of the authorized applicator.
3. Wood substrate:
 - i) The wood subfloor must be adequate to withstand live and dead loads with a deflection limitation of L/360.
 - ii) Wood should be agency approved 23/32" (1.8cm) T & G subfloor sheathing.

3.02 REQUIREMENTS

- A. Leak Prevention:
 1. Fill cracks and voids in subfloor where leakage of slurry could occur.
- B. Priming subfloor:
 1. Prime substrate according to manufacturer's recommendations.
- C. Application:
 1. Install in accordance with reference standards and manufacturer's instructions.

3.03 GENERAL INSTALLATION REQUIREMENTS

- A. Mixing Proportions:
 1. General Requirements: Mix proportions and methods shall be in strict accordance with product manufacturer recommendations.
- B. Application:
 1. Acousti-Mat Installations: Install Acousti-Mat following manufacturer's recommendations and specifications
 2. Pour floor topping to recommended thickness. Immediately spread and screed product to a smooth surface. Expansion joints in all types of work shall be brought through the underlayment.
- C. Drying:
 1. The general contractor must provide and maintain correct environmental conditions to keep the building clean and dry, and protect against infestation of moisture from a variety of potential sources. The general contractor must supply mechanical ventilation and heat if necessary to remove moisture from the area until the Gyp-Crete is dry.
 2. Protection from Heavy Loads: During construction, place temporary wood planking over Gyp-Crete wherever it will be subject to heavy wheeled or concentrated loads.

3.04 PREPARATION FOR INSTALLATION OF GLUE DOWN FLOOR GOODS

- A. Sealing:
 1. Seal all areas that receive glue down floor goods with Maxxon Overspray or Maxxon Acrylic according to the Maxxon Corporation's specifications. Any floor areas where the surface has been damaged shall be cleaned and sealed regardless of floor covering to be used. Where floor goods manufacturers require special adhesive or installation systems, their requirements supersede these recommendations.
 2. Maxxon UWR can be used over Maxxon underlayments in low traffic areas such as utility rooms, storage rooms and closets, as a protective surface.
- B. Moisture Testing:
 1. Follow the respective floor goods manufacturers' recommendations for relative humidity requirements. When manufacturer does not have a relative humidity requirement, refer to Maxxon's *Procedures for Attaching Finished Floor Goods to Maxxon Underlayments* brochure.
- C. Finished Floor Goods:
 1. There are many reference standards for the installation procedures and recommendations for finished flooring applications over gypsum underlayments. These include instructions of the

manufacturers of the finished flooring, adhesives and thin-set as well as national agency reference standards. The national standards are listed below:

Flooring Type	Reference Standard
Resilient	ASTM F2419

See Maxxon Corporation's *Procedures for Attaching Finished Floor Goods to Maxxon Underlayments* brochure for guidelines for installing finished floor goods. This procedure is not a warranty and is to be used as a guideline only.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

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. Steel framing and supports for countertops.
- B. Related Sections:
 - 1. Section 07 62 00 "Sheet Metal Flashing and Trim."
 - 2. Section 07 92 00 "Joint Sealants."
 - 3. Section 09 91 00 "Painting and Coating" for finishing metal fabrications assemblies, unless otherwise noted.

1.3 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- C. Samples: For each finish specified. Minimum 4 in. square.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Welding certificates.

- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Professional Engineer shall be registered in the State of California.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.8 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Z-shapes: ASTM A 36; galvanize per ASTM A 153.
- C. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches.
2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.

2.3 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 1. Provide stainless-steel fasteners for fastening aluminum.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 2.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Eyebolts: ASTM A 489.
- F. Machine Screws: ASME B18.6.3.
- G. Plain Washers: Round, ASME B18.22.1.
- H. Lock Washers: Helical, spring type, ASME B18.21.1.
- I. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- J. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- K. Post-Installed Anchors: Torque-controlled expansion anchors.
 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.

2.8 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.9 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products. Galvanize all exterior steel assemblies, unless otherwise noted.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099100 "Painting".
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

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. Wood blocking, cants, and nailers.
 - 2. Wood furring and grounds.
 - 3. Non-load-bearing wood studs.
 - 4. Plywood backing panels.
- B. Related Requirements:
 - 1. Section 06 16 00 "Sheathing."
 - 2. Section 09 91 00 "Painting" for field painting of plywood backerboards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 2. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Fire-retardant-treated wood.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that

periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood flat with spacers beneath and between each bundle to provide air circulation. Protect wood from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
- C. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Application: Treat all rough carpentry unless otherwise indicated.
 - 1. Plywood backing panels.

2.2 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Cants.
 - 4. Furring.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber:
 - 1. Spruce-pine-fir; NLGA.
 - 2. Western woods; WCLIB or WWPA.

2.3 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exterior, AC, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness. Panels shall not contain added urea-formaldehyde.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Power-Driven Fasteners: NES NER-272.
- C. Lag Bolts: ASME B18.2.1.
- D. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- E. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Framing with dimension lumber.

1.02 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preserved-treated wood.
 2. Fire-retardant-treated wood.
 3. Post-installed anchors.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings.

2.03 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat items indicated on Drawings.

2.04 DIMENSION LUMBER FRAMING

- A. Framing: No. 1 grade.
 - 1. Application: Framing other than interior partitions not indicated as load bearing.
 - 2. Species:
 - a. Douglas fir-larch; WCLIB or WWPA.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction.
- C. Do not splice structural members between supports unless otherwise indicated.
- D. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- E. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.

3.02 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

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SECTION 06 40 05

EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Exterior Finish Carpentry, complete, as shown and specified.
- B. Work Specified Elsewhere:
 - 1. Interior Architectural Woodwork: Section 06 40 23.

1.2 SUBMITTALS

- A. Product Data: Submit for College of Marin Representative's action. Submit manufacturer's literature and installation instructions for each material and accessory, clearly notating each specified requirement.
- B. Shop Drawings: Submit for College of Marin Representative's action. Prepare details at a scale not less than 3 in. = 1 ft. Coordinate shop drawings with assemblies in Work Specified Elsewhere.
- C. Samples: Submit for College of Marin Representative's action. Label samples to indicate product, characteristics, and location in the Work. Samples will be reviewed for color and appearance only. Furnish sufficient samples to establish the full range of colors and textures for materials exposed in the finished work. Compliance with other requirements is the responsibility of the Contractor.
 - 1. Actual width by 12 in. long.
- D. Quality Assurance/Quality Control Submittals: Submit for College of Marin Representative's information.
 - 1. Certificates:
 - a. Installer's Qualifications.

1.3 QUALITY ASSURANCE

- A. Qualified Installer: Installer to have 5 years experience in the installation of specified materials on comparable projects. The firm shall have the approval of the materials manufacturer.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, and regulations of Authorities Having Jurisdiction (AHJs). Obtain necessary approvals from AHJs.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Do not deliver exterior architectural woodwork until painting, finishing, and overhead work is complete in applicable spaces.

- B. Storage: Store architectural woodwork in building, out of the way of other construction activities, at a relative humidity of 50 percent to 55 percent at 70 degrees F.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Woodwork Summary: Exterior wood sunshades. Install Exterior Finish Carpentry on existing metal armatures.
- B. Exterior trellis slats: Resysta “Hollow Profile RESP3423412”, or equal, as approved by the District. Finish: Burma. Made from polymers, rock salt, mineral oil, and rice husks.
 - 1. Class A fire rated.
 - 2. Finish prior to installation. Refer to Section 09 91 00 “Painting and Coating.”

PART 3 – EXECUTION

3.1 GENERAL

- A. Manufacturer's Instructions: Prepare substrates and install the work, including components and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified. Examine the areas to receive the Work and remedy detrimental conditions.
- B. Field Dimensions: Verify dimensions and conditions in field and adjust Architectural Woodwork in the shop to accommodate field conditions.

3.2 INSTALLATION

- A. Installation Tolerances:
 - 1. Variation from Plane: Limit variation from plane or location shown to 1/8 in. in 10 ft.; 1/4 in. over total length.
 - 2. Alignment: Where surfaces abut in line and at corners and where surfaces are separated by less than 1/4 in., limit offset from true alignment to less than 1/32 in.
 - 3. Offsets In End-To-End Or Edge-To-Edge Alignment Of Consecutive Members: 1/16 in. maximum offset in any alignment.

3.3 ADJUSTING AND CLEANING

- A. Defective Work: Touch-up, refinish, or replace damaged, stained, scratched, or otherwise disfigured portions of the Work to the satisfaction of the College of Marin Representative.

3.4 PROTECTION

- A. General: Protect Exterior Architectural Woodwork against damage until Work is accepted.

END OF SECTION

SECTION 06 40 23

ARCHITECTURAL WOODWORK

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. Plastic laminate cabinets.
2. Finished plywood cabinets.
3. Plastic laminate paneling at elevators.
4. Accompanying countertops.
5. Wood Handrails.

B. Related Requirements:

1. Section 06 20 23 "Interior Finish Carpentry."
2. Section 07 92 00 "Joint Sealants."
3. Section 09 22 16 "Non-Structural Metal Framing" for backing strips.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Meeting the requirements of Architectural Woodwork Standards. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate casework.
4. Apply a WI Certified Compliance Program label to the first page of the Shop Drawings.

B. Samples for Verification:

1. 6 in square sample of each exposed finish.
2. Four panels, with Veneer representative of and selected from flitches to be used for transparent-finished cabinets and paneling. Samples shall be at least 8 by 10 inches, for

each species and cut. Include at least one face-veneer seam. Finish each sample with the intended finish.

3. Lumber for transparent finish, not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.
4. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For the following:
 1. Composite wood and agrifiber products.
- C. Woodwork Quality Standard Compliance Certificates: WI Quality Certification Program certificates.

1.6 QUALITY ASSURANCE

- A. Quality Standard: Architectural Woodwork Standards, (AWS), latest edition, jointly published by Woodwork Institute, Architectural Woodwork Institute, and the Architectural Woodwork Manufacturers Association of Canada.
 1. If there is a conflict between the requirements of the AWS and the Drawings and/or Specifications, the Drawings and specifications shall govern.
- B. Woodwork Institute Certified Compliance Program (CCP)
 1. Before delivery to the job site provide a Woodwork Institute Certified Compliance Certificate indicating the millwork products to be provided, and certifying that they meet the requirements of the AWS for the Grade or Grades specified, as well as the requirements of the Contract Documents.
 2. Provide a Woodwork Institute Certified Compliance Label on each elevation of casework and on each plastic laminate top.
 3. On completion of installation provide a Woodwork Institute Certified Compliance Program certificate certifying that installation meets the requirements of the AWS and of the Plans and Specifications.
 4. All fees charged by the Woodwork Institute for their Certified Compliance Program are the responsibility of the millwork manufacturer and/or installer, and shall be included in their bid.
- C. Woodwork Institute Certified Seismic Installation Program (CSIP)
 1. Before walls and ceilings are closed, provide a Woodwork Institute CSIP inspection report indicating that backing for casework attachment is installed as required, or itemizing each location where backing is missing or improperly located.
 2. All fees charged by the Woodwork Institute for their Certified Seismic Installation Program are the responsibility of the casework installer, and shall be included in their bid.
- D. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is licensee of the Woodwork Institute Certified Compliance Program.

- E. Installer Qualifications: A licensee of Woodwork Institute's Certified Compliance Program and Certified Seismic Installation Program. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver casework until painting and similar operations that could damage woodwork have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinetwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.
- B. Field Measurements: Where casework is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that Architectural Woodwork can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 087110 "Door Hardware" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Plastic laminate panels for elevator walls

- B. Kitchen: plastic laminate casework.
- C. Reception desk: polycarbonate panel by Pentaglas, alum channel by Schluter
- D. Reception desk countertop: 3/4" finish plywood, pre-finished, cabinet grade: Europly plus or equal, as approved by the District.
- E. Adjacent Flooring to Reception Desk: ½ in. plywood, pre-finished, cabinet grade: Europly plus or equal, as approved by the District. Match reception desk countertop finish.
- F. Quartz countertops

2.2 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS AND DOORS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate casework indicated for construction, finishes, installation, and other requirements.
 - 1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Custom.
- C. Core: MDF, ANSI 208.2 Grade 130. Provide marine grade MDF at sinks – minimum 3 ft. to either side of sink.
 - 1. Manufactured with no added urea formaldehyde.
 - 2. At rated corridors and where required by Local Authorities Having Jurisdiction (AHJ): Fire Retardant MDF certified to US Class 1/A (E-84) flame spread and smoke generation rating. Sierra Pine Medite FR or equal.
- D. Type of Construction: Frameless.
- E. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- F. Exposed Exterior Surfaces: High-Pressure Decorative Laminate: NEMA LD 3, grades as required by woodwork quality standard.
- G. Exposed Interior Surfaces: High-Pressure Decorative Laminate matching the exposed exterior surfaces.
- H. Semi-Exposed Surfaces: Melamine
- I. Edge Band: ABS matching the color and pattern of the exposed laminate.
- J. Dust Panels: Provide 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- K. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure laminate, NEMA LD 3, Grade BKL.
- L. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Drawer Sides: Seven or nine ply hardwood plywood with no internal voids, or solid hardwood.
2. Drawer Bottoms: Hardwood Plywood.
3. Construction method: Dowels or dovetails.

M. Colors, Patterns, and Finishes: Laminart, or equal, as approved by the District.

2.3 PLASTIC-LAMINATE-FACED PANELS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate casework indicated for construction, finishes, installation, and other requirements.
1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Custom.
- C. Core: MDF, ANSI 208.2 Grade 130.
1. Manufactured with no added urea formaldehyde.
- D. Edge Band: ABS matching the color and pattern of the exposed laminate.
- E. Z-clips for hanging panels: Aluminum. Doug Mockett, Monarch, or equal, as approved by the District.

2.4 FINISHED PLYWOOD CORE CASEWORK

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades for construction, finishes, installation, and other requirements.
1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. If there are any conflicts between the AWS and the Contract Documents, the Contract Documents shall govern.
- B. Grade: AWS Premium Grade.
- C. Laminating adhesives shall contain no added urea-formaldehyde.
- D. Exposed Surfaces:
- E. Plywood Core: DOC PS-1, Exterior A-C.
1. Manufactured with no added urea formaldehyde.
 2. Europly Plus, or equal, as approved by the District.
- F. Plywood Core Finish: Match College of Marin Representative's sample.

2.5 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 8 to 13 percent.
 - B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 1. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
 2. Moisture Resistant MDF: ANSI 208.2 Grade 155 MR-50.
- 2.6 POLYCARBONATE PANELS
- A. Product: CPI Daylighting "Pentaglas", or equal, as approved by the District.
 1. Thickness: 12 mm.
 2. Color: White.
- 2.7 COUNTERTOPS
- A. Quartz Surfacing: Caesarstone, or equal, as acceptable to the District. Basis of Design Caesarstone "Calacatta Nuvo."
- 2.8 HARDWARE AND ACCESSORIES
- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087001 "Door Hardware."
 - B. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
 1. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.
 - C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
 - D. Wire Pulls: Back mounted, solid metal, 6 inches long, 5/16 inch in diameter.
 - E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
 - F. Drawer Slides: BHMA A156.9.
 1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 2.
 4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1.
 5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100.
 6. For computer keyboard shelves, provide Grade 1.

7. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-100.
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Exposed Hardware Finishes: Satin stainless steel.
- J. For concealed hardware, provide manufacturer's standard painted finish or stainless steel finish.

2.9 MISCELLANEOUS MATERIALS

- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.10 FABRICATION

- A. Arrange casework in shop or other suitable space in proposed sequence for examination by College of Marin Representative. Mark units with temporary sequence numbers to indicate position in proposed layout.
 1. Lay out one elevation at a time if approved by College of Marin Representative.
 2. Notify College of Marin Representative seven days in advance of the date and time when layout will be available for viewing.
 3. Provide lighting of similar type and level as that of final installation for viewing layout unless otherwise approved by College of Marin Representative.
 4. Rearrange paneling as directed by College of Marin Representative until layout is approved.
 5. Do not trim end units and other nonmodular-size units to less than modular size until after College of Marin Representative's approval of layout.
 6. Obtain College of Marin Representative's approval of layout before start of assembly. Mark units and Shop Drawings with assembly sequence numbers based on approved layout.
- B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 1. Corners of Cabinets: 1/16 inch unless otherwise indicated.
- C. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 1. Notify College of Marin Representative seven days in advance of the dates and times woodwork fabrication will be complete.
 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

- D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.11 WOOD HANDRAILS

- A. Provide wood handrails, as shown on Drawings. Lumber to be Grade AA quality. Provide transparent finish, per Section 09 91 00 "Painting and Coating."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition casework to average prevailing humidity conditions in installation areas.
- B. Before installing casework, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install casework to comply with same grade as item to be installed.
- B. Assemble casework and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install casework level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut casework to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Casework: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install casework with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws or toggle bolts through metal backing or metal framing behind wall finish.

- F. Touch up finishing work specified in this Section after installation of woodwork.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective casework, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.

- C. Clean casework on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 07 21 00
BUILDING INSULATION

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. Glass-fiber blanket insulation and Sound Attenuation Blankets.
 - 2. Rigid insulation at the roof.
- B. Related Sections:
 - 1. Section 07 25 00 "Weather Barriers."
 - 2. Section 07 31 13 "Asphalt Shingles."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Plans and Elevations indicating extent of each type of exterior insulation.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

- A. Unfaced, Glass-Fiber Blanket Insulation and Sound Attenuation Blankets: Provide type as shown on Drawings. ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.2 RIGID INSULATION

- A. Roof Insulation: Polyisocyanurate Insulation: ASTM C1289, Type II, Class 1, Grade 2 (20 psi). GAF "EnergyGuard" insulation, or equal, as approved by the District. Each board to be 2.6" thick.

2.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to rain at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

2.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

2.5 INSTALLATION OF RIGID INSULATION AT ROOF

- A. Fasten in accordance with wind uplift requirements for the roof system. Stagger end joints and tightly abut insulation units.

END OF SECTION

SECTION 07 25 00

WEATHER BARRIERS

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 self-adhering sheet air and water barriers for walls and roofs.
- B. Related Requirements:
 - 1. Section 07 31 13 "Asphalt Shingles."
 - 2. Section 07 62 00 "Sheet Metal Flashing and Trim."
 - 3. Section 07 92 00 "Joint Sealants".

1.3 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
- B. Shop Drawings: For air-barrier assemblies.
 - 1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 2. Include details of interfaces with other materials that form part of air barrier.
 - 3. Details shall be project specific beyond those typically published by the product manufacturer showing intended substrates and integrations with adjacent systems.
 - 4. Submit shop drawings to manufacturer for review and approval prior to submitting to College of Marin Representative.
 - 5. Provide plans and elevations to indicate extent of materials and location of details.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with air barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- D. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity specializing in the installation of air barrier systems with a minimum 5 years documented experience that employs installers and supervisors who are trained and approved by manufacturer.
 - 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
- B. Manufacturer Qualifications: Company specializing in production of waterproofing and air barrier systems with minimum 10 years documented continuous experience in the manufacture of permeable water-resistive air barrier products and employing experienced in-house technical and field observation personnel qualified to provide expert technical support.
- C. Preinstallation Conference: Conduct conference at Project site after approval of complete submittal. Review requirements for air barrier, including surface preparation specified under other Sections, substrate condition and pretreatment, temporary weather protection, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original containers with seals unbroken, wrapped in a polythene sleeve, labeled with manufacturer's name, and product brand name.
- B. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- C. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
 - 1. Protect substrates from environmental conditions that affect air-barrier performance.
 - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.9 WARRANTY

- A. Contractor's Labor and Material Guarantee: Correct defective Work at no cost to the College of Marin.
 - 1. Warranty Period: 1 year from the date of Final Completion in accordance with Document 00 65 36 – Warranty Form Contractor's Guarantee.

- B. Special Manufacturer's Warranty: Warranty all work under this section in a written document endorsed by the Manufacturer:
 - 1. Warranty Period: 10 years from date of Final Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous weather barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.3 ROOF UNDERLAYMENT

- A. Sheet: Self-adhered roofing underlayment. GCP Applied Technologies "Ice & Water Shield", or equal as approved by the District.
 - 1. Material: Cold applied, self adhering membrane composed of a high strength polyethylene film coated on one side with a layer of rubberized asphalt adhesive and interwound with a disposable release sheet. An embossed, slip resistant surface is provided on the polyethylene.
 - 2. Color: Gray-black.
 - 3. Membrane Thickness: 40 mil (1.02 mm) ASTM D3767 procedure A (Section 9.1).
 - 4. Tensile Strength, Membrane: 250 psi (1720 kN/m²) ASTM D412 (Die C modified).
 - 5. Elongation, Membrane: 250% ASTM D412 (Die C modified).
 - 6. Low Temperature Flexibility: Unaffected @ -20°F (-29°C) ASTM D1970.
 - 7. Adhesion to Plywood: 3.0 lbs/in. width (525 N/m) ASTM D903.
 - 8. Permeance (Max): 0.05 Perms (2.9 ng/m²s Pa) ASTM E96.
 - 9. Material Weight Installed (Max): 0.3 lb/ft² (1.3 kg/m²) ASTM D461.
 - 10. Primer: Water-based Perm-A-Barrier WB Primer by GCP Applied Technologies, Inc.

2.4 ACCESSORY MATERIALS

- A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier membrane.
- B. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade. Grace Bituthene Liquid Membrane, or equal as approved by the District.
- C. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- D. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
 - 1. Install modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.
- E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- F. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 INSTALLATION

- A. General: Install modified bituminous sheets and accessory materials according to air-barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.
 - 1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous air-barrier sheet produced for low-temperature application. Do not install low-temperature sheet if ambient or substrate temperature is higher than 60 deg F.
- B. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
 - 1. Install modified bituminous strips centered over vertical inside corners. Install 3/4-inch fillets of termination mastic on horizontal inside corners.
- C. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.

- D. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.
 - 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- E. Apply and firmly adhere modified bituminous sheets horizontally over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
 - 1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
 - 2. Roll sheets firmly with a manufacturer approved hand roller to enhance adhesion to substrate.
- F. Apply continuous modified bituminous sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.
- G. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch- wide, modified bituminous strip.
- H. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with compatible sealant.
- I. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.
 - 1. Coordinate air-barrier installation with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
- J. Connect and seal exterior wall air-barrier membrane continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- K. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
 - 1. Modified Bituminous Transition Strip: Roll firmly with a manufacturer approved hand roller to enhance adhesion.
- L. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.
- M. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- N. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.

- O. Do not cover air barrier until it has been tested and inspected by College of Marin's testing agency.
- P. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 - 1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
 - 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 31 13
ASPHALT SHINGLES

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. Asphalt shingles.
- 2. Roof cover board.

- B. Related Requirements:

- 1. Section 07 25 00 "Weather Barriers" for roofing underlayment.

1.3 DEFINITION

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Samples for Verification: For the following products, of sizes indicated:

- 1. Asphalt Shingles: Full size.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by manufacturer and witnessed by a qualified testing agency.

- C. Sample Warranty: For manufacturer's warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For asphalt shingles to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Asphalt Shingles: 100 sq. ft. of each type, in unbroken bundles.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture according to manufacturer's written instructions.
- B. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
- C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.
- D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.12 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Manufacturing defects.
 - 2. Material Warranty Period: 30 years from date of Substantial Completion.

- B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of asphalt-shingle roofing that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ASSEMBLY

- A. GAF Timberline HD 'birchwood', or equal as approved by District. Color: Dark Sage. Provide complete shingle roof system, including, but not limited to: starter shingles and ridge cap shingles.
 - 1. Class A fire rated per UL 790.
 - 2. Passes ASTM D 7158, Class H.
 - 3. ASTM D 3018, Type 1.
 - 4. ASTM D 3161, Class F.

2.2 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
- B. Wind Speed: Provide roofing system to withstand 115 mph window speed, Exposure Category C, per CBC 2016.

2.3 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch-diameter, sharp-pointed, with a minimum 3/8-inch-diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
 - 1. Shank: Barbed.
 - 2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Roof Cover Board: Georgia-Pacific "Densdeck", or equal, as approved by the District.

2.4 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provisions have been made for flashings and penetrations through asphalt shingles.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENTS

- A. Install roof insulation in accordance with Section 07 21 00 "Building Insulation."
- B. Install underlayment in accordance with Section 07 25 00 "Weather Barriers."

3.3 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim."
 - 1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.
- C. Rake Drip Edges: Install rake drip-edge flashings over underlayment and fasten to roof deck.
- D. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 ASPHALT-SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip with self-sealing strip face up at roof edge.
 - 1. Install starter strip along rake edge.

- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.
- E. Fasten asphalt-shingle strips with a minimum number of roofing nails located according to manufacturer's written instructions.

3.5 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS **<Insert name>** of **<Insert address>**, herein called the "Roofing Installer," has performed roofing and associated work ("the work") on the following project:
 - 1. Owner: **<Insert name of Owner>**.
 - 2. Address: **<Insert address>**.
 - 3. Building Name/Type: **<Insert information>**.
 - 4. Address: **<Insert address>**.
 - 5. Area of the Work: **<Insert information>**.
 - 6. Acceptance Date: **<Insert date>**.
 - 7. Warranty Period: **<Insert time>**.
 - 8. Expiration Date: **<Insert date>**.
- B. AND WHEREAS Roofing Installer has contracted to warrant the work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of the work as are necessary to correct faulty and defective work and as are necessary to maintain the work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
 - 1. Specifically excluded from this Warranty are damages to the work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding 115 mph;
 - c. Fire;
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Vapor condensation on bottom of roofing; and
 - f. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by College of Marin.
 - 2. When the work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by College of Marin or by another responsible party so designated.

3. Roofing Installer is responsible for damage to the work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of the work.
4. During Warranty Period, if College of Marin allows alteration of the work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of the alterations, but only to the extent the alterations affect the work covered by this Warranty. If College of Marin engages Roofing Installer to perform the alterations, Warranty shall not become null and void unless Roofing Installer, before starting the alterations, notified College of Marin in writing, showing reasonable cause for claim, that the alterations would likely damage or deteriorate the work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a use or service more severe than originally specified, this Warranty shall become null and void on date of the change, but only to the extent the change affects the work covered by this Warranty.
6. College of Marin shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect the work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on the work and shall not operate to restrict or cut off College of Marin from other remedies and resources lawfully available to College of Marin in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of the work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with College of Marin or a subcontract with College of Marin's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this **<Insert day>** day of **<Insert month>**, **<Insert year>**.

1. Authorized Signature: **<Insert signature>**.
2. Name: **<Insert name>**.
3. Title: **<Insert title>**.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

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. Sheet Metal Flashing and Trim.
 - 2. Formed roof-drainage sheet metal fabrications.
- B. Related Requirements:
 - 1. Section 07 31 13 "Asphalt Shingles."
 - 2. Section 09 91 00 "Painting."

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site after approval of a complete submittal.
 - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
 - 3. Review requirements for insurance and certificates if applicable.
 - 4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.

5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of coping and roof edge flashing that is FM Approvals approved.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of a minimum of 5 years of successful in-service performance.
 1. For copings and roof edge flashings that are FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.
- B. Installer Qualifications: Engage an experienced Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a minimum 5 year fabrication and installation record of successful in-service performance.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 PROJECT CONDITIONS

- A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation. Paint exposed flashing in the field in accordance with Seciton 09 91 00 "Painting."
 - 1. Surface: Smooth, flat.
- C. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - 1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color: Match College of Marin Representative's sample.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

- C. Solder:
 - 1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.
- J. Slip Sheet: Red Rosin Paper, by W.R. Meadows.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- D. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- E. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- F. Do not use graphite pencils to mark metal surfaces.
- G. Saddles: Fabricate one-piece, watertight saddles that are mechanically fastened and soldered watertight at intersections in plane.

2.5 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Gutters and trim to be made from 0.050 aluminum with fluoropolymer finish, as specified herein.
- B. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
 - 1. Gutter Screens: Global Gutter Screens, Inc., or equal, as approved by the District.
- C. Downspouts: Fabricate downspouts to shapes and dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 2. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 3. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 4. Torch cutting of sheet metal flashing and trim is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 1. At typical laps, provide a sealed butt joint with a 12 inch wide backer plate. At exposed horizontal flashing, such as copings, provide a backer plate with a 6 inch wide cover plate. Manufacturer fabricated flashings shall be lapped a minimum of 4 inches and set in a bed of sealant.
 2. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 3. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
 1. Do not use torches for soldering.
 2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 3. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.3 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.4 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

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. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.

B. Related Sections:

1. Section 08 80 00 "Glazing" for glazing sealants.
2. Section 09 29 00 "Gypsum Board" for sealing perimeter joints.
3. Section 09 30 00 "Tiling" for sealing tile joints.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
 1. Joint-sealant application, joint location, and designation.
 2. Joint-sealant manufacturer and product name.
 3. Joint-sealant formulation.
 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

- C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- E. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 - 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Contractor's Labor and Material Guarantee: Correct defective Work at no cost to the College of Marin.
 - 1. Warranty Period: 2 years from the date of Final Completion in accordance with Document 00 65 36 – Warranty Form Contractor's Guarantee.
- B. Special Manufacturer's Warranty: Warranty all work under this section in a written document endorsed by the Manufacturer:
 - 1. Warranty Period: 10 years from date of Final Completion.

- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. **Compatibility:** Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. **Liquid-Applied Joint Sealants:** Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - 1. **Suitability for Immersion in Liquids.** Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- C. **Stain-Test-Response Characteristics:** Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. **Suitability for Contact with Food:** Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. **Colors of Exposed Joint Sealants:** As selected by College of Marin Representative from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. **Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant:** ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following, or equal as approved by District:
 - a. Dow Corning Corporation; 790.
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
 - c. Sika Corporation, Construction Products Division; SikaSil-C990.
 - d. Tremco Incorporated; Spectrem 1.

2.3 URETHANE JOINT SEALANTS

- A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
 - 1. Products: Subject to compliance with requirements, provide the following, or equal as approved by District:
 - a. Sika Corporation, Construction Products Division; Sikaflex - 15LM.
 - b. Tremco Incorporated; Vulkem 921.

2.4 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, provide one of the following, or equal as approved by District:
 - a. BASF Building Systems; Sonolac.
 - b. Pecora Corporation; AC-20+.
 - c. Tremco Incorporated; Tremflex 834.

2.5 PREFORMED JOINT SEALANTS

- A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
- B. Products: Subject to compliance with requirements, provide the following, or equal as approved by District:
 - 1. Dow Corning Corporation; 123 Silicone Seal.
 - 2. GE Advanced Materials - Silicones; UltraSpan US1100.
 - 3. Pecora Corporation; Sil-Span.
 - 4. Sealex, Inc.; ImmerSeal.

2.6 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bicellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Remove laitance and form-release agents from concrete.
 - 3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

- A. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

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 hollow-metal work.
- B. Related Requirements:
 - 1. Section 08 71 00 "Door Hardware" for door hardware for hollow metal doors.
 - 2. Section 08 80 00 "Glazing" for glazing in hollow metal doors.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.

9. Details of conduit and preparations for power, signal, and control systems.

- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal as approved by District:
1. Amweld International, LLC.
 2. Ceco Door Products; an Assa Abloy Group company.
 3. Curries Company; an Assa Abloy Group company.
 4. Door Components, Inc.
 5. Steelcraft; an Allegion company.
 6. Stiles Custom Metal, Inc.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Commercial Doors and Frames: NAAMM-HMMA 861. At locations indicated in the Door and Frame Schedule.
1. Physical Performance: Level A according to SDI A250.4.

2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum G60 coating.
 - d. Edge Construction: Continuously welded with no visible seam.
 - e. Core: Steel stiffened.
 - 1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum G60 coating.
 - b. Construction: Full profile welded.
4. Louvers: Provide louvers for doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
5. Exposed Finish: Prime.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B..
 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
 - d. Edge Construction: Model 1, Full Flush.
 - e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
 - f. Core: Manufacturer's standard.
 - g. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated and temperature-rise-rated doors.
 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
 - b. Construction: Full profile welded.
 3. Exposed Finish: Prime.

2.4 FRAME ANCHORS

- A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 2. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.5 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

- B. Hollow-Metal Doors:
1. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
 2. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
 3. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
 4. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 5. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 3. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 4. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 2. Provide loose stops and moldings on inside of hollow-metal work.
 3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - d. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

- e. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
- 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
- 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
- 4. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
- 5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

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. Solid-core doors with transparent finished faces.
- 2. Factory fitting flush wood doors to frames and factory machining for hardware.

- B. Related Requirements:

- 1. Section 08 71 00 "Door Hardware" for hardware of both swing doors and sliding doors.
- 2. Section 08 80 00 "Glazing" for glass view panels in flush wood doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings.

- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

- 1. Dimensions and locations of blocking.
- 2. Dimensions and locations of mortises and holes for hardware.
- 3. Dimensions and locations of cutouts.
- 4. Undercuts.
- 5. Requirements for veneer matching.
- 6. Doors to be factory finished and finish requirements.

- C. Samples for Verification:

- 1. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each transparent veneer finish and opaque finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.5 QUALITY ASSURANCE

- A. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal as approved by District:
 - 1. Algoma Hardwoods, Inc.
 - 2. Eggers Industries.
 - 3. Graham Wood Doors; an Assa Abloy Group company.
 - 4. Marshfield Door Systems, Inc.
- B. Source Limitations: Obtain flush wood doors indicated to be blueprint matched from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

- B. WDMA I.S.1-A Performance Grade: Heavy Duty.
- C. Particleboard-Core Doors:
 - 1. Particleboard: ANSI A208.1, Grade LD-1 or Grade LD-2, made with binder containing no urea-formaldehyde.
 - 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 - 3. Provide doors with glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
 - 1. Grade: Premium, with Grade AA faces.
 - 2. Species: Match College of Marin Representative's sample.
 - 3. Cut and Match: Match College of Marin Representative's sample.
 - 4. Exposed Vertical and Top Edges: Same species as faces or a compatible species - edge Type A.
 - 5. Core: Particleboard.
 - 6. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.
 - 7. Construction: Seven plies, either bonded or nonbonded construction.
 - 8. WDMA I.S.1-A Performance Grade: Heavy Duty.

2.4 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 - 1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

2.5 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 5, conversion varnish.
 - 3. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS AND FRAMES

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. Access doors and frames for walls and ceilings.
- B. Related Requirements:
 - 1. Section 09 29 00 "Gypsum Board."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Detail fabrication and installation of access doors and frames for each type of substrate.
- C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
- D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES AT TILED WALLS

- A. Product: Karp Type DSC-214M Stainless Steel, or equal. Door to be 14 gauge stainless steel, fitted flush with flange of frame. Frame to be 16 gauge stainless steel. Flange of frame to be nominal 1 in. wide.

2.2 METAL ACCESS DOORS AT CEILINGS

- A. Fire-Rated Gypsum Board Partitions: Wind Lock GRRG 18"x18" Interior Drop-in access panel, or equal as approved by District.

2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 - 1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
 - 2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For cylinder locks, furnish two keys per lock and key all locks alike.
 - 2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Stainless-Steel Finishes:
 - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 08 41 13

INTERIOR ENTRANCES AND GLAZING ASSEMBLIES

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. Meeting Room Storefronts.
 - 2. Office Storefronts.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants."
 - 2. Section 08 80 00 "Glazing."

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Verification: For each type of exposed finish required. Provide large format samples of the following:
 - 1. Each Aluminum Framing Finish: min. 1 ft. long extrusion with applied finish.
- C. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For aluminum-framed entrances and glazing assemblies, for tests performed by manufacturer and witnessed by a qualified testing agency.

- C. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and glazing assemblies to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by College of Marin Representative, except with College of Marin Representative's approval. If changes are proposed, submit comprehensive explanatory data to College of Marin Representative for review.

1.8 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of aluminum-framed entrances and glazing assemblies that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Failure of operating components.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain aluminum-framed entrances and glazing assembly materials and accessories from single source from single manufacturer or from source approved by the entrances and glazing assemblies' manufacturer.

2.2 MANUFACTURERS

- A. Meeting Room Storefront Manufacturer: Oldcastle "MS 360", or equal, as approved by the District. Provide clear anodized finish.
- B. Office Storefront Manufacturer: Oldcastle "FG 2000", or equal, as approved by the District. Provide clear anodized finish. System coordinates with wood sliding doors specified in Section 08 14 16 "Flush Wood Doors."
- C. Source Limitations: Obtain all components of aluminum-framed entrance and glazing assemblies, including accessories, from single manufacturer.

2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.

2.4 GLAZING

- A. Glazing: Comply with Section 08 80 00 "Glazing."

2.5 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

2.6 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

- A. Refer to Section 09 96 00 "High Performance Coatings." Color to be selected by College of Marin Representative from manufacturer's standards for specified system.

2.8 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- B. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components plumb and true in alignment with established lines and grades.
- D. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- E. Install glazing as specified in Section 08 80 00 "Glazing."
- F. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and glazing assemblies to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.5 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for College of Marin's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION

SECTION 08 51 13
ALUMINUM WINDOWS

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 aluminum windows for exterior locations.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants."
 - 2. Section 08 80 00 "Glazing."

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
 - 3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
 - 4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 - 5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: For aluminum windows.

1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
 - C. Samples: For each exposed product and for each color specified, **[2 by 4 inches]** <Insert dimensions> in size.
 - D. Samples for Initial Selection: For units with factory-applied finishes.
 1. Include Samples of hardware and accessories involving color selection.
 - E. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:
 1. Exposed Finishes: **[2 by 4 inches]** <Insert dimensions>.
 2. Exposed Hardware: Full-size units.
 - F. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For manufacturer and Installer.
 - B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
 - C. Field quality-control reports.
 - D. Sample Warranties: For manufacturer's warranties.
- 1.6 QUALITY ASSURANCE
- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
 - B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- 1.7 WARRANTY
- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.

2. Warranty Period:
 - a. Window: [10] <Insert number> years from date of Substantial Completion.
 - b. Glazing Units: [Five] [10] [20] <Insert number> years from date of Substantial Completion.
 - c. Aluminum Finish: [10] [20] <Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: International Window Corp. "No. 6280", or equal as approved by the District. Provide block framed fixed and sliding types. Provide manufacturer's aluminum wire screens at sliding windows.
- B. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 1. Window Certification: AAMA certified with label attached to each window.
 2. Windows shall comply with Section 1709.5 of the 2013 California Building Code as adopted by the city of Novato including, but not limited to, performance and anchorage.
 3. Windows shall be tested and labeled as required by Section 1709.5.1 or shall be tested according to 1709.5.2
 4. Testing required by 1709.5.2 shall be in accordance with ASTM E330 and the design wind loads determined in Section 1605.3.
 5. Glazing shall comply with Section 2403 of the 2013 California Building Code.
 6. Water Penetration Resistance: No water infiltration when tested in accordance with ASTM E1105 procedure B for four cycles of five minutes each at a differential pressure of 15 percent of the positive design wind load from 1605.3.
 7. Testing shall demonstrate compliance with, as a minimum, the requirements for Performance Class "LC" and optional Performance Grade "40" in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 for air infiltration, water penetration, and structural performance.

2.3 ALUMINUM WINDOWS

- A. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
- B. Insulating-Glass Units: ASTM E 2190. Refer to Section 08 80 00 "Glazing."
- C. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- D. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material

compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: As selected by College of Marin Representative from manufacturer's full range.

2.4 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- D. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.
- E. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.
- F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

- A. Provide two-coat fluoropolymer coating that meets AAMA 2605. College of Marin Representative shall select color from manufacturer's standards.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

- A. Initial Testing: The College of Marin may engage a qualified consultant to perform field tests on the installed windows, in accordance with ASTM E1105 Procedure B (cyclic) for four cycles at the pressure noted herein, to verify compliance with specified requirements.
 - 1. The testing will be conducted throughout the duration of the project and shall be scheduled for selected windows as soon as practical after perimeter sealant joints have cured (approximately 7 - 10 days after installation or as recommended by the sealant manufacturer).
 - 2. Cost of testing, including staging, temporary assemblies, access to utilities, and other facilities required by the testing consultant will be at College of Marin's expense.
 - 3. College of Marin's consultant will issue a written report in accordance with ASTM E1105 documenting the test results.
- B. Re-Testing: Installations which fail the test shall be modified and retested by the Contractor.
 - 1. Scope of retesting will be determined by College of Marin's consultant based on results of previous tests and inspections.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY:

- A. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.
 - 1. Door hardware for steel (hollow metal) doors.
 - 2. Door hardware for aluminum doors.
 - 3. Door hardware for wood doors.
 - 4. Door hardware for other doors indicated.
 - 5. Keyed cylinders as indicated.

- B. Related Sections:
 - 1. Division 6: Rough Carpentry.
 - 2. Division 8: Aluminum Doors and Frames
 - 3. Division 8: Hollow Metal Doors and Frames.
 - 4. Division 8: Wood Doors.
 - 5. Division 26 Electrical
 - 6. Division 28: Electronic Security

- C. References: Comply with applicable requirements of the following standards. Where these standards conflict with other specific requirements, the most restrictive shall govern.
 - 1. Builders Hardware Manufacturing Association (BHMA)
 - 2. NFPA 101 Life Safety Code
 - 3. NFPA 80 -Fire Doors and Windows
 - 4. ANSI-A156.xx- Various Performance Standards for Finish Hardware
 - 5. UL10C – Positive Pressure Fire Test of Door Assemblies
 - 6. ANSI-A117.1 – Accessible and Usable Buildings and Facilities
 - 7. DHI /ANSI A115.IG – Installation Guide for Doors and Hardware
 - 8. ICC – International Building Code

- D. Intent of Hardware Groups
 - 1. Should items of hardware not definitely specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
 - 2. Where items of hardware aren't definitely or correctly specified, are required for completion of the Work, a written statement of such omission, error, or other discrepancy to be submitted to Architect, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.

- E. Allowances
 - 1. Refer to Division 1 for allowance amount and procedures.

- F. Alternates

1. Refer to Division 1 for Alternates and procedures.
- 1.2 SUBSTITUTIONS:
- A. Comply with Division 1.
- 1.3 SUBMITTALS:
- A. Comply with Division 1.
 - B. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the "design intent" of the system/assembly is understood and can be reviewed together.
 - C. Product Data: Manufacturer's specifications and technical data including the following:
 1. Detailed specification of construction and fabrication.
 2. Manufacturer's installation instructions.
 3. Wiring diagrams for each electric product specified. Coordinate voltage with electrical before submitting.
 4. Submit 6 copies of catalog cuts with hardware schedule.
 5. Provide 9001-Quality Management and 14001-Environmental Management for products listed in Materials Section 2.2
 - D. Shop Drawings - Hardware Schedule: Submit 6 complete reproducible copy of detailed hardware schedule in a vertical format.
 1. List groups and suffixes in proper sequence.
 2. Completely describe door and list architectural door number.
 3. Manufacturer, product name, and catalog number.
 4. Function, type, and style.
 5. Size and finish of each item.
 6. Mounting heights.
 7. Explanation of abbreviations and symbols used within schedule.
 8. Detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment and access control equipment, and door and frame rough-ins required for specific opening.
 - E. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.
 1. Templates, wiring diagrams and "reviewed Hardware Schedule" of electrical terms to electrical for coordination and verification of voltages and locations.
 - F. Samples: (If requested by the Architect)
 1. 1 sample of Lever and Rose/Escutcheon design, (pair).
 2. 3 samples of metal finishes
 - G. Contract Closeout Submittals: Comply with Division 1 including specific requirements indicated.
 1. Operating and maintenance manuals: Submit 3 sets containing the following.

- a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Name, address, and phone number of local representative for each manufacturer.
 - d. Parts list for each product.
2. Copy of final hardware schedule, edited to reflect, "As installed".
 3. Copy of final keying schedule
 4. As installed "Wiring Diagrams" for each piece of hardware connected to power, both low voltage and 110 volts.
 5. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

1.4 QUALITY ASSURANCE

A. Comply with Division 1.

1. Statement of qualification for distributor and installers.
2. Statement of compliance with regulatory requirements and single source responsibility.
3. Distributor's Qualifications: Firm with 3 years experience in the distribution of commercial hardware.
 - a. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.
 - b. Hardware Schedule shall be prepared and signed by an AHC.
4. Installer's Qualifications: Firm with 3 years experienced in installation of similar hardware to that required for this Project, including specific requirements indicated.
5. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.
 - a. Provide UL listed hardware for labeled and 20 minute openings in conformance with requirements for class of opening scheduled.
 - b. Underwriters Laboratories requirements have precedence over this specification where conflict exists.
6. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.

B. Review Project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and furnish hardware in compliance with the Specification unless otherwise directed in writing by the Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Comply with Division 1.

1. Deliver products in original unopened packaging with legible manufacturer's identification.
2. Package hardware to prevent damage during transit and storage.
3. Mark hardware to correspond with "reviewed hardware schedule".
4. Deliver hardware to door and frame manufacturer upon request.

B. Storage and Protection: Comply with manufacturer's recommendations.

1.6 PROJECT CONDITIONS:

- A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
- B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.7 WARRANTY:

- A. Refer to Conditions of the Contract
- B. Manufacturer's Warranty:
 - 1. Closers: Ten years
 - 2. Exit Devices: Five Years
 - 3. Locksets & Cylinders: Three years
 - 4. All other Hardware: Two years.

1.8 OWNER'S INSTRUCTION:

- A. Instruct Owner's personnel in operation and maintenance of hardware units.

1.9 MAINTENANCE:

- A. Extra Service Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals Section.
 - 1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
 - 2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.
 - 3. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra service materials.
- B. Maintenance Service: Submit for Owner's consideration maintenance service agreement for electronic products installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. The following manufacturers are approved subject to compliance with requirements of the Contract Documents. Approval of manufacturers other than those listed shall be in accordance with Division 1.

<u>Item:</u>	<u>Manufacturer:</u>	<u>Approved:</u>
Hinges	Stanley	
Continuous Hinges	Stanley	
Locksets	Best	No Substitution
Cylinders	Best	No Substitution
Exit Devices	Precision	Von Duprin

Closers	Stanley D-4550	LCN4040XP, Norton 7500
Automatic Operators	Stanley D-4990	No Substitution
Push/Pull Plates	Trimco	Don Jo, Hager
Push/Pull Bars	Trimco	Don Jo, Hager
Protection Plates	Trimco	Don Jo, Hager
Overhead Stops	ABH	Rixson, Glynn Johnson
Door Stops	Trimco	Don Jo, Hager
Flush Bolts	Trimco	Don Jo, Hager
Coordinator & Brackets	Trimco	Don Jo, Hager
Threshold & Gasketing	National Guard	Reese, Pemko

2.2 MATERIALS:

A. Hinges: Shall be Five Knuckle Ball bearing hinges

1. Template screw hole locations
2. Bearings are to be fully hardened.
3. Bearing shell is to be consistent shape with barrel.
4. Minimum of 2 permanently lubricated non-detachable bearings on standard weight hinge and 4 permanently lubricated bearing on heavy weight hinges.
5. Equip with easily seated, non-rising pins.
6. Non Removable Pin screws shall be slotted stainless steel screws.
7. Hinges shall be full polished, front, back and barrel.
8. Hinge pin is to be fully plated.
9. Bearing assembly is to be installed after plating.
10. Sufficient size to allow 180-degree swing of door
11. Furnish five knuckles with flush ball bearings
12. Provide hinge type as listed in schedule.
13. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
14. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
15. UL10C listed for Fire rated doors.

B. Geared Continuous Hinges:

1. Tested and approved by BHMA for ANSI A156.26-1996 Grade 1
2. Anti-spinning through fastener
3. UL10C listed for 3 hour Fire rating
4. Non-handed
5. Lifetime warranty
6. Provide Fire Pins for 3-hour fire ratings
7. Sufficient size to permit door to swing 180 degrees

C. Door Closers shall:

1. Tested and approved by BHMA for ANSI 156.4, Grade 1
2. UL10C certified
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Closer shall have extra-duty arms and knuckles
5. Conform to ANSI 117.1
6. Maximum 2 7/16 inch case projection with non-ferrous cover
7. Separate adjusting valves for closing and latching speed, and backcheck

8. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions
9. Full rack and pinion type closer with 1½" minimum bore
10. Mount closers on non-public side of door, unless otherwise noted in specification
11. Closers shall be non-handed, non-sized and multi-sized.

D. Low Energy Operators shall:

1. Conform to ANSI/BHMA A156.19 as a low energy power opening device.
2. Be listed under UL228, UL325, UL10B, UL10C, UBC 7.2 and FCC listed.
3. Shall be non-handed.
4. Be rated for door panels weighing up to 350 lbs (160 kg).
5. The manual door closer within the Low Energy Operator shall be adjusted to meet Americans with Disabilities Act (ADA) 5 lbs opening force [Push-Side applications only]
6. Operator shall be isolated from mounting plate with rubber mounts to mitigate the transmission of forces between the door and the operator.
7. Shall have a position encoder to communicate with microprocessor.
8. Incorporate a resettable powered operation counter that tracks both powered and non-powered cycling of the Operator.
9. Incorporate the following adjustable settings:
 - i. Hold Open Timer, to 28 seconds
 - ii. Open Speed
 - iii. Backcheck Speed
 - iv. Vestibule Sequence Timer
10. Include DIP switch controls for:
 - i. On board diagnostics
 - ii. Power close
 - iii. Push and Go operation
 - iv. Time delay logic for electrified hardware components
11. Include terminals for auxiliary controls including:
 - i. Activation devices; provide two discrete inputs
 - ii. Vestibule sequencing
12. Control switches including:
 - i. Day/Night open (illuminated)
 - ii. Power On-Off
13. Includes adhesive Low Energy Operator mounting templates.
14. R-14 Aluminum Allow Materials
15. For non-powered operation, the unit shall function as a standard door closer with adjustable spring force size 1 thru 6.

E. Kickplates: Provide with four beveled edges ANSI J102, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

F. Mop plates: Provide with four beveled edges ANSI J103, 4 inches high by width less 1 inch on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

G. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.

2.3 FINISH:

- A. Designations used in Schedule of Finish Hardware - 3.05, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products
- B. Powder coat door closers to match other hardware, unless otherwise noted.
- C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.4 KEYS AND KEYING:

- A. Provide keyed brass construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway (or key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.
- B. Cylinders, removable and interchangeable core system: Best CORMAX™ Patented 7-pin.
- C. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate."
- D. Transmit Grand Masterkeys, Masterkeys and other Security keys to Owner by Registered Mail, return receipt requested.
- E. Furnish keys in the following quantities:
 - 1. 1 each Grand Masterkeys
 - 2. 4 each Masterkeys
 - 3. 2 each Change keys each keyed core
 - 4. 15 each Construction masterkeys
 - 5. 1 each Control keys
- F. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Hardware Supplier. Construction cores and keys remain the property of the Hardware Supplier.
- G. Keying Schedule: Arrange for a keying meeting, and programming meeting with Architect Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of keying and programming schedule to Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.
 - 1. Do not proceed until unsatisfactory conditions have been corrected.

3.2 HARDWARE LOCATIONS:

- A. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.
 - 1. Recommended Locations for Builder's Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).
 - 2. Recommended locations for Architectural Hardware for flush wood doors (DHI).
 - 3. WDMA Industry Standard I.S.-1A-04, Industry Standard for Architectural wood flush doors.

3.3 INSTALLATION:

- A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- B. Conform to local governing agency security ordinance.
- C. Install Conforming to ICC/ANSI A117.1 Accessible and Usable Building and Facilities.
 - 1. Adjust door closer sweep periods so that from the open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door.
- D. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.

3.4 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT

- A. Contractor/Installers, Field Services: After installation is complete, contractor shall inspect the completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawings.
 - 1. Check and adjust closers to ensure proper operation.
 - 2. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.
 - a. Verify levers are free from binding.
 - b. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.
 - 3. Report findings, in writing, to architect indicating that all hardware is installed and functioning properly. Include recommendations outlining corrective actions for improperly functioning hardware if required.

3.5 SCHEDULE OF FINISH HARDWARE:

Manufacturer List

<u>Code</u>	<u>Name</u>
NA	National Guard
SD	Stanley Door Closers
ST	Stanley
TR	Trimco

Option List

<u>Code</u>	<u>Description</u>
MC	Metal Cover
B4E	Beveled 4 Edges
CSK	Counter Sunk Screw Holes
LDW	Less Door Width

Finish List

<u>Code</u>	<u>Description</u>
626	Satin Chromium Plated
628	Satin Aluminum, Clear Anodized
630	Satin Stainless Steel
689	Aluminum Painted
US26D	Chromium Plated, Dull

Hardware Sets

SET #1

Doors: 201, 202, 203, 204, 205, 206, 208

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Secure All Lock System	by Others		
1 Wall Bumper	by Owner	626	BY
1 Gasketing	S88D Head & Jambs		PE

SET #2

Doors: 209, 213

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Secure All Lock System	by Others		
1 Door Closer	CLD-4551 STD W/PA BRKT MC	689	SD
1 Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	by Owner	626	BY
1 Gasketing	S88D Head & Jambs		PE

SET #3

Doors: 210, 211

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Secure All Lock System	by Others		
1 Wall Bumper	by Owner	626	BY
1 Gasketing	S88D Head & Jambs		PE

SET #4

Doors: E100A, E100B

1 Low Energy Operator	CLD-4990	628	SD
2 Full Length Actuator Plate	10LPR36-HW	630	BEA
1 Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR

NOTE: Balance of hardware to remain.

SET #5

Doors: E102A, E110, ES1A, E105, E101

1 Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
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NOTE: Balance of hardware to remain.

SET #5.1

Doors: E108, E109

1 Low Energy Operator	CLD-4990	628	SD
2 Full Length Actuator Plate	10LPR36-HW	630	BEA
1 Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR

NOTE: Balance of hardware to remain.

SET #6

Doors: 112

3 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Secure All Lock System	by Others		
2 Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1 Floor Stop	by Owner	626	BY
1 Door Shoe	215AV		PE
1 Gasketing	S88D Head & Jambs		PE

SET #6.1

Doors: S1

3 Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1 Secure All Lock System	by Others		
1 Door Closer	CLD-4551 STD W/PA BRKT MC	689	SD
2 Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	by Owner	626	BY
1 Gasketing	S88D Head & Jambs		PE

SET #6.2

Doors: 215

3 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Secure All Lock System	by Others		
1 Door Closer	CLD-4551 STD W/PA BRKT MC	689	SD
1 Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1 Floor Stop	by Owner	626	BY
1 Door Shoe	215AV		PE
1 Gasketing	S88D Head & Jambs		PE

SET #7

Doors: G1, G2

6 Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1 Padlock	A6460		AM
1 Hasp	A825		AM
1 Cane Bolt	SP 1009-18"		ST

SECTION 08 80 00

GLAZING

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 glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.
- B. Related Sections:
 - 1. Section 08 11 13 "Hollow Metal Doors and Frames."
 - 2. Section 08 41 13 "Interior Entrances and Glazing Systems."
 - 3. Section 08 51 13 "Aluminum Windows."

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:
 - 1. Design Wind Pressures: As required by Applicable Codes.
 - 2. Design Wind Pressures: Determine design wind pressures applicable to Project according to the California Building Code, based on heights above grade indicated on Drawings.

3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
 4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
 5. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 6. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
 7. Provide tempered or laminated glazing where required to meet safety glazing requirements of Local Authorities Having Jurisdiction (AHJ).
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
1. Tinted glass.
 2. Patterned glass.
 3. Coated glass.
 4. Insulating glass.
- C. Glazing Accessory Samples: For gaskets, sealants, and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers and manufacturers of insulating-glass units with sputter-coated, low-e coatings.
- B. Product Certificates: For glass and glazing products, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for coated glass and insulating glass.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Source Limitations for Glass: Obtain coated float glass, and insulating glass from single source from single manufacturer for each glass type.
- F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA's "Glazing Manual."
 - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
 - 3. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- I. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other

openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

- J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- K. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.11 WARRANTY

- A. Contractor's Labor and Material Guarantee: Correct defective Work at no cost to the College of Marin.
 - 1. Warranty Period: 1 year from the date of Final Completion in accordance with Document 00 65 36 – Warranty Form Contractor's Guarantee.
- B. Special Manufacturer's Warranty: Warranty all work under this section in a written document endorsed by the Manufacturer:
 - 1. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - a. Warranty Period: 10 years from date of Final Completion.
 - 2. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - a. Warranty Period: 10 years from date of Final Completion.

3. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - a. Warranty Period: 10 years from date of Final Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
- B. Strength: Provide glass products to meet local building codes. Where safety glass is required, provide tempered glass or laminated glass. Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 2. For uncoated glass, comply with requirements for Condition A.
 3. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.3 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
 2. Spacer: Aluminum with black, color anodic finish.
 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.4 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
 2. Interlayer Thickness: Provide thickness not less than needed to comply with requirements.
 3. Interlayer Color: Refer to Drawings.

2.5 GLAZING SEALANTS

- A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 4. Colors of Exposed Glazing Sealants: As selected by College of Marin Representative from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT. Black color.
1. Products: Subject to compliance with requirements, provide the following, or equal:
 - a. Dow Corning Corporation; 790.
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
 - c. Pecora Corporation; 890.
 - d. Sika Corporation, Construction Products Division; SikaSil-C990.
 - e. Tremco Incorporated; Spectrem 1.

2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
- B. Related Requirements:
 - 1. Section 09 21 16 "Gypsum Board Shaft Wall Assemblies".
 - 2. Section 09 29 00 "Gypsum Board".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated. No other coating is acceptable.
- B. Standard Studs and Runners: ASTM C 645.
 - 1. Steel Studs and Runners:

- a. Minimum Base-Metal Thickness: 25 gauge, unless otherwise indicated on Drawings.
- C. Slip-Type Head Joints: Provide one of the following:
1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: Subject to compliance with requirements, provide the following, or equal as approved by the District:
 - 1) ClarkDietrich Building Systems; BlazeFrame DSL Slotted Deflection Track
 - 2) MBA Building Supplies; FlatSteel Deflection Track.
 - 3) Steel Network Inc. (The); VertiTrack VTD Series.
 - 4) Superior Metal Trim; Superior Flex Track System (SFT).
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
- E. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.
 1. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 1. Minimum Base-Metal Thickness: 25 gauge, unless otherwise indicated on Drawings.
 2. Depth: 7/8 in. unless otherwise indicated on Drawings.
 3. Product: Clark Dietrich RC Deluxe.
- G. Resilient Furring Channels: 0.053 inch uncoated steel thickness, with minimum 1/2-inch-wide flanges. ClarkDietrich Building Systems Resilient Channel RC Deluxe, or equal as approved by the District.
- H. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
 1. Depth: As indicated on Drawings.
 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch.
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, expansion anchor.
 - 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Flat Hangers: Steel sheet, in size indicated on Drawings.
- E. Carrying Channels, typical at Gypsum Board Ceilings, unless otherwise indicated on Drawings: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch- wide flanges. 1 ½ in. deep and spaced at 48 in. on center, unless otherwise indicated on Drawings.
- F. Furring Members:
 - 1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep. 25 gauge, fastened and perpendicular to carrying channels at 16 in. on center, typical, at gypsum board ceilings unless otherwise indicated on Drawings.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock. Provide where indicated on Drawings.
 - 1. Products: Subject to compliance with requirements, provide the following, or equal as approved by the District:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; Drywall Grid System.
 - c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

D. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Z-Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not attach hangers to steel roof deck.
 - 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

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. Interior gypsum board.
2. Tile backing panels.
3. Moisture-resistant gypsum board.
4. Acoustical gypsum board.
5. Acoustical Sealant.

B. Related Requirements:

1. Section 07 21 00 "Building Insulation" for Sound Attenuation Blankets.
2. Section 09 22 16 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
3. Section 09 21 16.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide the following, or equal as approved by the District:

1. American Gypsum.
2. CertainTeed Corp.
3. Georgia-Pacific Gypsum LLC.
4. National Gypsum Company.
5. USG Corporation.
6. Saint Gobain.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

D. Water Resistant Gypsum Board: Glass-Mat Gypsum Board (Siliconized Gypsum Board) (SGB) – Exterior and Perimeter Wall Locations: ASTM C1177M, gypsum based board with water-resistant treated core, fully embedded glass fiber mats on both sides with a polymer modified gypsum surface and acrylic face coating, 1200 wide by longest lengths practicable. Thickness unless specified otherwise-16 mm thickness; ends square cut, tapered.

1. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
2. Exposure Warranty: Manufacturers standard 12-month warranty.
3. Product: DensGlass Fireguard sheathing by Georgia-Pacific Gypsum LLC.
4. Acceptable Alternate Products: Subject to the requirements of this article 'CGC Securock Glass-Mat Sheathing Type X' manufactured by CGC Inc. or 'GlasRoc Sheathing Type X 5/8"' by CertainTeed Corp.

E. Acoustical Gypsum Board: Quiet Rock "510", or equal as approved by the District.

2.4 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges. Provide at bathtub and shower enclosures, trash termination room, janitor's closet and other locations indicated on Drawings.

1. Products: Subject to compliance with requirements, provide the following, or equal as approved by the District:
 - a. Georgia-Pacific Gypsum LLC; DensShield FireGuard.
2. Core: 5/8 inch, Type X.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - e. F-Bead: F-shaped; exposed long flange receives joint compound.
 - f. Z-Bead: Z-shaped; exposed long flange receives joint compound.
 - g. Expansion (control) joint.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 1. Manufacturers: Subject to compliance with requirements, provide the following, or equal as approved by the District:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound
- D. Joint Compound for Tile Backing Panels:
1. Tile Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Fire and Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 1. Products: Subject to compliance with requirements, provide the following, or equal as approved by the District:
 - a. Pecora Corporation; AC-20 FTR .
 - b. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - c. USG Corporation; SHEETROCK Acoustical Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Face layer of gypsum board is to be held back ¼ in. from intersecting surfaces and sealed airtight with acoustical sealant. Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD, IMPACT-RESISTANT, AND WATER-RESISTANT GYPSUM BOARDS

- A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- B. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying face layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- D. Fire-Rated Gypsum Assemblies: Refer to Section 07 92 00 "Joint Sealants" for sealants at fire-rated assemblies.
1. Marking and identification. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
 - a. Be located in accessible concealed floor, floor-ceiling or *attic* spaces;
 - b. Be repeated at intervals not exceeding 30 feet (914 mm) measured horizontally along the wall or partition; and
 - c. Include lettering not less than 0.5 inch (12.7 mm) in height, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS," or other wording.

Exception: Walls in Group R-2 occupancies that do not have a removable decorative ceiling allowing access to the concealed space.

3.4 APPLYING TILE BACKING PANELS

- A. Tile Backing Panels: ANSI A108.11, at showers, tubs, and where indicated.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. Bullnose Bead: Use at outside corners.
 - 3. LC-Bead: Use at exposed panel edges.
 - 4. L-Bead: Use where indicated.
 - 5. U-Bead: Use at exposed panel edges.
- C. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 3: Where indicated on Drawings.
 - 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

5. Level 5: At locations indicated on the Drawings as accent, graphics and specialty walls.
 - a. Primer and its application to surfaces are specified in Section 099100 "Painting."
- E. Tile Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 30 00

TILING

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. Porcelain tile.
 - 2. Waterproof membrane.
- B. Related Sections:
 - 1. Section 09 29 00 "Gypsum Board" for tile backer board.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PERFORMANCE REQUIREMENTS

- A. Dynamic Coefficient of Friction: Not less than 0.42 per ANSI A137.1.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- D. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
 - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
 - 3. Full-size units of each type of trim and accessory for each color and finish required.
 - 4. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Material Test Reports: For each tile-setting and -grouting product and special purpose tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Waterproof membrane.
2. Metal edge strips.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store liquid materials in unopened containers and protected from freezing.
- D. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
- E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

- A. Wall: Crossville Inc, "Retro Active" Porcelain, or equal, as approved by the District. Size: 5 3/4" x 11 3/4", 5/16" thickness.

- B. Floor: Dal Tile, "Unity" Porcelain, or equal, as approved by the District. Size: 12"x24". Provide floor cove base and cove base corner tile to match the floor tile.

2.3 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.
 - 1. Products: Subject to compliance with requirements, provide the following, or equal as approved by the District:
 - a. Noble Company (The); Nobleseal TS.

2.4 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the following, or equal as approved by the District:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
 - 4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.5 GROUT MATERIALS

- A. Polymer-Modified Tile Grout: ANSI A118.7.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the following, or equal as approved by the District:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - 2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

2.6 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 079200 "Joint Sealants."
 - 1. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.
- C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
 - 1. Products: Subject to compliance with requirements, provide the following, or equal as approved by the District:
 - a. Dow Corning Corporation; Dow Corning 786.
 - b. GE Silicones; a division of GE Specialty Materials; Sanitary 1700.
 - c. Laticrete International, Inc.; Latacil Tile & Stone Sealant.
 - d. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
 - e. Tremco Incorporated; Tremcil 600 White.

2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; white zinc alloy exposed-edge material.
- C. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
 - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
 - 1. Products: Subject to compliance with requirements, provide the following, or equal as approved by the District:
 - a. Bonsal American; an Oldcastle company; Grout Sealer.
 - b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer.
 - c. C-Cure; Penetrating Sealer 978.
 - d. Custom Building Products; Surfaceguard Grout and Tile Sealer.

2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.

- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with College of Marin Representative.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors composed of tiles 8 by 8 inches or larger.

- c. Tile floors composed of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile at Walls and Floors: 1/16 inch.
 - 2. Glazed Wall Tile: 1/16 inch.
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- J. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.
- C. Acoustical Underlayment: Install in accordance with manufacturer's recommendations.

3.5 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Tile Installation F122: Thin-set mortar on waterproof membrane; TCA F122.
 - a. Thin-Set Mortar: Latex- portland cement mortar.
 - b. Grout: Polymer-modified sanded grout.

END OF SECTION

SECTION 09 51 23

ACOUSTICAL CEILINGS

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 acoustical tiles and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Tile: Set of 6-inch- square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.
- C. 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. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Size and location of initial access modules for acoustical tiles.
 - 4. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access tiles.
 - 5. Perimeter moldings.
- D. Qualification Data: For testing agency.
- E. Product Test Reports: For each acoustical tile ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- F. Evaluation Reports: For each acoustical tile ceiling suspension system and anchor and fastener type, from ICC-ES.

- G. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Acoustical Ceiling Tiles: Full-size tiles equal to 2 percent of quantity installed.
 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockup of typical ceiling area as shown on Drawings.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical tiles, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to 2016 California Building Code.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 450 or less.

2.2 MANUFACTURERS

- A. Typical Product: Armstrong World Industries "Ultima no. 1914", or equal as approved by the District. 2 ft. by 4 ft. panel with beveled tegular edges.
- B. For Areas with a 2 ft. by 2 ft. diffuser: Armstrong World Industries "Ultima no. 1911", or equal as approved by the District. 2 ft. by 2 ft. panel with beveled tegular edges.
- C. Suspension System: Armstrong World Industries "Prelude XL", or equal as approved by the District.

2.3 ACOUSTICAL TILES, GENERAL

- A. Source Limitations:
 - 1. Acoustical Ceiling Tile: Obtain each type from single source from single manufacturer.
 - 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Glass-Fiber-Based Tiles: Made with binder containing no urea formaldehyde.
- C. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.
 - 2. Acoustical tiles shall be made from plant-based materials and shall contain no formaldehyde.
- D. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by College of Marin Representative from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung, heavy-duty metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Post-installed expansion anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.
- D. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical tiles in place. Armstrong BERQ-2, or equal as approved by the District.

2.5 METAL TRIM

- A. Extruded-Aluminum Edge Moldings, Shadow Mold edge trim and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
 2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical tile ceilings.
- B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical tile ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 8. Do not attach hangers to steel deck tabs.
 - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.

10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.
1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical tiles with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut tiles at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical tiles as follows:
 - a. As indicated on reflected ceiling plans.
 2. For reveal-edged tiles on suspension-system runners, install tiles with bottom of reveal in firm contact with top surface of runner flanges.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical tile ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

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. Resilient base.
 - 2. Metal edge strips.
- B. Related Sections:
 - 1. Section 09 65 19 "Resilient Tile Flooring."
 - 2. Section 09 68 13 "Tile Carpeting."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
- C. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
- E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 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. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
 1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide the following, or equal as approved by the District:
 1. Johnsonite Commercial Flooring "Baseworks."
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 1. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet.
 - b. Style B, Cove: Provide in areas with resilient flooring.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches, unless otherwise noted.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Site formed.
- G. Inside Corners: Site formed.
- H. Colors: As indicated by manufacturer's designations.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- C. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.

- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 09 65 19
RESILIENT TILE FLOORING

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. Rubber floor tile.
- B. Related Sections:
 - 1. Section 09 65 13 "Resilient Base and Accessories."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples: Full-size units of each color and pattern of floor tile required.
- D. Samples for Initial Selection: For each type of floor tile indicated.
- E. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- F. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in 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.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for floor tile including resilient base and accessories.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by College of Marin Representative.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless College of Marin Representative specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LINOLEUM TILE

- A. R1 - reception area: Forbo "Marmoleum Black Hole T3707", or equal as approved by the District.
- B. R2- kitchen: Forbo "Marmoleum Graphite T3048", or equal as approved by the District.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range recommended by flooring manufacturer.
 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations.
- C. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.

- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.

END OF SECTION

SECTION 09 68 13

TILE CARPETING

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 modular, carpet tile.
- B. Related Requirements:
 - 1. Section 07 26 16 "Concrete Vapor Treatment."
 - 2. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.
 - 9. Type, color, and location of edge, transition, and other accessory strips.
 - 10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.

- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
- B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups at locations and in sizes shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.9 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.10 WARRANTY

- A. Special Manufacturer's Warranty: Warranty all work under this section in a written document endorsed by the Manufacturer. Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, loss of face fiber, and delamination.
 - 3. Warranty Period: 10 years from date of Final Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Product: Shaw contract, Directional Tile, style no. 5T071, or equal, as approved by the District. Color name: Distance 69597, 18"x18"
 - 1. Construction: Multi-Level Pattern Loop
 - 2. Fiber: Eco Solution Q® Nylon
 - 3. Backing: EcoWorx® Tile
 - 4. Dye Method: 100% Solution Dyed
 - 5. Tufted Weight:15.0

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Refer to Section 09 65 13 "Resilient Base and Accessories" for transition strips.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 2. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving carpet tile.
 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer .
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove yarns that protrude from carpet tile surface.
 - 2. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 09 68 16

SHEET CARPETING

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. Tufted carpet.

- B. Related Requirements:

- 1. Section 02 41 16 "Selective Demolition" for removing existing floor coverings.
- 2. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet.
- 3. Section 09 68 13 "Tile Carpeting" for modular carpet tiles.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include manufacturer's written data on physical characteristics and durability.
- 2. Include manufacturer's written installation recommendations for each type of substrate.

- B. Shop Drawings: For carpet installation, showing the following:

- 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
- 2. Carpet type, color, and dye lot.
- 3. Seam locations, types, and methods.
- 4. Type of subfloor.
- 5. Type of installation.
- 6. Pattern type, repeat size, location, direction, and starting point.
- 7. Pile direction.
- 8. Types, colors, and locations of insets and borders.
- 9. Types, colors, and locations of edge, transition, and other accessory strips.
- 10. Transition details to other flooring materials.

- C. Samples for Initial Selection: For each type of product.

1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.
 - D. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 1. Carpet: 12-inch-square Sample.
 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.
 3. Carpet Seam: 6-inch Sample.
 4. Mitered Carpet-Border Seam: 12-inch-square Sample. Show carpet pattern alignment.
 - E. Product Schedule: For carpet. Use same designations indicated on Drawings.
 - F. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer.
 - B. Product Test Reports: For carpet, for tests performed by a qualified testing agency.
 - C. Sample Warranties: For special warranties.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Comply with CRI's "CRI Carpet Installation Standard."
 - B. Deliver carpet in original mill protective covering with mill register numbers and tags attached.
- 1.7 FIELD CONDITIONS
- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
 - B. Environmental Limitations: Do not deliver or install carpet until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

1.8 WARRANTY

- A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.
 - b. Loss of tuft bind strength.
 - c. Excess static discharge.
 - d. Delamination.
 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TUFTED CARPET

- A. Carpet broadloom: Shaw contract Shade Gradient, color name: Element 34583, or equal, as approved by the District.
1. Size: 12 Foot (3.66 M)
 2. Construction: Graphic Loop
 3. Product Type: Broadloom
 4. Fiber: Eco Solution Q® Nylon
 5. Backing: Ultraloc®
 6. Dye Method: 100% Solution Dyed
 7. Tufted Weight:30.0
- B. Contrasting Stripe: Provide carpeted stripes on top and bottom treads of each stair run. Interior stairs shall have the upper approach and lower tread marked by a stripe providing clear visual contrast. The stripe shall be 2 inches wide and placed parallel to, and not more than 1 inch from, the nose of the step or upper approach. The stripe shall extend the full width of the step or upper approach and shall be of material that is at least as slip resistant as the other treads of the stair (carpet).

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.
- B. Examine carpet for type, color, pattern, and potential defects.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard" and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 CARPET INSTALLATION

- A. Comply with CRI's "CRI Carpet Installation Standard" and carpet manufacturer's written installation instructions for the following:
 - 1. Stair installation.
- B. Comply with carpet manufacturer's written instructions and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
 - 1. Stretch-in Carpet Installation: Install carpet cushion seams at 90-degree angle with carpet seams.
- C. Do not bridge building expansion joints with carpet.
- D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet as marked on subfloor. Use nonpermanent, nonstaining marking device.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI's "CRI Carpet Installation Standard."
- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods recommended in writing by carpet manufacturer and carpet adhesive manufacturer.

END OF SECTION

SECTION 09 72 00

WALL COVERINGS

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. Vinyl wall covering for markerboards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
- B. Shop Drawings: Show location and extent of each wall-covering type. Indicate seams and termination points.
- C. Samples: For each type of wall covering and for each color, pattern, texture, and finish specified, 12 in. square.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity

conditions at levels intended for occupants after Project completion during the remainder of the construction period.

1. Wood-Veneer Wall Coverings: Condition spaces for not less than 48 hours before installation.
- B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.

2.2 VINYL WALL COVERING FOR MARKERBOARDS

- A. Basis of Design: Koroseal Walltalkers "M-248 Mag-Rite", or equal, as approved by the District. Provides magnetic and writing surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.

- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 2. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
- D. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- E. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 WALL-COVERING INSTALLATION

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.
- C. Install strips in same order as cut from roll.
 - 1. For solid-color, even-texture, or random-match wall coverings, reverse every other strip.
- D. Install wall covering without lifted or curling edges and without visible shrinkage.
- E. Install seams vertical and plumb at least 6 inches from outside corners and 6 inches from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.
- F. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.4 CLEANING

- A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

SECTION 09 83 00

ACOUSTIC FINISHES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Acoustic Finishes, complete, as shown and specified. Section includes the following:
 - 1. Acoustical Core Panels.
 - 2. Acoustical Panel at Underside of Stair.

- B. Work Specified Elsewhere:
 - 2. Backing Plates: Section 09 21 16.

1.2 REFERENCES

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation occurs in the referenced standards, it shall be considered mandatory. In the event of conflict, the more stringent standard or requirement shall govern.
 - 1. American Society for Testing and Materials (ASTM)
 - a. ASTM E84 "Surface Burning Characteristics of Building Materials".

1.3 SUBMITTALS

- A. Product Data: Submit for College of Marin Representative's action. Submit manufacturer's literature and installation instructions for each material and accessory, clearly notating specified requirements.

- B. Shop Drawings: Submit for College of Marin Representative's action. Submit shop drawings for the installation of the Work. On elevation, show fabric direction, panel seams, cutouts, and other details as necessary to clearly indicate arrangement of panels and materials. In details, show method of attachment to wall.

- C. Samples: Submit for College of Marin Representative's action. Furnish sufficient samples to establish full range of colors and textures for materials exposed in the finished Work. Label samples to indicate product and location in the Work. Samples will be reviewed for appearance only. Compliance with other requirements is the responsibility of the Contractor.
 - 1. Fabric: 12 in. square of each specified type.

- D. Quality Assurance/Quality Control Submittals: Submit for College of Marin Representative's information.
 - 1. Certificates:
 - a. Document Review: Submit a written statement signed by the Contractor and the Applicator stating that the Contract Documents, shop drawings and

product data have been reviewed with qualified manufacturer representatives. The statement shall certify that selected materials are proper, compatible with contiguous materials and adequate for the application shown.

b. Installer's Qualifications.

G. Closeout Submittals: Submit for College of Marin's documentation.

1. Maintenance Data for fabric.

1.6 PRODUCT HANDLING

A. Take measures as required to ensure materials are not damaged or deformed. Store products in flat position in properly ventilated, dry space. Use suitable means to prevent materials from lying in direct contact with the ground.

1.7 PROJECT CONDITIONS

A. Environmental Requirements: Store materials for 1 day prior to installation in area of installation to achieve temperature stability.

PART 2 – PRODUCTS

2.1 ASSEMBLIES

A. Acoustical Core Panels: F-Sorb "Acoustical Core System", or equal, as acceptable to the District.

1. Finish and Color: As selected by the College of Marin Representative from Manufacturer's standards.

B. Acoustical Panel at Underside of Stair: LBI/Boyd "Ecocore Panels", or equal, as acceptable to the District. 2 in. thick. Mounting as shown on Drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. Manufacturer's Instructions: Prepare substrates and install the work, including components and accessories, in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified. Examine the areas to receive the Work and remedy detrimental conditions.

B. General: Install Work plumb, level, aligned, and secured to substrates per manufacturer's recommendations.

3.2 CLEANING

A. General: On completion of installation, clean soiled surfaces and remove debris. Provide suitable protection to maintain Work of this Section clean and free of defects at Substantial Completion.

END OF SECTION

SECTION 09 91 00

PAINTING AND COATING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Painting, complete as shown and specified.
- B. Work Specified Elsewhere:
 - 1. Shop Priming of Ferrous Metal Items: Sections 05 50 00, 081113, and other applicable sections.
 - 2. Shop Finishing of Architectural Woodwork and Casework: Section 06 40 23.

1.2 SYSTEM DESCRIPTION

- A. General: Paint every interior and exterior surface, except as otherwise shown or as follows:
- B. Surfaces Not to be Painted:
 - 1. Factory-finished items specified in various Sections.
 - 2. Prefinished wall, ceiling, and floor coverings.
 - 3. Painting specified elsewhere and included in respective Sections, including but not necessarily limited to, shop priming.
 - 4. Code-Required Labels: Keep equipment identification and fire rating labels free of paint.
 - 5. Surfaces concealed in walls and above ceilings except as specifically indicated otherwise.
 - 6. Ducts, piping, conduit, and equipment concealed in walls and ceilings, unless specifically indicated otherwise.

1.3 SUBMITTALS

- A. Product Data: Submit for College of Marin Representative's action. Submit manufacturer's literature and installation instructions for each material and accessory, clearly notating specified requirements.
- B. Samples: Submit for College of Marin Representative's action. Furnish sufficient samples to establish full range of colors and textures for materials exposed in the finished Work. Label samples to indicate product and location in the Work. Samples will be reviewed for appearance only. Compliance with other requirements is the responsibility of the Contractor.
 - 1. Opaque Colors and Finishes: Submit samples, on hardboard, using materials accepted for Project, of each color and paint finish selected with texture to

simulate actual conditions. Prepare three samples, 8-1/2 inches by 11 inches, with required number of paint coats clearly visible.

2. Transparent and Stained Finishes: Prepare samples on species and quality of wood to be used in the Work. Re-submit as requested until acceptable sheen, color, and texture are achieved. Label and identify each sample as to location and application.
- C. Quality Assurance/Quality Control Submittals: Submit for College of Marin Representative's information.
1. Certificates:
 - a. Document Review: Submit a written statement signed by the Contractor and the Applicator stating that the Contract Documents, shop drawings and product data have been reviewed with qualified manufacturer representatives. The statement shall certify that selected materials are proper, compatible with contiguous materials and adequate for the application shown.
 - b. Installer's Qualifications

1.4 QUALITY ASSURANCE

- A. Qualified Installer: Installer to have 5 years' experience in the installation of specified materials on comparable projects. The firm shall have the approval of the materials manufacturer.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, and regulations of Authorities Having Jurisdiction (AHJs), including the Air Quality Management District. Obtain necessary approvals from AHJs.
- C. Visual Mock-Up(s): As directed by the College of Marin Representative, apply on actual wall surfaces where designated, samples of each and any color selected for final review.
 1. On at least 100 square feet of surface as directed, provide full-coat finish samples until required sheen, color and texture are obtained.
 2. Duplicate painted finishes of prepared samples.
 3. Simulate finished lighting conditions for review of in-place work.
- D. Labeling: Include following on label of each container:
 1. Manufacturer's name and product name.
 2. Generic type of paint.
 3. Manufacturer's stock number.
 4. Color.
 5. Instructions for reducing, where applicable.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling, and Unloading: Deliver material in sealed containers with labels legible and intact.
- B. Storage and Protection:
 - 1. Store only acceptable Project materials on Project site.
 - 2. Restrict storage to paint materials and related equipment.

1.6 PROJECT/SITE CONDITIONS

- A. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be stored and applied.
- B. Do not apply finish in areas where dust is being generated.

1.7 SCHEDULING

- A. Gypsum Board: Verify with Section 092116 that skim coat has been applied to surfaces scheduled to receive semi-gloss and gloss paints. Do not proceed until completed.

1.8 MAINTENANCE

- A. Extra Materials: At completion of Work, deliver to College of Marin extra stock of paint of one gallon of each color used of each coating material used. Tightly seal and clearly label containers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. General: Kelly Moore, Benjamin Moore, or equal, or as acceptable to the District. Product designations of Kelly Moore are specified as standard.
- B. Substitutions: For consideration, accompany substitution proposals, with manufacturer's data and current statement from a recognized independent testing agency stating that each substitution for finish coat is equal to or better than specified product.

2.2 MATERIALS

- A. General: Provide materials selected for coating system for each type of surface which are the product of single manufacturer.
- B. Unsuitability of Specified Products: Claims concerning unsuitability of any materials specified will not be entertained, unless such claim is made in writing to the College of Marin Representative before Work is started.

2.3 COLORS

- A. Color Schedule: College of Marin Representative will prepare color schedule with samples for guidance of painter and reserves right to select, allocate, and vary colors on

different surfaces throughout building. Colors may be selected by College of Marin Representative from manufacturer's standard palette or be custom mixed.

- B. Mixing: Deliver paints and stains ready mixed to Project site.

2.4 PAINT SYSTEMS

- A. Schedule: Only major areas are scheduled. Treat miscellaneous and similar items and areas within room or space with similar system.
- B. Number of Coats: Where number of coats is specified, it is only as a minimum requirement. Apply additional coats, at no additional cost to College of Marin, if necessary to completely hide base material, produce uniform color, and provide satisfactory finish result.
- C. Systems Specifications: These specifications are a guide and are meant to establish procedure and quality. Confer with College of Marin Representative to determine exact finish desired.
- D. Acceptance of Final Colors: Do not apply final coats of paint for either exterior and interior systems until colors have been accepted by College of Marin Representative.
- E. Exterior Painting Systems:
 - 1. Galvanized Steel, Zinc-Rich Painted Steel, and Aluminum:
 - a. Prime Coat: Kelly-Moore KM5725 DTM Acrylic Primer Finish.
 - b. Body Coat: Kelly-Moore 1215 Color Shield Exterior Acrylic Semi-Gloss Enamel. KM 5885 DTM High Performance Acrylic Semi-Gloss Enamel
 - c. Finish Coat: Kelly-Moore 1215 Color Shield Exterior Acrylic Semi-Gloss Enamel. KM 5885 DTM High Performance Acrylic Semi-Gloss Enamel
 - 2. Woodwork, Opaque Finish:
 - a. Prime Coat: Kelly-Moore 255 Acry-Shield 100% Acrylic Exterior Wood Primer.
 - b. Body Coat: Kelly-Moore 1215 Color Shield Exterior Acrylic Semi-Gloss Enamel.
 - c. Finish Coat: Kelly-Moore 1215 Color Shield Exterior Acrylic Semi-Gloss Enamel.
 - 3. Woodwork, Transparent Finish: United Gilsonite Laboratories ZAR Clear Wood Sealer. Provide 2 coats, or as otherwise required per Visual Mock-up.
- F. Interior Painting Systems:
 - 1. Cementitious Surfaces:
 - a. Enamel:
 - 1) Prime Coat: Kelly-Moore 971 Acry-Plex Interior PVA Primer/Sealer.

- 2) Body Coat: Kelly-Moore 1010 KM Professional Interior Acrylic Eggshell Enamel or 1650 Acry-Plex 100% Acrylic Semi-Gloss Enamel.
 - 3) Finish Coat: Kelly-Moore 1010 KM Professional Interior Acrylic Eggshell Enamel or 1650 Acry-Plex 100% Acrylic Semi-Gloss Enamel.
2. Gypsum Board:
- a. Enamel:
 - 1) Prime Coat: Kelly-Moore 971 Acry-Plex Interior PVA Primer/Sealer.
 - 2) Body Coat: Kelly-Moore 1010 KM Professional Interior Acrylic Eggshell Enamel or 1050 KM Professional Interior Acrylic Semi-Gloss Enamel.
 - 3) Finish Coat: Kelly-Moore 1010 KM Professional Interior Acrylic Eggshell Enamel or 1050 KM Professional Interior Acrylic Semi-Gloss Enamel.
 - b. Acrylic Epoxy Finish:
 - 1) Prime Coat: Kelly-Moore 971 Acry-Plex Interior PVA Primer/Sealer.
 - 2) Finish Coats: -Devoe Tru-Glaze – WB 4426 semi-gloss epoxy finish , not less than 3 mils dry film thickness.
Sierra Performance S-16 Epoxy Acrylic Wall & Trim Semi-Gloss Enamel.
3. Metal:
- a. Enamel:
 - 1) Prime Coat: Shop-applied under other applicable Section.
(Touch up with KM 5725 DTM Acrylic Primer Finish.
 - 2) Body Coat: Same as finish coat.
 - 3) Finish Coat: Kelly-Moore 1650 Acry-Plex 100% Acrylic Semi-Gloss Enamel.KM 5885 DTM High Performance Acrylic Semi-Gloss Enamel
 - b. Acrylic Epoxy Finish:
 - 1) Prime Coat: Shop-applied under other applicable Sections.
 - 2) Finish Coats: Devoe Tru-Glaze-WB 4426 Semi-Gloss Epoxy Finish, not less than 3 mils DFT.
Sierra Performance S-16 Epoxy Acrylic Wall & Trim Semi-Gloss Enamel.

4. Wood:
 - a. Prime Coat: Sierra Performance S-30 Griptec Multi-Surface Primer.
 - b. Body Coat: Kelly-Moore 1650 Acry-Plex 100% Acrylic Semi-Gloss Enamel.
 - c. Finish Coat: Kelly-Moore 1650 Acry-Plex 100% Acrylic Semi-Gloss Enamel.

- G. Miscellaneous Interior Painting Systems:
 1. Ductwork at Grilles and Diffusers: Flat black Satin Glide 128-200 latex enamel or Kelly-Moore 1240-407 Flat Carbon (Black). Apply to visible interior surfaces of ductwork.
 2. Exposed Insulated Pipes and Ductwork:
 - a. Sealer: 1 coat Kelly-Moore 971 Acry-Plex Interior PVA Primer/Sealer. Omit sealer where glass fabric jackets are used.
 - b. Body and Finish Coats: As specified for exposed non-insulated pipes, conduits, and ductwork.
 3. Exposed Non-Insulated Pipes and Ductwork: Including conduit.
 - a. Cast-Iron Pipe:
 - 1) Prime Coat: KM 5725 DTM Acrylic Primer Finish
 - 2) Body Coat: Same as finish coat.
 - 3) Finish Coat: Kelly-Moore 1010 KM Professional Interior Acrylic Eggshell Enamel or 1050 KM Professional Interior Acrylic Semi-Gloss Enamel.
 - b. Other Pipes, Conduit, and Ductwork:
 - 1) Prime Coat: As specified for ferrous and non-ferrous metals as applicable.
 - 2) Body Coat: Same as finish coat.
 - 3) Finish Coat: Kelly-Moore 1010 KM Professional Interior Acrylic Eggshell Enamel or 1050 KM Professional Interior Acrylic Semi-Gloss Enamel.
 4. Factory Finished Equipment: Satisfactorily refinish surfaces damaged before, during, or after installation as directed; use Kelly-Moore 1050 KM Professional Interior Acrylic Semi-Gloss Enamel.
 5. Finish Hardware: Specified with USP finish under Section 087100, paint as specified for metal. Color and gloss to match doors and frames as applicable, unless otherwise specified.

6. Plywood Backing: In Telephone and Electric Closets; one coat Kelly-Moore 1010 KM Professional Interior Acrylic Eggshell Enamel or 1050 KM Professional Interior Acrylic Semi-Gloss Enamel.
 7. Protective Overspray: On sprayed-on fireproofing; 2 coats Kelly-Moore 485 KM Professional Interior Acrylic Flat Wall Paint.
 8. Stair Nosings:
 - a. General: On top and bottom nosing of each run, paint 2-inch-wide stripe parallel to and not more than one inch from edge.
 - b. Application: Type and number of coats recommended by paint manufacturer for durability and slip-resistance on applicable type substrate; contrasting color as selected.
- H. Pipe Identification:
1. General: Per ANSI A13.1; buried pipe, electrical conduit, and pipe in concealed spaces such as furred spaces and shafts not included.
 2. Color Scheme: ANSI Z53.1 in combination with legend and flow markers; intermittent displays. Locate and space as specified for legend and flow markers. Safety colors as specified under applicable mechanical Section.
 3. Legend: Stencil letters of colors, type, and sizes per ANSI A13.1. Tags for identification of pipes less than 3/4-inch overall outside diameter, including valves and fittings; provided under applicable mechanical Section.
 4. Flow Markers: Provide each type with appropriate size arrows to indicate flow direction in pipe; same color as legend.
 5. Visibility: Locate legend and flowmarkers for easy visibility from operating floor; space not over 20 feet with at least one per room.

PART 3 - EXECUTION

3.1 GENERAL

- A. Manufacturer's Instructions: Prepare substrates, apply primers and apply the work, including components and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified. Examine the areas to receive the Work and remedy detrimental conditions.

3.2 SURFACE PREPARATION

- A. General: Remove scale, dirt, dust, grit, rust, wax, grease, efflorescence, loose material, and other foreign matter detrimental to proper adhesion of paint.
- B. Cementitious Surfaces:
 1. General: Repair minor cracks and holes; roughen when necessary to assure good adhesion.

2. Alkali Conditions: Test surfaces for presence of alkali. If present, neutralize as recommended by paint manufacturer, after drying remove precipitate by brushing. Do not paint if PH is above 12.
- C. Gypsum Board:
1. Narrow, Shallow Cracks and Small Holes: Fill with spackling compound.
 2. Deep, Wide Cracks and Deep Holes: Rake out, dampen with clear water, and fill with thin layers of gypsum board joint compound.
 3. Curing: Allow to dry.
 4. Sanding: Sand smooth after drying; do not raise nap of paper on gypsum board.
- D. Metals:
1. Chipped or Abraded Areas in Shop Coatings: Touch-up using appropriate primer.
 2. Galvanized Surfaces: Apply a wash coat of Jasco's Prep 'n' Prime. Allow to dry completely.
 3. Stainless Steel: Scarify surfaces before applying prime coat.
- E. Cement Plaster:
1. Fill cracks and irregularities with Portland cement grout or patching mortar to provide uniform surface texture.
 2. Surfaces shall not be painted until they have completely cured and have a stabilized moisture content, but in no case less than 30 days from completion of surface.
- F. Wood:
1. General: If required, sandpaper surfaces smooth before applying primer. Thoroughly clean knots; apply thin coat of knot sealer over surfaces shown to receive opaque finish.
 2. Back Priming: Back prime surfaces installed against cementitious surfaces; give particular attention to sealing cross-grained surfaces.
 3. Puttying:
 - a. General: Fill nail holes, cracks, and other depressions flush with putty after prime coat application. Allow putty to dry; sandpaper smooth before applying body coat.
 - b. For Opaque Finish: Linseed oil type putty.
- G. Old Work: Sand, wire brush, or scrape painted surfaces to remove loose, scaling paint and to reduce gloss. Wash soiled surfaces.
- H. Protection:

1. General: Properly protect floors and other adjacent work by drop cloths or other suitable coverings. In areas scheduled for painting, maintain wrappings and factory-applied protection provided by other trades.
 2. Hardware and Other Obstructions: Remove or protect factory finished items such as hardware, plates, lighting fixtures, grilles, and similar items placed prior to painting. Reposition or remove protection upon completion of each space. Equipment adjacent to surfaces requiring paint disconnected, moved, reset, and reconnected by respective trades.
 3. Fire Precautions: At end of each work day, place in metal containers or remove from premises, solvent soaked cloths, waste, and other materials which constitute a fire hazard.
- I. Moisture Content: Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer.

3.3 APPLICATION

- A. General: Apply paint per manufacturer's instructions and as specified. Thoroughly stir paint and keep at uniform consistency during application. Apply paint evenly, free from drops, ridges, waves, laps, and brush marks; finished surface uniform in sheen, color, and texture. Apply succeeding coats to unscarred and completely integral base coats; slightly vary color of undercoats to distinguish them from preceding coat. Allow sufficient time between coats to assure proper drying. Sandpaper smooth interior finishes between coats.
- B. Prime Coat: Do not thin primers in excess of manufacturer's printed directions. Apply by brush, unless otherwise specified, within 8 hours after cleaning.
- C. Body and Finish Coats: Do not thin; apply by brush, roller or spray.
- D. Drying Time: Comply with recommendations of product manufacturer for drying time between succeeding coats.
- E. Moldings and Ornaments: Leave clean and true to details with no undue amount of paint in corners and depressions.
- F. Edges of Paint: Where adjoining other materials or colors, make clean and sharp with no overlapping.
- G. Refinishing: Refinish entire wall where portion of finish is deemed not acceptable.
- H. Precaution: Do not paint over fusible links, UL labels, or sprinkler heads.
- I. Exposed Plumbing and Mechanical Items: Finish items without factory finish such as conduits, pipes, access panels, and items of similar nature to match adjacent wall and ceiling surfaces, unless otherwise directed.

3.4 CLEANING

- A. General: Touch up and restore finish where damaged. Remove spilled, splashed, or spattered paint from surfaces. Do not mar surface finish of item being cleaned.
- B. Storage Space: Leave clean and in condition required for equivalent spaces in Project.

INDIAN VALLEY CAMPUS
BUILDING 11 RENOVATION

COLLEGE OF MARIN
MARIN COMMUNITY COLLEGE DISTRICT

END OF SECTION

SECTION 10 22 33

ACCORDION FOLDING PARTITIONS

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. Manually operated, accordion folding partitions.

1.3 DEFINITIONS

- A. STC: Sound Transmission Class.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design accordion folding partitions, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Seismic Performance: Accordion folding partitions shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Acoustical Performance: Provide accordion folding partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
 - 1. Sound-Transmission Requirements: Accordion folding partition assembly tested in a laboratory for sound transmission loss performance according to ASTM E 90, calculated according to ASTM E 413, and rated for not less than the STC value indicated.
 - 2. Acoustical Performance Requirements: Installed accordion folding partition assembly, identical to partition tested for STC, tested for NIC according to ASTM E 336, determined by ASTM E 413, and rated for STC 50.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Indicate storage and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.

2. Indicate facing-material seam locations if any.
- C. Samples for Initial Selection: For each type of exposed material, facing material, and finish indicated.
1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed material, facing material, and finish indicated, prepared on Samples of size indicated below:
1. Textile: Full width by not less than 36-inch-long section of **[fabric]** **[carpet]** from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.
 2. Facing Material: Manufacturer's standard-size unit, not less than 3 inches square.
 3. Edge Material: Not less than full width by 3 inches long.
 4. Hardware: Manufacturer's standard exposed door-operating device.
- E. Delegated-Design Submittal: For accordion folding partitions indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.
1. Design Calculations: Calculate requirements for seismic restraints.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Suspended ceiling components.
 2. Structural members to which suspension systems will be attached.
 3. Size and location of initial access modules for acoustical tile.
 4. Items penetrating finished ceiling, including the following:
 - a. HVAC ductwork, outlets, and inlets.
 - b. Speakers.
 - c. Sprinklers.
 - d. Smoke detectors.
- B. Qualification Data: For Installer.
- C. Seismic Qualification Certificates: For accordion folding partitions, accessories, and components, from manufacturer.
- D. Product Certificates: For each type of accordion folding partition, from manufacturer.
- E. Material Certificates: For each textile dye lot, signed by manufacturers.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each accordion folding partition.
- G. Field quality-control reports.
- H. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For accordion folding partitions to include in maintenance manuals. In addition to items specified in Division 01, include the following:
 - 1. Facing materials and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 - 2. Seals, hardware, track, carriers, and other operating components.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Fire-Test-Response Characteristics: Provide partitions with finishes meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of accordion folding partition openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 ACCORDION FOLDING PARTITION

- A. Product: Panelfold "Scale 12", or equal as approved by the District.
- B. Accordion Folding Partition: Accordion folding frame with hinged sections designed for horizontal extension and retraction, covered with decorative facing material, reinforced for hardware attachment, supported by overhead suspension system, and equipped with manufacturer's standard air-release method to prevent billowing.
- C. Facing Material: Tek-Wall 1000 Panel Fabrics and Woventex Panel Fabrics, or equal, as acceptable to the District.
 - 1. Color/Pattern: As selected by College of Marin's Representative from manufacturer's full range.

2.2 COMPONENTS

- A. Posts and Seals: Provide types of posts and seals that produce accordion folding partitions complying with performance requirements.

1. Posts: Steel or aluminum; formed with deep-nesting and interlocking interfaces and fabricated to ensure rigidity of accordion folding partition.
 2. Perimeter Seals: Manufacturer's standard vinyl, neoprene, or woven silica vertical seals, horizontal top and bottom seals, and closures for lead posts and jambs.
- B. Hardware: Manufacturer's standard manually operated pulls, latches, locks, and bolts as required to operate accordion folding partitions; with decorative, protective finish.
- C. Trim: Manufacturer's standard with decorative, protective finish.
- D. Tiebacks: As required to maintain accordion folding partitions in stacked position; with manufacturer's standard finish.

2.3 SUSPENSION SYSTEMS

- A. Suspension Tracks: Steel or aluminum designed for type of operation, size, and weight of accordion folding partition indicated. Size track to support partition operation and storage without damage to suspension system, accordion folding partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
1. Track: Surface mounted.
 - a. Head Closure Trim: Integral with track for protecting overhead surfaces; with factory-applied, decorative, protective finish.
 - B. Carriers: Trolley system as required for size and weight of partition and for easy, quiet operation; with six-wheel ball-bearing carriers at lead post and two-wheel ball-bearing carriers at intermediate panel supports.
 1. Wheels: Manufacturer's standard.
 - C. Track Switches and Accessories: Manufacturer's standard switches as required for type of operation, storage, track configuration, and layout indicated.
 - D. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.

2.4 WOOD MATERIALS, GENERAL

- A. Accordion Folding Partitions are made from high density particle board.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of accordion folding partitions.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with ASTM E 557 except as otherwise required by accordion folding partition manufacturer's written installation instructions. Install accordion folding partitions level and plumb, with tight joints and uniform appearance, and free of deformation and surface and finish irregularities.
- B. Install accordion folding partitions and accessories after other finishing operations, including painting, have been completed.

3.3 ADJUSTING

- A. Adjust accordion folding partitions to operate smoothly, without warping or binding. Lubricate hardware and other moving parts.
- B. Adjust storage pocket doors to operate smoothly and easily, without binding or warping. Check and readjust operating hardware. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.4 CLEANING

- A. Clean soiled surfaces of accordion folding partitions, to remove dust, loose fibers, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train College of Marin's maintenance personnel to adjust, operate, and maintain accordion folding partitions.

END OF SECTION

SECTION 10 26 00

WALL AND DOOR PROTECTION

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. Corner guards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For each type of wall and door protection showing locations and extent.
 - 1. Include plans, elevations, sections, and attachment details.
- C. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.
 - 1. Include Samples of accent strips and accessories to verify color selection.
- D. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
 - 1. Corner Guards: 12 inches long.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
 - 2. Keep plastic materials out of direct sunlight.
 - 3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
 - a. Store corner-guard covers in a vertical position.

PART 2 - PRODUCTS

2.1 CORNER GUARDS

- A. Surface-Mounted, Polycarbonate Corner Guards: Nystrom "Lexan CGLS-2-S-D" Corner Guards, or equal, as approved by the District.
 - 1. Material: Clear polycarbonate.
 - 2. Mounting: Surface.
 - 3. Mounting Method: Mechanical.
 - 4. Size: 2" wing.
 - 5. Length: As required for application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

SECTION 10 28 00
TOILET ACCESSORIES

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. Washroom accessories.
- 2. Door hook for office doors.

- B. Related Sections:

- C. Coordination:

- 1. Contractor shall provide thicker partitions where recessed accessories are indicated to be installed.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:

- 1. Construction details and dimensions.
- 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
- 3. Material and finish descriptions.
- 4. Features that will be included for Project.
- 5. Manufacturer's warranty.

- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

- 1. Identify products using designations indicated.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Schedule: The following products are listed as the Basis of Design. Provide the following, or equal as approved by the District. Finishes to be stainless steel with brushed finish, unless otherwise noted.
 1. Grab Bars: Bobrick B-6806. 1 ½ in. diameter grab bars with snap flange. Length as shown.
 2. Sanitary Napkin Disposal: Bobrick B-5270. MatrixSeries Surface-Mounted Sanitary Napkin Disposal.
 3. Mirror: Bobrick B-165 2436. Mirror with Stainless Steel Channel Frame.
 4. Paper Towel Dispenser: Owner Furnished/Contractor Installed. Bobrick B-262. ClassicSeries Surface-Mounted Paper Towel Dispenser.
 5. Hook: Sugatsune Item No. EU-50. Type 316 stainless steel fork hook.

2.3 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to College of Marin Representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf , when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

SECTION 10 85 00

EXTERIOR ACOUSTICAL SPECIALTIES

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.

1.1 SUMMARY

- A. Work Included: Exterior Acoustical Specialties, complete, as shown and specified.

1.2 SUBMITTALS

- A. Product Data: Submit for College of Marin Representative's action. Submit manufacturer's literature and installation instructions for each material and accessory, clearly notating specified requirements.
- B. Qualifications of Installer.
- C. Closeout Submittals: Submit for College of Marin's documentation.
 - 1. Maintenance Data.

1.3 QUALITY ASSURANCE

- A. Qualified Installer: Installer to have successful experience in the installation of specified materials on comparable projects. The firm shall have the approval of the materials manufacturer.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, and regulations of Authorities Having Jurisdiction (AHJs). Obtain necessary approvals from AHJs.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. General: Protect items from damage at factory, in transit, and after installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

- A. Acoustical Panels for Generator Enclosure: Noise Barriers, LLC, "QuietPerf", or equal, as acceptable to the District. Provide 4 in. thick panels, unless otherwise shown. Size as shown on Drawings. 22 gauge perforated galvanized/galvannealed steel with polyester powder-coat finish. College of Marin Representative shall select color from manufacturer's standards.

- B. Acoustical Louvers: Noise Barriers, LLC, "QuietLouver", or equal, as acceptable to the District. Louver to be 12 in. deep. Provide galvanized steel louvers with manufacturer's standard powder-coat finish. College of Marin Representative shall select color from manufacturer's standards.

PART 3 - EXECUTION

3.1 GENERAL

- A. Manufacturer's Instructions: Prepare substrates and install the work, including components and accessories in accordance with the manufacturer's instructions, except where more stringent requirements are shown or specified. Examine the areas to receive the Work and remedy detrimental conditions.
- B. Field Conditions and Measurements: Verify in field for Work fabricated to fit Project conditions.

3.2 INSTALLATION

- A. General: Install per manufacturer's recommendations. Install Work plumb, level, and true; properly assembled, installed and anchored. Use mechanics skilled in Work involved.

3.3 CLEANING

- A. General: Leave installation clean and free from defects.

END OF SECTION

SECTION 12 24 13

ROLLER WINDOW SHADES

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. Manually operated roller shades with single and double rollers.

B. Related Requirements:

- 1. Section 06 10 00 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
- 2. Section 07 92 00 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples for Initial Selection: For each type and color of shadeband material.

- 1. Include Samples of accessories involving color selection.

D. Samples for Verification: For each type of roller shade.

- 1. Shadeband Material: Not less than 10 inches square. Mark interior face of material if applicable.
- 2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
- 3. Installation Accessories: Full-size unit, not less than 10 inches long.

E. Product Schedule: For roller shades.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of shadeband material.
- C. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roller shades to include in 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. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than **[two] <Insert number>** units.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify College of Marin Representative of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Bead Chains: Stainless steel.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Clip, jamb mount.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- E. Shadebands:
 - 1. Shadeband Material: Light-filtering fabric.
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum covered with shadeband material.
- F. Installation Accessories: Installation type as shown on Drawings.

2.3 MANUALLY OPERATED SHADES WITH DOUBLE ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Bead Chains: Stainless steel.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Clip, jamb mount.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under.
 - 2. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- E. Inside Shadebands:
 - 1. Shadeband Material: Light-filtering fabric.
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
- F. Outside Shadebands:
 - 1. Shadeband Material: Light-blocking fabric.
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
- G. Installation Accessories: Provide installation type as shown on Drawings.

2.4 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 - 1. Basis of Design: Hunter Douglass "GreenScreen Evolve", or equal, as approved by the District. Color to be selected by College of Marin Representative. 3% openness.
 - 2. Type: 100% fiberglass.
 - 3. Weave: Basketweave.
- C. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.
 - 1. Basis of Design: Hunter Douglass "Avila Twilights", or equal, as approved by the District. Color to be selected by College of Marin Representative. 0% openness.
 - 2. Type: 100% polyester with acrylic foam backing.

2.5 ROLLER SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
 1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by College of Marin Representative, before time of Substantial Completion.

END OF SECTION

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - WGENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Section 21 05 00, Common Work Results for Fire Suppression apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. This Section includes Design-Build Work. The intent of Division 21 Specifications and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include all work specified in Division 21 and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.
 - 2. The Division 21 Specifications and the accompanying Drawings are complimentary and what is called for by one shall be as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa. Specifications shall supersede drawings in case of conflict, except sprinkler head locations where shown on the plans take precedence.
 - 3. Imperative language is frequently used in Division 21 Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.
 - 4. The Drawings that accompany the Division 21 Specifications are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions shall be assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. Piping and sprinkler head locations shall meet the Architectural design intent for the building in addition to applicable code. The right is reserved to make any reasonable changes in sprinkler head location prior to roughing-in, without cost impact.
 - 5. Furnish piping, pipe fittings, valves, gauges and incidental related items as required for complete systems. Identify valves, piping and equipment components to indicate their function and system served.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. All products and equipment shall be prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipments within this specification contain these banned substances, provide complying products and equipments from approved manufacturers with equal performance characteristics.
 2. General: All work and materials conformS to the local and State codes, equipment must be UL listed and in the latest edition of the Factory Mutual Approval Guide and comply with all Federal, State and other applicable laws and regulations.
 3. Contractor responsible for obtaining and payment for all permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.
 4. All fire protection system designs must bear the stamp and seal of the registered Professional Engineer who prepared the documents. The Engineer's stamp certifies that the work was done under the Engineer's supervision and control. Certification from NICET technicians, or other contractors, cannot replace the certification by the Engineer. Verify/coordinate with local building department for their specific requirements.
- B. Materials and equipment shall be new. Work shall be of good quality, free of faults and defects and in conformance with the Contract Documents.
- C. Apparatus shall be built and installed to deliver its full rated capacity at the efficiency for which it was designed.
- D. The entire system and apparatus shall operate at full capacity without objectionable noise or vibration.
- E. For remodel projects, the existing system must remain fully operational, or provisions made to provide coverage while the new system is being installed. New installation switchover shall require minimal down time. Provide method to maintain fire protection or fire watch during any system down time. Include any related cost for materials or labor that is needed for providing continuous coverage.
- F. Materials and Equipment:
1. Each piece of equipment furnished shall meet all detailed requirements of the Drawings and Specifications and shall be suitable for the installation shown. Equipment not meeting all requirements will not be acceptable, even though specified by name along with other manufacturers.
 2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
 3. Furnish all materials and equipment of size, make, type, and quality herein specified.
 4. Equipment scheduled by performance or model number shall be considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for all changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements or any other differences which impact the project.

G. Workmanship:

1. General: All materials shall be installed in a neat and professional manner.
2. Manufacturer's Instructions: Follow manufacturer's directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division 21 Specifications, obtain clarification before starting work.

H. Cutting and Patching:

1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting shall be performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Additional openings required in building construction shall be made by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Beams or columns shall not be pierced without permission of Architect and then only as directed.
5. All new or existing work cut or damaged shall be restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces shall be repaired, refinished, and left in condition existing prior to commencement of work.

1.04 SUBMITTALS

A. Certified Shop Drawings:

1. Coordination with other trades and with field conditions will be required for piping and sprinkler head layout. For this purpose, prepare fire protection system layout Drawings showing locations and types of head or outlets, alarm valves and devices, pipe sizes and cutting lengths, test tees and valves, drain valves, and other related items. Shop Drawings shall be new drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. All drawings shall be same size as Architect's Drawings with title block similar to the Drawings and identifying Architect's Drawing number or any reference drawings. All drawings shall be fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
2. Shop drawings shall be prepared in two-dimensional format.
3. Shop drawings shall include but are not limited to:
 - a. Layout drawings, coordinating sprinkler head and piping installation with structure, lighting, sound speakers, mechanical ductwork, diffusers and other ceiling installed items. All submitted plans shall be readable with indicated scale.
 - b. Name, address, phone number, and fax number of Contractor.
 - c. Site plan to show the entire site.

- d. Full height cross section, or schematic diagram if required for clarity, including ceiling construction height. Show beam size, material, and location on plan. Sprinkler and escutcheon plates: include Sprinkler Identification Number (SIN) nomenclature on fire sprinkler product data, manufacturer's model number, response type, temperature rating, sprinkler type, orifice size and any other information for all sprinklers used.
 - e. Number of sprinklers protecting floor.
 - f. Hydraulic calculation criteria.
 - g. The information on the hydraulic data nameplate for the most remote area.
 - h. Hydraulic reference points shown on the plan shall correspond with comparable reference points shown on the hydraulic calculation sheets. Outline/highlight remote area.
 - i. Provide on the plan the minimum application rate (density) and the design area of application.
 - j. Provide on the plan the total quantity of water and the pressure required noted at the riser.
 - k. Relative elevations or sprinklers, distance of sprinkler deflector to ceiling, junction points, and supply or reference points.
 - l. Provide end-of-life restraint for end sprinkler on each branch line.
 - m. Modifications to an existing system include removal of unused excess piping. Relocation of heads shall be according to approved plan. Field installation approved set of plans shall require recalculation of the system, taking into account all new piping and fittings.
 - n. Where the equipment is to be installed as an addition to an existing system, enough of the existing system shall be indicated on the plans to make all conditions clear.
 - o. New fire sprinkler system calibration hydraulic flow labels must be installed at each floor showing required information at completion of all sprinkler system modifications at tenant expense.
4. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.
 5. Written statement that coordination has been accomplished with work of other contractors and installers.

B. Product Data:

1. Submit product data for review on all scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes.
2. Include manufacturer's detailed shop drawings, specifications and data sheets.
3. Data sheets shall include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data.
4. Manufacturer's abbreviations or codes are not acceptable
5. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Submission Requirements:

1. Refer to Division 01, General Requirements for additional requirements related to submittals.
2. Shop Drawings:
 - a. Provide three sets of Drawings showing sprinkler head locations and layout coordinated with architectural ceiling details to the Architect for review prior to submitting Drawings to insurance underwriter and Fire Marshal.
 - b. Provide six sets of Drawings and calculations to the Architect to be sent to the Owner's insurance underwriter for approval.
 - c. Then submit six sets of approved Drawings to Architect for final review.
3. Product Data:
 - a. Submit copies of product data in a 3-ring loose leaf binder with each item filed under a tab and labeled with its respective specification section number, article and paragraph, and mark if applicable.
 - b. Submit electronic copies of shop drawings and product data for Work of Division 21 in PDF format with each item filed under a folder and labeled with its respective specification section number, article and paragraph and mark, if applicable.
 - c. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
 - d. Submit shop product data in a single submittal. Partial submittals will not be accepted. Re-submittals submitted after return of the original binder shall include a tab similar to that originally submitted. Upon receipt of the returned re-submittals, insert them in the previously submitted binder.

D. Responsibilities:

1. See that submittals are submitted at one time and are in proper order.
2. Ensure that all equipment will fit in the space provided.
3. Assure that all deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.05 PROJECT CONDITIONS

A. Existing Conditions:

1. Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include all factors which may affect the execution of this Work.
2. Include related costs in the initial bid proposal.

B. Coordinate exact requirements governed by actual job conditions. Check information and report discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

C. Coordinate shutdown and start-up of existing, temporary, and new systems. Notify Owner and City.

1.06 WARRANTY

- A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.
- B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.
- C. Correct warranty items promptly upon notification.

1.07 TEST REPORTS AND CERTIFICATES

- A. Submit one copy of all test reports and certificates specified herein to the Architect.

1.08 SUBSTITUTIONS

- A. Submit any requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 - PRODUCTS

2.01 PIPE SLEEVES

- A. Interior Wall and Floor Sleeves:
 - 1. 18 gauge galvanized steel or another pre-approved water tight system.
- B. Interior Wall and Floor Sleeves (fire rated):
 - 1. Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.

2.02 ELECTRICAL EQUIPMENT

- A. General:
 - 1. Equipment and installed work as specified under Division 26, Electrical.
- B. Motors:
 - 1. Furnish as integral part of driven equipment. They shall be drip-proof induction type with ball bearings unless noted otherwise.
 - 2. Built to NEMA Standards for the service intended.
 - 3. Rated for the voltage specified, suitable for operation within the range of 10 percent above to 10 percent below the specified voltage.
 - 4. Manufacturers:
 - a. Baldor
 - b. Westinghouse
 - c. General Electric

- d. Or approved equal.
 - 5. Where provided, refer to Equipment Schedules on the Drawings for motor horsepower, voltage and phase.
 - 6. Refer to individual product sections for additional motor requirements.
 - 7. Built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors have quick trip devices.
- C. Starters: Provided under Division 26, Electrical, suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.
- D. Equipment Wiring:
- 1. Provide interconnecting wiring within or on a piece of fire suppression equipment with the equipment unless shown otherwise.
 - 2. This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.
- E. Control Wiring: Provide control wiring for fire suppression equipment.
- F. Codes: Electrical equipment and products to bear the UL as required by governing codes and ordinances.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Coordinate fire protection piping and appurtenances with ducts, other piping, electrical conduit, and other equipment.
- B. Conceal fire protection piping and equipment be concealed except in area without ceilings and as noted on the Drawings.
- C. Locate piping, heads, and equipment where shown on Drawings.

3.02 GENERAL

- A. Install fire protection systems to serve the entire project scope area.
- B. The drawings do not indicate the locations of sprinkler heads in ceiling areas. In general, sprinklers shall be located in the center of ceiling panels and symmetrically within rooms and down corridors, coordinated with and in pattern with lights and grilles. Deviations must be approved.
- C. Locations of sprinkler heads, outlets, piping, and appurtenances are not shown in areas and therefore are to be installed in accord with code requirements.
- D. Location of heads shown in ceiling areas may be changed if required by code requirements, but only after review by the Architect for new head locations for each specific instance.

3.03 SLEEVES

- A. Interior Floor and Wall Sleeves:
 - 1. Provide sleeves large enough to provide clearances around pipe outside diameter as required by NFPA.
 - 2. Penetrations through mechanical room and fan room floors shall be made watertight by packing with safig insulation and sealing with Tremco Dymeric Sealant or approved water tight system.
- B. Sleeves through Rated Floors and Walls: Similar to interior sleeves except install fire-rated system approved by Authority Having Jurisdiction and Owner's Insurance Underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
- C. Layout work prior to concrete forming. Do all cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.
- D. Floor sleeves maintain a water barrier by providing a water tight seal or extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof shall extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated. Sleeves through planters extend 8-inches above planter base.
- E. Do not support pipes by resting pipe clamps on floor sleeves. Provide supplementary members so pipes are floor supported.
- F. Special sleeves detailed on the Drawings take precedence over this section.

3.04 FLOOR, WALL AND CEILING PLATES

- A. Install on piping passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe and duct.
- B. Secure wall and ceiling plates to pipe or structure.
- C. Plates not required in mechanical rooms or unfinished spaces.

3.05 CLEANING

- A. General: Clean equipment and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.
- B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.
- C. Additional requirements are specified under specific Sections of this Division.

3.06 EQUIPMENT PROTECTION

- A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated equipment, or apparatus to original conditions or replace at no cost to the Owner.

- B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.
- C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.07 ACCESSIBILITY

- A. General: Locate valves, indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.
- B. Gauges: Install gauges so as to be easily read from the floors, platforms and walkways.

3.08 PAINTING

- A. General: Coordinate painting of fire suppression equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.
- B. Equipment Rooms and Finished Areas:
 - 1. Hangers, Miscellaneous Iron Work, Structural Steel Stands, Tanks, and Equipment Bases: Paint one coat of black enamel.
 - 2. Steel Valve Bodies and Bonnets: One coat of black enamel.
 - 3. Equipment: One coat of red machinery enamel. Do not paint nameplates.
- C. Sprinkler Heads: Not painted. Concealed Spaces (above ceilings, not visible):
 - 1. Hangers, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.
- D. Sprinkler Piping:
 - 1. Concealed from View: Not painted.
 - 2. Exposed to View: Paint pipe and hangers exposed to view, including in equipment spaces, with one coat approved rust inhibiting primer. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.
 - 3. Exterior: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.
 - 4. Alarm Bell: Factory paint with two coats of red enamel.

3.09 ADJUSTING AND CLEANING

- A. General:
 - 1. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.

2. Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

B. Piping:

1. Clean interior of piping before installation.
2. Flush sediment out of piping systems.

3.10 ELECTRICAL EQUIPMENT

- A. Do not install fire suppression systems in switchgear rooms, transformer vaults, telephone rooms, or electric closets except as indicated.
- B. Fire Suppression systems shall not pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

END OF SECTION

SECTION 21 10 00

WATER BASED FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Section 21 05 00, Common Work Results for Fire Suppression apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. This Section includes Design-Build work.
 - 2. Provide a complete automatic fire sprinkler/combination standpipe system.

1.03 QUALITY ASSURANCE

- A. Provide a complete automatic fire sprinkler system with existing zoning (and sprinkler head) layout as indicated on the Drawings.
- B. Reference Codes and Standards:
 - 1. 2013 California Building Code (2012 IBC)
 - 2. 2013 California Fire Code (2012 IFC)
 - 3. 2013 NFPA 13, Standard for the Installation of Sprinkler Systems
 - 4. 2011 NFPA 25, CA Edition "Testing and Maintenance of Water-Based Fire Protection Systems
 - 5. 2011 NFPA 70, National Electrical Code
 - 6. 2013 NFPA 72, National Fire Alarm Code
 - 7. 2013 City of Menlo Park Building Code and Amendments
 - 8. 2013 City of Menlo Park Fire Code and Amendments
 - 9. Factory Mutual Global Requirements: To meet increased density by Factory Mutual Global Standards is not required for this project.

10. Menlo Park Fire Protection District Standard: Fire Protection Systems Installation of Fire Sprinkler Systems (Revised 4/20/11) and including the following as required by Section 6-C:
 - a. This fire sprinkler system designed and installed in accordance with 2013 NFPA 13 and Menlo Park Fire District standards.
 - b. Only listed and approved devices installed in this system.
 - c. Only new listed sprinklers employed in the installation of this sprinkler system.
 - d. A minimum of two spare fire sprinklers of each type, temperature rating and orifice size, along with a sprinkler wrench, shall be located in a spare head cabinet at the system riser or other approved location. If less than three heads of a particular type are used, only one spare head shall be provided.
 - e. Provide piping with hangers and supported per code and manufacturer's specifications.
 - f. Hang piping from structure members.
 - g. Underground mains and lead-in connections flushed before connection is made to sprinkler piping.
 - h. This fire sprinkler system shall be tested and inspected at both rough and final inspections, prior to occupancy being granted. Call two working days in advance to schedule all inspections.

C. Regulatory Requirements:

1. As a minimum, sprinkler system complies with 2013 NFPA 13 and Menlo Park Fire District Requirements.

D. System piping hydraulically designed throughout all areas in accordance with the rules and regulations of the applicable standards using the design densities indicated herein:

1. Fire Sprinklers: The fire sprinkler hydraulic calculations shall include hose allowances as defined for the hazard for inside and outside hose streams as required to meet applicable standards.
2. Hydraulically designed sprinkler systems should include a 10% reduction in the available water pressure.
3. The velocity of water through the fire protection piping system shall not exceed maximum allowable velocities allowed by applicable standards.
4. Entire project be sprinklered.
5. All sprinkler system pipes shall be installed so that it can be drained.
6. Prior to installation, contractor must perform a flow test and verify with AHJ the safety margin/cushion is to be percentage of the system demand pressure or a minimum additional fixed pressure in the system demand safety margin/cushion.
7. Contractor shall determine size of existing piping and proper sizing of new piping. Fire protection Shop Drawings shall indicate hydraulic reference points that correspond with comparable reference points in the hydraulic reference points in the hydraulic calculation sheets.
8. Fire protection contractor shall perform multiple hydraulic calculations in order to determine which design area is the most hydraulically demanding.
9. Contractor shall obtain a complete set of as-built drawings of existing construction from the Owners for information on existing conditions.

10. Type of System: Wet pipe automatic sprinkler system is required throughout unless allowed to be omitted per applicable sections of 2013 NFPA 13. The sprinkler area to be remodeled will be modified to meet the architectural reflected ceiling plans including cloud ceilings.
 11. Concealed spaces of exposed combustible construction shall not be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by Sections 8.15.1.2.1 (including Annex A.8.15.1.2, A.8.15.1.2.6, and A.8.15.1.2.11) through 8.15.1.2.16 (including Annex A.8.15.1.2.16) and Section 8.15.6 of the 2013 NFPA 13, Section 8.15.1. "Concealed Spaces".
 12. Raised Floor: Unless all the requirements of 8.15.6.2 of the 2013 NFPA 13 are met, sprinkler protection shall be installed under all combustible platforms.
 13. All sprinkler piping, sprinklers and equipment will be installed and tested in accordance with California Fire Code, 2013 and NFPA 25, 2011 California edition, and the manufacturer's recommendations/guidelines.
- E. Hydraulic calculations be based on current hydrant flow test results. The Contractor shall be required to obtain current flow data information prior to starting their design of the fire sprinkler system.
- F. Wet Fire Sprinkler Density Requirements:
1. All sprinkler systems shall be hydraulically calculated.
 2. In the event design criteria information from the project fire insurance underwriter is unavailable at the time of initial design, the following minimum criteria shall be used:
 - a. Laboratory Areas, Utility Rooms, Storage Spaces:
 - 1) The automatic sprinkler system will be designed to provide a 0.2 GPM/SF density over the most demanding 3,000 SF design area (or largest room). The protection area per quick response, standard coverage pendent, and upright sprinklers shall be limited to a maximum of 130 sq.ft.
 - b. Open Office, Lobby, Conference Room, Micro Kitchen Spaces, IDF Rooms and Similar Areas: The automatic sprinkler system will be designed to provide a 0.18 GPM/SF density over the most demanding 3,000 SF area. The protection area per standard coverage pendent and upright sprinklers shall be limited to a maximum of 225 SF and 196 SF for quick response, standard coverage horizontal sidewall sprinkler. Total combined inside and outside hose steam: 500 GPM.
 - c. Paint Booth: Utility Rooms, Storage Spaces: The automatic sprinkler system will be designed to provide a 0.4 GPM/SF density over the most demanding 2,500 SF design area (or largest room). The protection area per standard response, standard coverage pendent, and upright sprinklers shall be limited to a maximum of 90 sq.ft. Total combined inside and outside hose steam: 500 GPM.
- G. NFPA 13 (without the use of exceptions found in NFPA 13 systems minimum guideline) shall be used for the location, sizing, and installation of piping and sprinkler systems unless local fire marshal and AHJ are more stringent. Exceptions must be approved by the Engineer prior to usage.
- H. Water Service Pressure Basis of Design: Coordination was done to determine fire service water pressure used to develop the fire sprinkler system design information included herein. The Contractor shall be required to obtain current flow data information prior to starting their design of the fire sprinkler system.
- I. Zoning of Fire Protection Systems: Existing to remain.

1.04 SUBMITTALS

- A. Provide submittal in accordance with Section 21 05 00, Common Work Results for Fire Suppression.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Following is a list of manufacturers whose products may be submitted for review. All items submitted as being equal to that specified, shall have same quality, finish, material construction, etc., as those specified under base Specification.
- B. Acceptable Manufacturers:
 - 1. Valves:
 - a. Jenkins
 - b. Kennedy
 - c. Walworth-Aloyco
 - d. Crane
 - e. CLA-Val
 - f. Croker
 - 2. Fire Protection:
 - a. ZURN
 - b. Elkhart
 - c. Potter Roemer
 - d. Standard Fire West
 - e. FireFlex
 - 3. Sprinkler Heads: Match existing.
 - 4. Waterflow Switches:
 - a. Potter Electric Co.
 - b. Potter-Roemer
 - c. Notifier
- C. Other Manufacturers: Submit substitution request.

2.02 SPRINKLER HEADS

- A. Acceptable Manufacturers: Match existing.
- B. General:
 - 1. Fire sprinklers one manufacturer throughout building. No mixing of sprinkler brands shall be permitted.
 - 2. Sprinklers shall be of all brass frame construction with a coated metal-to-metal seating mechanism. Sprinklers utilizing non-metal parts in the sealing portion of the sprinkler are strictly prohibited.

3. Sprinklers shall have a quick response frangible bulb type fusible element with a temperature rating of 155 degrees or 200 degrees F or shall have a fast response metal type fusible element with a temperature rating of 165 degrees or 212 degrees F.
 4. Sprinklers shall have a 1/2-inch NPT, a standard orifice, a 5.6 nominal K Factor and/or a 3/4-inch NPT, a 8.0 nominal K factor.
 5. Sprinklers shall be UL listed and FM Approved for working water pressures up to 175 psi.
 6. All heads shall be U.L. approved for application and installation.
 7. Provide approved sprinkler head wire guards for sprinkler heads located 7-feet-6-inches or lower above finished floor level.
- C. Sprinklers Installed in Finished Ceilings: Quick response or standard response, recessed, bulb type, chrome finish, 165 degrees F unless required otherwise to match existing.
- D. Sprinklers Installed in Finished Ceilings: Quick response, concealed pendent with chrome drop-off cover plate, rough bronze finish, 155 degrees °F unless required otherwise.
- E. Sprinklers Installed in Unfinished Ceiling Areas (or Above Finished Ceilings Where Required): Pendent or up-right fusible solder type, rough bronze finish and shall be of adequate temperature for the hazard.
- F. Flexible Stainless Steel Hose: UL rated, FM approved stainless steel hose assembly for individual sprinkler connections, similar to FlexHead Industries.
- G. Sprinkler head models and final finishes are subject to Architect's review and approval prior to installation.

2.03 FLOW SWITCH

- A. Existing to remain.

2.04 TAMPER SWITCH

- A. Existing to remain.

2.05 VALVES

- A. Acceptable Manufacturers:
1. Where only one manufacturer's model is listed, equivalent products by those specified below, or equal, are acceptable.
 - a. Gate, Swing Check:
 - 1) Jenkins
 - 2) Victaulic
 - 3) Crane
 - 4) Hammond
 - 5) NIBCO
 - 6) Kennedy
 - b. Silent Check:
 - 1) Jenkins
 - 2) Victaulic
 - 3) Mueller

- 4) Metraflex
 - 5) Gustin-Bacon.
 - c. Butterfly:
 - 1) Jenkins
 - 2) NIBCO
 - 3) Keystone
 - 4) Victaulic
 - 5) Gustin-Bacon
 - d. Specialty:
 - 1) NIBCO
 - 2) Conbraco
 - 3) Victaulic
 2. One manufacturer only
 3. Gate, butterfly and check valves meet current MSS standards.
 4. Bronze gate and check valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
 5. Full lug and grooved butterfly valves shall be suitable for bi-directional dead end service at full rated pressure without use or need of a downstream flange.
 6. Valves in Insulated Piping: Valves shall have 2-inch stem extensions and the following features:
 - a. Gate Valves: Shall be rising stem type.
 - b. Butterfly Valves: Shall have extended necks.
 7. Valve ends may be threaded, flanged, soldered, or grooved as applicable to piping system.
 8. Provide ball drip drains, test orifices, and other related items as required to provide a complete fire protection system.
- B. Gate Valves:
1. Bronze Gate: Bronze body, bronze screwed bonnet, bronze solid wedge, OS&Y pattern, rising stem, pre-grooved stem for supervisory switch mounting, 175 psi CWP, UL listed, FM approved; NIBCO T-104.
 2. Iron Gate: Iron body, bronze trim, OS&Y pattern, solid wedge, pre-grooved stem for supervisory switch mounting, 175 psi CWP, UL listed, FM approved; NIBCO F-607-OTS.
 3. Iron Gate, High Pressure: Iron body, bronze trim, flanged OS&Y pattern, solid wedge, FM approved for 300 psi, UL listed 350 psi; NIBCO F-697-0.
- C. Check Valves:
1. Horizontal Bronze Swing Check:
 - a. Bronze body, bronze-mounted, TFE disc, 150 psi SWP, 300 psi CWP; NIBCO T-443-Y, NIBCO S-433-Y.
 - b. Check valves in main riser path FM approved.

2. Horizontal Bronze Swing Check, High Pressure: Bronze body, bronze-mounted, regrinding bronze disc, 300 psi SWP, 1000 psi CWP; NIBCO T473-B. Check valves in main riser path shall be FM approved.
 3. Horizontal Iron Swing Check:
 - a. Iron body, bronze-mounted, regrinding bronze disc and seat ring, 200 psi CWP; NIBCO F-918-B.
 - b. Check valves in main riser path FM approved.
 4. Vertical and Silent Check Valves:
 - a. Iron body, stainless steel spring, wafer type, globe style, 200 psi CWP; NIBCO 910-B.
 - b. Check valves in main riser path, FM approved.
 5. Vertical and Silent Check Valves, High Pressure:
 - a. Iron body, stainless steel spring, wafer type, globe style, 400 psi CWP; NIBCO W-960-B, NIBCO F-960-B.
 - b. Check valves in main riser path, FM approved.
- D. Butterfly Valves:
1. Iron Butterfly:
 - a. Ductile iron body, aluminum-bronze disc and one-piece stainless steel shaft, copper bushing, fasteners and pins shall not be used to attach stem to disc, gear operator, stem neck length to accommodate insulation where applicable, EPDM liner or disc, 200 psi CWP; NIBCO LD 2000 (lug style), NIBCO GD-4765 (grooved ends).
 - b. Butterfly valves in main riser path, FM approved.
 2. Iron Butterfly, High Pressure:
 - a. Ductile iron body, ductile iron disc and one-piece stainless steel shaft, copper bushings, fasteners and pins shall not be used to attach stem to disc, with lever handle and locking feature on valves 6-inches and smaller, gear operator, EPDM liner or disc, 300 psi CWP, integral supervisory switch, UL listed, FM approved; NIBCO GD-4765.
- E. Specialty Valves:
1. Drain Valves: Bronze ball valve, garden hose end, cap and chain 3/4-inch size, bronze cast body, chrome-plated full port ball, with handle, Teflon seat, threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing, 600 psi CWP; NIBCO T-585-70-HC.
 2. Gauge Cocks: Brass, tee handle, male to female, 200 psi working pressure, 1/4-inch; Conbraco 41 series, or equal.

2.06 BLACK STEEL PIPE

- A. General:
1. UL listed and FM approved for fire protection use.
 2. Fittings and joints must be UL listed with pipe chosen for use.
 3. Listing restrictions and installation procedures per NFPA 13 and state and local authorities for fire protection use.

4. Pipe/fittings must be hot-dipped galvanized in accordance with ASTM A53 for all dry pipe sprinkler systems.
- B. Pipe: ASTM A135 or A53.
 1. For Fire Protection:
 - a. Schedule 10 or Schedule 40 in sizes up to 5 inches.
 - b. 0.134-inch wall thickness for 6-inch.
 - c. 0.188-inch wall thickness for 8-inch and 10-inch.
 - d. 0.330-inch wall thickness for 12-inch.
- C. Fittings: Roll grooved ends with mechanical couplings as specified.
- D. Service Above Grade: Fire protection system only for sizes listed, as approved by NFPA 13.

2.07 FLANGED JOINTS

- A. Flanged Joints:
 1. Flanges shall be cast iron or steel for screwed piping and forged steel welding neck for welded line sizes.
 2. Pressure rating and drilling shall match the apparatus, valve, or fitting to which they are attached.
 3. Flanges shall be in accordance with ANSI B16.1; 150 lb. for system pressures to 150 psig; 300 pounds for system pressures 150 psig to 400 psig.
 4. Gaskets shall be 1/16-inch thick, Cranite or equal, ring type, coated with graphite and oil to facilitate making a tight joint.
 5. Make joint using American Standard hexagon head bolts, lock washers, and nuts (per ASTM A307 GR.B) for service pressures to 150 psig; alloy steel stud bolts, lock washer, and American Standard hexagon head nuts (per ASTM A307 GR.B) for service pressures 150 psig to 400 psig. Use length of bolt required for full nut engagement.
 6. Provide electro-cad plated bolts and nuts.

2.08 MECHANICAL PIPE COUPLINGS AND FITTINGS

- A. Acceptable Manufacturers:
 1. Victaulic
 2. Gruvlok
- B. Couplings and Fittings:
 1. Coupling housing to be zero flex rigid type coupling with angled bolt pad design. Couplings shall be fully installed at visual pad-to-pad offset contact. Couplings that require gapping of bolt pads or specific torque ratings for proper installation are not permitted. Installation-Ready, for direct stab installation without field disassembly. Similar to Victaulic Type 009N.

2. Flexible couplings to be used only when expansion contraction, deflection or noise and vibration is to be dampened. Flexible Coupling to be similar to Victaulic Installation-Ready Type 005. Coupling gasket similar to Victaulic's Grade E molded synthetic rubber per ASTM D-2000.
3. Coupling bolts oval neck track head type with hexagonal heavy nuts per ASTM A-449 and A-183.

2.09 PRESSURE GAUGES

A. Acceptable Manufacturers:

1. Marsh
2. Ashcroft
3. Weiss
4. Terice
5. Weksler
6. Tel-Tru.

B. Description: 4-1/2-inch dial, molded black polypropylene turret case.

C. Range:

SYSTEM	PRESSURE	GRADUATIONS
Fire Protection	0-160 psi	1 psi
*Provide compound gauge where shown on inlet side of fire pump on open piping systems (30-inch 15 psi). Other ranges may be listed on Drawings in which case they take precedence.		

2.10 VALVE IDENTIFICATION

A. Valve Tags:

1. General:

- a. Identify valves with metal tags or plastic signs, legends to be stamped or embossed.
- b. Indicate the function of the valve and its normal operating position, and area served.

3RD FL	(Area Served)
ISOLATION	(Valve Function)
NO	(Normal Operation Position)

2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
3. Material: Use 0.050 or 0.064-inch brass tags.
4. Control Valves: Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicaid or equal. Form letters by exposing center ply.

B. Valve Tag Directory: Include tag number, location, exposed or concealed, area served, valve size, valve manufacturer, valve model number, and normal operating position of valve.

2.11 PIPING MARKERS

A. Acceptable Manufacturers:

1. W.H. Brady
2. Seton
3. Marking Systems, Inc. (MSI).

B. Label pipes with all-vinyl, self-sticking labels or letters. For pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters. For sizes from 3/4 to 2-inch outside diameter, 3/4-inch letters; above 2-inches outside diameter, 2-inch letters. The pipe markers shall be identified and color coded as follows with white directional arrows.

SERVICE	PIPE MARKER	BACKGROUND COLOR
SPRINKLER WATER	FIRE PROTECTION WATER	RED
AIR, COMPRESSED	*COMPRESSED AIR*	GREEN

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Provide seismic hangers as required by 2013 CBC and the 2013 NFPA 13.
 - a. Calculations of loads for sway bracing, included details shall be provided.
2. A corrosion-resistant metal placard shall be provided on riser indicating location number of sprinklers, design criteria, water demand, and date of installation.
3. Provide fire sprinkler guards on exposed sprinklers in areas subject to damage.
4. Quick response sprinklers shall be listed for installation in an Ordinary Hazard occupancy when installed in an Ordinary Hazard occupancy.

B. Flexible Sprinkler Hose Fittings:

1. Install per manufacturer's installation requirements and in accordance with 2013 NFPA 13, Section 9.2.1.3.3 and Appendix A.9.2.1.3.3.
2. Coordinate head location with all other trades to assure space is available to maintain proper radius requirements.
3. Provide flexible sprinkler drops of appropriate length as conditions require.
4. Provide flexible sprinkler drops at all sprinkler heads located in suspended, dropped, or acoustical ceilings. In hard lid ceiling areas, provide flexible heads at Contractor's option.

C. Sprinklers above finished ceilings:

1. Include heads above finished ceilings if structure is combustible, or if steel beams are not provided with spray-on fire proofing.

2. Concealed spaces of exposed combustible construction shall be protected by sprinklers except in concealed spaces where sprinklers are not required to be installed by Sections 8.15.1.2.1 (including Annex A.8.15.1.2, A.8.15.1.2.6 & A.8.15.1.2.11) through 8.15.1.2.16 (including Annex A.8.15.1.2.16) and Section 8.15.6 of the 2013 NFPA 13, Section 8.15.1 "Concealed Spaces".

D. Electrical: Electrical work complies with Division 26, Electrical.

E. Hangers, Anchors, Supports and Sway Bracing:

1. Modification to existing system will require seismic upgrades to all exposed and accessible portions within the work area. These upgrades shall be to the current 2013 NFPA 13 and 2013 CBC.
2. Hangers, bracing, and restraint of system piping shall be installed in accordance with 2013 NFPA 13, Chapter 9 and Protection of Piping Against Damage Where Subject to Earthquakes in accordance with Section 9.3 of the 2013 NFPA 13 and 2013 CBC, Chapter 16 Structural Design.
3. Provide end-of-line restraints for end sprinkler on each branch line, except as allowed in section 9.3.6.5 of the 2013 NFPA 13.
4. Securely support piping from the building structure by means of Underwriters approved iron hangers, supports and pipe inserts and installed in accordance with Underwriters approved methods, in accordance with 2013 NFPA 13 and 2013 CBC.
5. Support horizontal piping by means of approved wrought iron clevis type hangers with proper size suspension rods and locknuts, spaced as required by the Underwriters, 2013 NFPA 13 and 2013 CBC.
6. Supports for vertical piping shall be heavy black iron extension clamps with bolts, each end resting on the building structure or hung from the slab in an approved manner.
7. Provide auxiliary steel required for pipe supports.
8. Hang piping from structural slab by means of malleable iron concrete inserts set in forms before concrete is poured. Drilled type concrete inserts may be provided. Power driven studs are not allowed.
9. Do not hang piping from ductwork, or the work of other trades.
10. No pipes or other apparatus shall be installed so as to interfere in any way with the full swing of doors, building access doors, and access doors in ductwork. The arrangement, positions, and connections of pipes, drains, valves, etc., shown on the Drawings taken as a close approximation and while they shall be followed as closely as possible, the right is reserved by the Project Representative to change the locations to accommodate any conditions which may arise during the progress of the work without additional compensation to this Contractor for such changes, provided that the changes are requested prior to the installation of this Contractor's work.
11. Piping typically shall be installed concealed in or above building construction; i.e.; hung ceilings, and shall be so arranged that relocation of lighting fixtures, or plumbing and mechanical systems, will not cause any interference.

12. Screwed pipe throughout the job reamed smooth before being installed. Do not split, bend, flatten otherwise injured either before or during the installation. The Architect reserves the right to reject work not in accordance with the review Shop Drawings.
13. Provide in accordance with referenced standards. Do not mix piping material and hanger material of dissimilar metals. Beam clamps fitted with steel retainer straps. Hanger rods of less than 3/8-inch diameter are not permitted. All horizontal piping shall be supported by means of UL approved clevis type hangers with proper size suspension rods and locknuts, spaced as required by the Underwriters.
14. New Hanger C clamps are not allowed. Upgrade existing C clamps with new retaining straps.
15. Bending of threaded hanger rod is not allowed.
16. Seismic sway bracing and hangers, sleeves, braces; methods of securing sprinklers: Provide type, manufacturer, size, and figure # for hanger components, including maximum size pipe hanger can support; fastener type, manufacturer, size, length, minimum embedment depth, ceiling/ beam information (type, material, size) fastener is attached to.
17. Calculations of loads for sway bracing, included details shall be provided.

F. Pressure Gauges:

1. Provide gauges where specified, shown on Drawings, or required by code.
2. Install additional gauges as required and as recommended by equipment manufacturer or their representative.
3. Locate all gauges so that they may be conveniently read at eye level or easily viewed and read from the floor or from the most likely viewing area, i.e., platform, catwalk, etc.
4. Install instruments over 6-feet-6*inches above floor, to be viewed from the floor, with face at 30 degrees to horizontal.
5. Provide instrument gauge cock at inlets.

G. Valves:

1. Provide valves at connections to equipment where shown or required for equipment isolation.
2. Install all valves accessible and same size as connected piping.
3. Provide separate support for valves where necessary.
4. Provide drain valves in all low points in the piping system, and at equipment, as required by code, and as indicated.
5. Fire Suppression Service:
 - a. In piping 2-inches and smaller; bronze gate valve, bronze swing check valve, vertical check valve.
 - b. In piping 2-1/2-inches and larger; iron gate valve, iron swing check valve, vertical check valve.

- c. UL approved butterfly valves.
 6. Provide gauge cocks for all pressure gauges.
- H. Piping Preparation:
 1. Measurements, Lines and Levels:
 - a. Check dimension at the building site and establish lines and levels for work specified in this Section.
 - b. Establish all inverts, slopes, and elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
 - c. Use established grid and area lines for locating trenches in relation to building and boundaries.
- I. Piping:
 1. Hold piping as tight to structure as possible. In general, run piping in areas without ceilings parallel to building elements in a neat, professional manner.
 2. Pipe inspector test connections to exterior and discharge as approved by local applicable governing authorities.
 3. Provide test tees as required.
 4. Install unions in all non-flanged piping connections to apparatus and adjacent to all screwed control valves, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.
 5. Mechanical Couplings:
 - a. On systems using galvanized pipe and fittings, fittings shall be galvanized at factory.
 - b. Before assembly of couplings, lightly coat pipe ends and outside of gaskets with approved lubricant.
 - c. Pipe grooving in accordance with manufacturer's specifications contained in latest published literature.
 6. Install all piping as to drain per 2013 NFPA 13.
 7. Support all piping independently at apparatus so that its weight shall not be carried by the equipment.
- J. Drain Piping:
 1. Pitch drain piping 1/2-inch per 10-feet minimum; no traps allowed.
 2. Discharge drain piping to outside with suitable splash plate to a location as approved by the architect.
- K. Piping Joints:
 1. Pipe and fittings shall be joined using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. shall be done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.

2. No couplings installed in floor or wall sleeves.
3. Steel Piping:
 - a. Screwed Joints: Pipes cut evenly with pipe cutter reamed to full inside diameter with all burrs and cuttings removed. Joints made up with suitable lubricant or Teflon tape applied to male threads only, leaving two threads bare. Joints tightened so that not more than two threads are left showing. Junctions between galvanized steel waste pipe and bell of cast iron pipe shall be made with tapped spigot or half coupling on steel pipe to form spigot end and caulked.
 - b. Flanged Joints: Pressure rating of flanges shall match valve or fitting joined. Joint gaskets coated with graphite and oil.
4. Welded Joints:
 - a. Preparation for Welding: Bevel piping on both ends before welding:
 - 1) Use following weld spacing on all butt welds:

NOMINAL PIPE WALL THICKNESS	SPACING	BEVEL
1/4-inch or less	1/8-inch	37-1/2
Over 1/4-inch, less than 3/4-inch	3/16-inch	27-1/2
 - 2) Before welding, remove all corrosion products and foreign material from surfaces.
 - b. Welded Joints: Joints shall be made by the "arc-welding" process using certified welders. Port openings of fittings must match the inside diameter of the pipe to which they are welded. Use full radius welding elbows for all turns, use welding tees for all tees. Reducing fittings must be used for size reduction. "Weldolets" may be used for branches up through one-half the pipe size of the main to which they are attached. Nipples are not allowed.
 - c. Welding Operation:
 - 1) After deposition, clean each layer of weld metal to remove slag and scale by wire brushing or grinding. Chip where necessary to prepare for proper deposition of next layer.
 - 2) Weld reinforcement no less than 1/16-inch not more than 1/8-inch above normal surface of jointed sections. Reinforcement crowned at center and taper on each side to surfaces being joined. Exposed surface of weld shall present professional appearance and be free of depressions below surface of jointed members.
 - 3) Do not weld done when temperature of base metal is lower than 0 degrees F. Material to be welded during freezing temperatures shall be made warm and dry before welding is started. Metal warm to the hand or approximately 60 degrees F.
5. Ductile Iron Pipe: Install joints per manufacturer's written instructions.

L. Pipe Wrap:

1. Apply per manufacturer's written instructions.
2. Apply wrapping to fittings in field after installation.

3.02 IDENTIFICATION

A. Valve Identification:

1. Valve Tags:
 - a. Attach to valve with a brass chain.

- b. Valve tag numbers shall be continuous throughout the building for each system. Contractor shall obtain a list for each system involved from the Owner to establish numbers following the listed sequences.
 2. Valve Tag Directory: Post final copy in Operation and Maintenance Manual.
- B. Piping Markers:
 1. Unless recommendations of ANSI A13.1, 1981 are more stringent, apply labels or letters after completion of pipe cleaning, painting, or other similar work, as follows:
 - a. Every 20-feet along continuous exposed lines.
 - b. Every 10-feet along continuous concealed lines.
 - c. Adjacent to each valve and stubout for future.
 - d. Where pipe passes through a wall, into and out of concealed spaces.
 - e. On each riser.
 - f. On each leg of a T.
 - g. Locate conspicuously where visible.
 2. Further, apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow. Arrows to be the same color and sizes as identification labels.
- C. Equipment Identification:
 1. Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.
 2. Nameplate Directory: Post final copy in Operation and Maintenance Manual.

3.03 EXTRA STOCK

- A. Provide additional number of heads of each type and temperature rating installed as required to meet NFPA 13 requirements.
- B. Provide storage cabinet or cabinets as required to receive reserve sprinkler heads and special installation tools required.
- C. Provide index label for each head indicating manufacturer, model, orifice size of K-factor, and temperature rating.
- D. Provide, inside cabinet a list of heads stored within and brief description of where installed.
- E. Locate cabinet near sprinkler control station as approved.

3.04 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 1. Perform tests and arrange for required inspections of installed system as required.
 2. Notify the Architect 48 hours prior to any test or inspection.
 3. Provide final test and certification in the presence of an Owner representative. Coordinate hereunder.

- B. Inspection Service:
 - 1. At start of warranty year, execute inspection agreement.
 - 2. Without additional charge to Owner, make quarterly inspection of system during year.
 - a. Check and operate control valves.
 - b. Lubricate valve parts.
- C. Report each inspection to Owner.

3.05 EARTHQUAKE PROTECTION

- A. Provide seismic protection for sprinkler in strict accordance with 2013 NFPA 13, 2013 CBC with local amendments.

3.06 FIRE PROTECTION DURING CONSTRUCTION

- A. Building Engineer shall be notified of the sprinkler shut-down no less than 48 hours prior to any work.
- B. Closing and opening of the valves shall be done by the Building Engineer.
- C. Throughout the period of construction, the portion of the fire protection system not under construction shall be maintained pressurized and ready for use.
- D. Entire sprinkler system restored to full operation at the end of each working day.
- E. All sprinklers during construction shall be protected by orange protective coverings to prevent sprinkler head from damage or from being painted. Protective orange caps for all sprinklers shall come from the factory. Remove plastic protective covers after construction.
- F. Keep all pipe and other openings plugged to prevent entry of foreign matter. Cover all equipment and apparatus to protect against dirt, water, chemical or mechanical damage before and during construction period. Restore to original condition all apparatus and equipment damaged prior to final acceptance, including restoration of damaged shop coats of paint.
- G. The condition of all sprinklers must be confirmed after ceilings are installed and rooms and ceilings are painted.

3.07 COORDINATION WITH EXISTING WORK

- A. Move, adjust or modify any existing pipe or equipment in conflict with new work as necessary to allow installation of new work such as light fixtures, walls, ceiling, new equipment, etc.

3.08 PLAN SUBMITTAL INFORMATION

- A. Sprinkler plans and calculations shall be submitted with all the information required by the latest approved edition of 2013 NFPA 13, INCLUDING ALL DETAILS FOR HANGERS, and EARTHQUAKE SWAY BRACING AND FASTENERS.

- B. Sprinkler system will not receive a final inspection unless and until the installation is in accordance with the approved plans, and the placard with the design information has been provided on the riser.

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SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of This Section, Common Work Results for Plumbing, apply to all Sections in Division 22, Plumbing.
- C. All Sections of Division 22, Plumbing are interrelated. When interpreting any direction, material, and method specified in any section of Division 22, Plumbing consider it within the entirety of Work in Division 22, Plumbing.

1.02 SUMMARY

- A. The intent of Division 22, Plumbing and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include all work specified in Division 22, Plumbing and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.
- B. Division 22, Plumbing and the accompanying Drawings are complementary and as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa. Specifications supersede drawings in case of conflict.
- C. Imperative language is frequently used in Division 22, Plumbing. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.
- D. The Drawings that accompany the Division 22, Plumbing, are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in fixture location prior to roughing-in, without cost impact.

1.03 RELATED WORK

- A. The General and Supplemental Conditions apply to this Division, including but not limited to:
 - 1. Drawings and specifications.
 - 2. Public ordinances, permits.
 - 3. Include payments and fees required by governing authorities for work of this Division.

- B. Division 01, General Requirements, applies to this Division.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements:

1. Products and equipment prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment within this specification contain these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
2. General:
 - a. Conform work and materials to local and State codes, and Federal, State and other applicable laws and regulations.
3. Responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.

- B. New materials and equipment. Work of good quality, free of faults and defects and in conformance with the Contract Documents.

- C. Build and install apparatus to deliver its full rated capacity at the efficiency for which it was designed.

- D. Operate the entire plumbing system and apparatus at full capacity without objectionable noise or vibration.

- E. Install equipment level and true. Use housekeeping pads and curbs to account for floor or roof slope.

- F. Materials and Equipment:

1. Meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
3. Furnish materials and equipment of size, make, type, and quality herein specified.
4. Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements or any other differences which impact the project.

- G. Workmanship:

1. General:
 - a. Install materials in a neat and professional manner.

2. Manufacturer's Instructions:
 - a. Follow manufacturer's directions where they cover points not specifically indicated.
 - b. If in conflict with the Drawings and Division 22, Plumbing, obtain clarification before starting work.

H. Cutting and Patching:

1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Additional openings required in building construction made by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Do not pierce beams or columns without permission of Architect and then only as directed.
5. Restore new or existing work cut or damaged to its original condition. Where there are alterations disturb lawns, paving, walks, etc., repair, refinish, and leave in condition existing prior to commencement of work.

1.05 SUBMITTALS

A. Shop Drawings:

1. The Contract Drawings indicate the general layout of the piping, and various items of equipment. Coordination with other trades and with field conditions will be required. Prepare Shop Drawings of piping, and equipment installations. Prepare Shop Drawings as new drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. Drawings the same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's Drawing number or reference drawings. Full dimensioned drawings including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
2. Prepared in three-dimensional format.
3. Include but are not limited to:
 - a. Plumbing site plan drawn to same scale as Site Plan.
 - b. Complete floor plans with plumbing to a minimum of 1/4-inch equals 1-foot scale.
 - c. Plumbing in mechanical rooms to a minimum of 1/2-inch equals 1-foot scale.
 - d. Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.
 - e. Fabricated Equipment: Scale and drawing sizes to suit contractor except equipment not less than 1/2-inch equals 1-foot scale.
 - f. Above Ground: Superplot plans with a colored overlay of all trades including, but not limited to the following:
 - 1) HVAC Piping
 - 2) HVAC Equipment
 - 3) Plumbing Piping and Equipment
 - 4) Sprinklers
 - 5) Lighting
 - 6) Lighting Controls

- 7) Cable Tray
 - 8) Fire Alarm Devices
 - 9) Electrical Power Conduit
 - 10) Ceiling system to a minimum of 1/2-inch equals 1-foot scale.
 - g. Below Ground: Superplot plans of below ground work with a colored overlay of all trades including, but not limited to the following:
 - 1) Structural Footings and Foundation
 - 2) HVAC Piping
 - 3) Civil Piping
 - 4) Plumbing Piping
 - 5) Power conduit to a minimum of 1/2-inch equals 1-foot scale.
 - h. Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.
 - i. Slab penetration drawings of HVAC, plumbing, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1-foot scale.
4. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:

1. Submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications and data sheets. Data sheets include the following:
 - a. Capacities
 - b. RPM
 - c. BHP
 - d. Pressure Drop
 - e. Design and Operating Pressures
 - f. Temperatures and Similar Data
2. Manufacturer's abbreviations or codes are not acceptable.
3. List the name of the motor manufacturer and service factor for each piece of equipment.
4. Indicate equipment operating weights including bases and weight distribution at support points.
5. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Submission Requirements:

1. Shop Drawings and Product Data:
 - a. Refer to Division 01, General Requirements for additional requirements related to submittals.
 - b. Submit electronic copies of shop drawings and product data for Work of Division 22, Plumbing in PDF format with each item filed under a folder and labeled with its respective specification section number, article, and paragraph and mark, if applicable.

- c. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
 - d. The bulk of the shop drawings and product data, excepting Controls and Instrumentation, included with the original submittal. Controls and Instrumentation submittals may lag but complete when submitted. Partial submittals will not be accepted. Other stragglers submitted after return of the original binder include a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.
- D. Contractor Responsibilities:
1. Submit submittals at one time and are in proper order.
 2. Ensure equipment will fit in the space provided.
 3. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.06 RECORD DRAWINGS

- A. Refer to Division 01, General Requirements for requirements.

1.07 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNER'S INSTRUCTIONS

- A. Refer to Division 01, General Requirements for additional requirements.
- B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Show literature on 8-1/2-inches by 11-inches sheets or catalogs suitable for side binding.
- C. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment.
- D. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.
- E. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover all phases of control.
- F. Furnish competent engineer knowledgeable in this building system for minimum of five 8 hour days to instruct Owner in operation and maintenance of systems and equipment. Keep a log of this instruction including dates, times, subjects, and those present and present such log when requested by Architect.

1.08 PROJECT CONDITIONS

- A. Existing Conditions:
1. Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work.
 2. Include related costs in the initial bid proposal.

- B. Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.
- C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

1.09 WARRANTY

- A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.
- B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.
- C. Correct warranty items promptly upon notification.

1.10 PROVISIONS FOR LARGE EQUIPMENT

- A. Make provisions for the necessary openings in building to allow for admittance of equipment.

1.11 TEST REPORTS AND CERTIFICATES

- A. Submit one copy of test reports and certificates specified herein to the Architect.

1.12 SUBSTITUTIONS

- A. Submit requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 - PRODUCTS

2.01 ACCESS PANELS

- A. Furnish under this Division as specified in another Division of work.

2.02 PIPE SLEEVES

- A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel, or another pre-approved system.
- B. Interior Wall and Floor Sleeves, Fire Rated: Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
- C. Exterior Wall Sleeves: Cast iron.
- D. On Grade Floor Sleeves: Same as exterior wall sleeves.
- E. Water Tight Sleeves: Combination steel pipe sleeves with water stop and anchor plate; Link Seal Model WS, mated with synthetic rubber links interlocked with bolts and nuts; Link Seal Model LS.

2.03 FLOOR, WALL AND CEILING PLATES

- A. Furnish stamped split type plates as follows:
 - 1. Floor Plates: Cast brass, chromium plated
 - 2. Wall and Ceiling Plates: Spun aluminum

2.04 MACHINERY GUARDS

- A. Furnish guards for protection on rotating and moving parts of equipment. Provide guards for metal fan drives and motor pulleys, regardless of being enclosed in a metal cabinet.
- B. Design guards so as not to restrict airflow at fan inlets resulting in reduced capacity.
- C. Provide shaft holes in guards for easy use of tachometers at pulley centers. Easily removable for pulley adjustment or removal and changing of belts.
- D. Meet OSHA requirements including back plates.
- E. Provide inlet and outlet screens on fans in plenums or where exposed to personnel.

2.05 ELECTRICAL EQUIPMENT

- 1. General: Equipment and installed work as specified under Division 26, Electrical.
- B. Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available interrupting current (AIC) rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment that meets the bracing requirement.
 - 1. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage, and phase.
 - 2. Refer to individual product sections for additional motor requirements.
 - 3. Built-in thermal overload protection, or protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors have quick trip devices.
- C. Equipment Wiring:
 - 1. Provide interconnecting wiring within or on a piece of mechanical equipment with the equipment unless shown otherwise. This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.
- D. Control Wiring: Provide control wiring for plumbing equipment
- E. Codes: Electrical equipment and products bear the Underwriters label as required by governing codes and ordinances.

PART 3 - EXECUTION

3.01 ACCESS PANELS

- A. Install in accord with manufacturer's recommendations, coordinated with architectural features.
- B. Provide 2-hour fire rated doors where required bearing the UL label.
- C. Furnish 18-inch by 18-inch panels for ceilings and for access to equipment in soffits and shafts, and 12-inch by 12-inch for walls unless indicated otherwise.
- D. Furnish where indicated and where required to access valves, trap primers, shock arresters, and other appurtenances requiring operation, service, or maintenance. Submit proposed locations for review prior to installation.

3.02 SLEEVES

- A. Interior Floor and Wall Sleeves:
 - 1. Provide sleeves large enough to provide 3/4-inch clearances around pipe or ductwork. Where pipe or ductwork is insulated, insulation pass continuously through sleeve with 3/4-inch clearance between insulation and sleeve.
 - 2. Penetrations through mechanical room and fan room floors made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved system.
- B. Sleeves Through Rated Floors and Walls: Similar to interior sleeves except install fire rated system approved by Authority Having Jurisdiction and Owners insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
- C. Exterior Wall Sleeves Below Grade:
 - 1. Provide water tight sleeves. Install at pipes entering building below grade and where shown. Adjust to provide positive hydrostatic seal.
 - 2. Responsible for following manufacturer's procedure for installing and tightening seal. Secure sleeves against displacement.
- D. On Grade Floor Sleeves: Same as below grade exterior wall sleeves, caulked from inside.
- E. Exterior Wall Sleeves Above Grade: Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.
- F. Layout work prior to concrete forming. Do cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.
- G. Floor sleeves maintain a water barrier by providing a water tight seal or they extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated. Waste stacks using carriers have sleeves flush with floor and sealed. Sleeves through planters extend 8-inches above planter base.

- H. Do not support pipes by resting pipe clamps on floor sleeves. Provide supplementary members so pipes are floor supported.
- I. Special sleeves detailed on drawings take precedence over this Section.

3.03 CLEANING

- A. General: Clean plumbing equipment, fixtures and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.
- B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.
- C. Additional requirements are specified under specific Sections of this Division.

3.04 EQUIPMENT PROTECTION

- A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, fixtures, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.
- B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.
- C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.05 ACCESSIBILITY

- A. General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.
- B. Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms, and walkways.

3.06 FLOOR, WALL AND CEILING PLATES

- A. Install on piping and ductwork passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe.
- B. Secure wall and ceiling plates to pipe, insulation, or structure.
- C. Plates not to penetrate insulation vapor barriers.
- D. Plates not required in mechanical rooms or unfinished spaces.

3.07 PAINTING

- A. General:
 - 1. Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.

2. Exposed work under this division receives either a factory painted finish or a field prime coat finish, except:
 3. Exposed copper piping.
 4. Aluminum jacketed outdoor insulated piping.
- B. Equipment Rooms and Finished Areas:
1. Insulation: Not painted.
 2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
 3. Steel Valve Bodies and Bonnets: One coat of black enamel.
 4. Brass Valve Bodies: Not painted.
 5. Equipment:
 - a. One coat of grey machinery enamel.
 - b. Do not paint nameplates.
- C. Concealed Spaces (above ceilings, not visible):
1. Insulation: Not painted.
 2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.
- D. Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.
- E. Exterior Black Steel Pipe: Wire brush and apply two coats of rust-inhibiting primer and one coat of exterior enamel. Painting schemes comply with ANSI A13.1.

3.08 ADJUSTING AND CLEANING

- A. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations made accordingly and that recommended lubricants have been used.
- B. Use particular care in lubricating bearings to avoid damage by overlubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

3.09 ELECTRICAL EQUIPMENT

- A. Do not install piping for plumbing systems not serving electrical space in switchgear room, transformer vault, telephone room, or electric closet except as indicated.
- B. Piping for plumbing systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

3.10 EQUIPMENT CONNECTIONS

- A. Make final connections to equipment specified in sections other than Division 22, Plumbing of the specifications and Owner furnished equipment in accordance with manufacturer's instructions and shop drawings furnished and as indicated.
- B. Piping:
 - 1. Connections include hot and cold water, deionized water, distilled water, natural gas, medical gases, medical air, and vacuum, dental air and vacuum, lab air and vacuum, sanitary waste and vent, lab waste and vent and fuel oil.
 - 2. Provide valves and specialties as specified and as detailed on the Drawings. Provide increasers, reducers, and any other fittings required for complete installation.
 - 3. Independently support piping connections to prevent undue strain on equipment.
- C. Refer to Division 11, Equipment for requirements.

END OF SECTION

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SECTION 22 05 19

METERS AND GAUGES FOR PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 22, Plumbing Section 22 05 00, Common Work Results for Plumbing, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Thermometers, Water
 - 2. Pressure Gauges

1.03 SUBMITTALS

- A. Submit the following:
 - 1. Products listed in this Section.
 - 2. Water flow meters, include graph of output signal vs. gpm for each device.
 - 3. Operating and Maintenance Data.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Thermometers, Water
 - 1. Ashcroft
 - 2. Weiss
 - 3. Trerice
 - 4. Marsh
 - 5. Weksler
 - 6. Tel-Tru
 - 7. Other Manufacturers: Submit substitution request.

B. Pressure Gauges:

1. Marsh
2. Ashcroft
3. Weiss
4. Terice
5. Weksler
6. Tel-Tru
7. Other Manufacturers: Submit substitution request.

2.02 THERMOMETERS, WATER

A. Description: Direct drive 5-inch dial type, stainless steel case, separable sockets, stem length to penetrate minimum of 1/2 pipe diameter, adjustable face, extension necks where required to clear insulation.

B. Range:

Plumbing Systems	Temperature	Graduations
Domestic Cold Water	25-125 degrees F	1 degrees F
Domestic Hot Water	30-180 degrees F	2 degrees F

2.03 PRESSURE GAUGES

A. Description: 4-1/2-inch dial, molded black polypropylene turret case.

B. Range:

Plumbing Systems	Pressure (psi)	Graduations (psi)
Domestic Cold Water	0-160 psi	1 psi
Domestic Hot Water	0-160 psi	1 psi
Other ranges may be listed on Drawings in which case they take precedence		

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

- A. Provide meters and gauges where shown on Drawings.
- B. Install gauges and meters as required and as recommended by equipment manufacturer or their representative.
- C. Extend connections, wells, cocks, or gauges to a minimum of 1-inch beyond insulation thickness of the various systems.
- D. Locate gauges so that they may be conveniently read at eye level or easily viewed and read from the floor or from the most likely viewing area.
- E. Install instruments over 6-feet 6-inches above floor, to be viewed from the floor, with face at 30 degrees to horizontal.

3.02 INSTALLATION - PRESSURE GAUGES

- A. Provide instrument gauge cock at inlets. Locate pressure gauge taps for measuring pressure drop or increase across pumps, etc., as close to the device as possible.

END OF SECTION

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SECTION 22 05 23

GENERAL DUTY VALVES AND SPECIALTIES FOR PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 22, Plumbing Section 22 05 00, Common Work Results for Plumbing, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Gate Valves
 - 2. Globe Valves
 - 3. Check Valves
 - 4. Ball Valves
 - 5. Butterfly Valves
 - 6. Balancing Valves
 - 7. Specialty Valves
 - 8. System Specialties
 - 9. Strainers

1.03 SUBMITTALS

- A. Submit product data.

1.04 DEFINITIONS

- A. CWP Cold working pressure
- B. EPDM Ethylene propylene copolymer 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. PTFE Polytetrafluoroethylene plastic
- H. SWP Steam working pressure
- I. Lead Free: Refers to the wetted surface of pipe, fittings, and fixtures in potable water systems that have a weighted average lead content ≤ 0.25 percent per Safe Drinking Water Act as amended January 4th 2011. Section 1417 *Add specific state requirements as needed.

1.05 QUALITY ASSURANCE

- A. ASME Compliance:
 - 1. ASME B16.10 for ferrous valve dimensions.
 - 2. ASME B31.9 for building services piping valves.
- B. NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 372 for valve materials for potable-water service. Valves for domestic water must be 3rd Party Certified.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. General: Where only NIBCO figure numbers are listed, equivalent products by those specified below are acceptable.
 - 1. Valves:
 - a. Gate, Globe, Swing Check:
 - 1) Apollo
 - 2) Victaulic
 - 3) Crane
 - 4) Kennedy
 - 5) Stockham
 - 6) Milwaukee
 - 7) Walworth
 - 8) Hammond
 - b. Silent Check:
 - 1) Mueller
 - 2) Metraflex
 - 3) Victaulic
 - 4) Bell and Gossett
 - 5) Milwaukee
 - 6) Gruvlok
 - c. Balancing:
 - 1) Bell and Gossett
 - 2) Armstrong
 - 3) Tour and Anderson
 - 4) NIBCO
 - d. Butterfly:
 - 1) Apollo
 - 2) Victaulic
 - 3) Gruvlok
 - 4) Crane

- 5) Walworth
- 6) Milwaukee
- 7) Metraflex
- e. Ball:
 - 1) Gruvlok
 - 2) Apollo
 - 3) Crane
 - 4) Hammond
 - 5) Milwaukee
 - 6) Victaulic
- 2. Specialty Valves:
 - a. Gas Pressure Regulator:
 - 1) Actaris
 - 2) Maxitrol
 - 3) Fisher
 - 4) Other Manufacturers: Submit substitution request.
 - B. Other Manufacturers: Submit substitution request.
 - C. Use only one manufacturer.
 - D. Valve ends may be threaded, flanged, soldered, or grooved, as applicable to piping system. Refer to Section 22 21 13, Pipe and Pipe Fittings Plumbing for allowable fittings.

2.02 GATE VALVES

- A. Lead Free Bronze Gate: Lead Free Silicon Bronze corrosion resistant body and trim, screwed bonnet; solid wedge, NSR, 300 psi CWP, NIBCO S/T-113-LF.
- B. Lead Free Iron Gate: Class 125, OS&Y, Cast or Ductile Iron body, Stainless steel or Lead Free silicon bronze corrosion resistant trim, OS&Y pattern, solid wedge, 200 psi rating; NIBCO F-607-RWS or F-619-RWS.

2.03 GLOBE VALVES

- A. Bronze Globe and Angle Globe: Bronze body, bronze mounted, renewable composition disc, 150 psi rating; NIBCO 235 or 335.
- B. Bronze Globe and Angle Globe High Pressure: Bronze body, stainless steel disc, union bonnet, 300 psi steam; NIBCO 276-AP or 376-AP.

2.04 CHECK VALVES

- A. Horizontal Y-Pattern Bronze Swing Check: Bronze body, bronze mounted, regrinding bronze disc, 150 psi steam rating, 300 psi WOG; NIBCO 433-Y.
- B. Lead Free Y-Pattern Horizontal Bronze Swing Check: Lead Free Silicon Bronze corrosion resistant body, and trim, PTFE renewable seat and disc, 300 psi CWP; NIBCO S/T 413-Y-LF.
- C. Horizontal Iron Swing Check: Iron body, bronze mounted, renewable seat and disc, 125 psi steam, 200 psi WOG; NIBCO 918.
- D. Lead Free Horizontal Iron Swing Check: Iron body, wafer style, renewable seat and disc, 200 CWP psi rating, 200 psi Non-Shock Cold Working Pressure; NIBCO W-910-LF.

2.05 BALL VALVES

- A. Lead Free Bronze Ball: Two piece, full port, Lead Free silicon bronze body, Stainless steel or silicon bronze trim, Reinforced PTFE or TFE seats, 600 psi CWP NIBCO T/S-585-80-LF or T/S-585-66-LF.

2.06 BUTTERFLY VALVES

- A. Lead Free Butterfly Valve: Ductile iron body, Lead Free Aluminum Bronze disc and stainless steel stem, with lever handle and locking feature on valves 6-inches and less, gear operator on valves 8-inches and over; stem neck length to accommodate insulation where applicable, EPDM liner, 200 psi water; NIBCO LD- 2000N-3/5,

2.07 BALANCING VALVE

- A. Lead-Free Calibrated: Bronze, Ametal (copper-alloy), or ductile iron body, brass globe or ball, differential pressure readout valves with integral checks, calibrated plate, integral pointer, suitable for tight shutoff, memory stops, threaded, grooved or soldered ends, 250 psi water, NSF/ANSI 61 compliant, Bell and Gossett Lead-Free Circuit Setter Plus.

2.08 SPECIALTY VALVES

- A. Gauge Cocks: Brass, tee handle, male to female, 200 psi working pressure, 1/4 inch; Apollo 41 series.
- B. Drain Valves: Bronze globe valve or full port ball valve, garden hose end, cap and chain 3/4 inch size.

2.09 SYSTEM SPECIALTIES

- A. Manual Air Vents: Coin type; Dole 9 or approved equal.
- B. Pressure/Temperature Test Plug:
 - 1. Acceptable Manufacturers:
 - a. Peterson Engineering, Inc.
 - b. Universal Lancaster
 - c. Sisco
 - d. Trerice.
 - e. Other Manufacturers: Submit substitution request.
 - 2. General: 1/2-inch NPT fitting to receive either a temperature or pressure probe 1/8-inch OD, fitted with a color coded and marked cap with gasket.
 - 3. Material: Solid brass with valve core of Nordel.
 - 4. Rating: Minimum 300 psig at 275 degrees F.
 - 5. Gauges and Thermometers: Supply Owner with two pressure gauge adapters with 1/8-inch OD probe and two five-inch stem pocket test thermometers 25 degrees F to 125 degrees F for chilled water, 40 degrees F to 240 degrees F for heating water.

2.10 STRAINERS

- A. Acceptable Manufacturers:
 - 1. Armstrong
 - 2. McAlear
 - 3. Sarco
 - 4. Steamflo
 - 5. MuellerR.P. & C.
 - 6. Other Manufacturers: Submit substitution request.
- B. Wye Pattern:
 - 1. Bronze: Lead free bronze body, 250 psi, 1/16-inch perforated Type 304 stainless screen.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide valves at connections to equipment where shown or required for equipment isolation.
- B. Provide separate support for valves where necessary.
- C. Provide drain valves in low points in the piping system, at coils and equipment, and as indicated.
- D. Coordinate gas pressure regulator selection with inlet pressure available at the regulator and the capacity and outlet pressure required by the equipment served.
- E. Install in accordance with manufacturer’s recommendations.
- F. Locate gas cocks and gas regulator readily accessible for servicing.
- G. Provide approved gas cock immediately upstream of each gas pressure regulator.
- H. Provide separate vent to the outside for each regulator.

3.02 APPLIED LOCATIONS PLUMBING VALVES

- A. In piping 2-inches and smaller:

System	Valve Types				
	Gate	Globe	Swing Check	Ball	Butterfly
Domestic Hot	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Not Allowed
Domestic Cold	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Lead Free Bronze	Not Allowed

B. In piping 2-1/2-inches and larger:

System	Valve Types				
	Gate	Globe	Swing Check	Ball	Butterfly
Domestic Hot	Lead Free Iron	Lead Free Iron	Lead Free Iron	Not Allowed	Lead Free Ductile Iron
Domestic Cold	Lead Free Iron	Lead Free Iron	Lead Free Iron	Not Allowed	Lead Free Ductile Iron

- C. Calibrated balancing valves on domestic hot water. Size balancing valves based on the published performance curve characteristics for the scheduled flow rate for each location to ensure proper operation at design conditions.
- D. Silent check valves on pump discharge for domestic cold water, solar hot water, reclaimed water, cold process water, process grey water.
- E. Check valves on vertical discharge of sump pumps and sewage ejector pumps, iron swing check with outside weight and lever. Mount in piping at 45 degree angle.
- F. Provide gauge cock for all pressure gauges.

3.03 VALVE IDENTIFICATION

- A. General: Identify valves to indicate their function and system served.
- B. Refer to Section 22 05 53, Identification for Plumbing Piping and Equipment.

3.04 CHAIN OPERATORS

- A. Valves in equipment rooms or fan rooms used for equipment or coil isolation and more than 8-feet above floor installed with stem horizontal and equipped with chain wheels and chains extending to 6 feet above floor.

3.05 INSTALLATION

- A. Manual Air Vents:
 - 1. Install at high points where automatic air vents are not used, where noted, and where required for proper venting of system.
 - 2. Install in accordance with manufacturer's recommendations.
- B. Install grooved joints in accordance with the manufacturer's published installation instructions.
- C. Mold and produce gaskets by the coupling manufacturer, and suitable for the intended service. Coupling manufacturer's factory trained representative to provide on-site training for the contractor's field personnel in the use of grooving tools and installation of grooved joint products. Representative to periodically visit the project site to ensure best practices in grooved installation are being followed. Distributor's representative is not considered qualified to conduct the training of field visits.
- D. Test Plugs: Install where indicated and in accordance with the manufacturer's recommendations.

- E. Pressure Reducing Valves: Install where indicated and in accordance with manufacturer's recommendations with 3 valve bypass.
- F. Water Relief Valves:
 - 1. Install where indicated, and in accordance with manufacturer's instructions.
 - 2. Pipe discharge to nearest floor drain using Schedule 40 steel pipe.
- G. Strainer:
 - 1. Applied Locations Plumbing:
 - a. Bronze wye, in piping 2-inch and smaller; domestic water, solar hot water, reclaimed water, cold process water, process grey water.
 - b. Cast iron, in piping 2-1/2-inch and larger; solar hot water, reclaimed water, cold process water, process grey water
 - c. Cast iron, high pressure wye, in piping 2-1/2-inch and larger; domestic water.
- H. Backwater Valves:
 - 1. Install backwater within vault indicated.
 - 2. If vault not indicated (shallow bury application), provide soil pipe extension to install ferrule and cover at top and flush with floor surface.

END OF SECTION

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SECTION 22 05 29

HANGERS, SUPPORTS, AND ANCHORS FOR PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 22, Plumbing Section 22 05 00, Common Work Results for Plumbing, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Supports, Anchorage and Restraint
 - 2. Pipe Attachments
 - 3. Pipe Rollers, Insulation Protection Shields and Insulation Protection Saddles
 - 4. Building Attachments
- B. Related Sections include:
 - 1. Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment
 - 2. Section 22 07 00, Insulation for Plumbing
 - 3. Section 22 21 13, Pipe and Pipe Fittings Plumbing

1.03 SUBMITTALS

- A. Submit the following:
 - 1. Shop Drawings of contractor fabricated piping support structures.
 - 2. No other submittals required under this section.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Supports, Anchorage and Restraint:
 - 1. Unistrut
 - 2. Superstrut

3. Powerstrut and Kinline
 4. B-Line Systems
 5. AnvilStrut
- B. Pipe Attachments:
1. Anvil
 2. Superstrut
 3. B-Line Systems
 4. Tolco
 5. ERICO
- C. Pipe Rollers, Insulation Protection Shields and Insulation Protection Saddles:
1. Anvil or equivalent
 2. Super Strut
 3. B-Line Systems
 4. Tolco
 5. ERICO
- D. Building Attachments:
1. Anvil as listed or equivalent products
 2. Elcen
 3. Superstrut
 4. B-Line Systems
 5. Tolco
 6. ERICO

2.02 SUPPORTS, ANCHORAGE AND RESTRAINT

- A. General:
1. Provide pipe and equipment hangers and supports in accordance with the following:
 - a. Equipment, supports, and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor responsible for their design.
 - b. Resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
 - c. Seismic restraint not to introduce excessive stresses in the piping caused by thermal expansion or contraction.

- d. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
 - e. In accordance with the latest edition of the SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems for the Seismic Hazard Level corresponding to the seismic zone in which the project is constructed.
 - f. In accordance with the applicable code.
 - g. Follow provisions described in Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment.
- B. Engineered Support Systems: Design, detail, and bear the seal of a professional engineer registered in the State having jurisdiction.
1. Supports and seismic restraints for suspended piping and equipment.
 2. Support frames such as pipe racks or stanchions for piping and equipment which provide support from below.
 3. Equipment and piping support frame anchorage to supporting slab or structure.
- C. Fabricate support members from welded standard structural shapes, pipe, and plate to carry the necessary rollers, hangers, and accessories as required.
- D. Support piping less than 4-inch pipe size from or by prefabricated roll-formed channels with necessary accessories to adequately support piping system.
- E. Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.
- F. Dissimilar Metal Protection: Hydra-Zorb cushions or Cush-a-strip.
- G. Clamps: Super Strut Series 700 through 702 or AnvilStrut Series 1000 through 1200.

2.03 PIPE ATTACHMENTS

- A. Uninsulated Horizontal Copper Piping:
1. 2-inch and Smaller: Anvil CT-65, CT-69, CT-99C.
 2. Larger than 2-inch:
 - a. Anvil 260 field or factory copper plated, plastic coated or other recognized industry methods.
 - b. Electricians' tape is unacceptable.
- B. Insulated Horizontal Copper Pipe with Hangers Inside of Insulation: Same as Uninsulated Horizontal Copper Pipe.
- C. Insulated Horizontal Copper Pipe with Hangers Outside of Insulation:
1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
 2. Larger than 2-inch: Anvil 260.
- D. Other Uninsulated Horizontal Pipe:
1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.

2. Larger than 2-inch: Anvil 260.
- E. Other Insulated Horizontal Pipe With Hangers Inside of Insulation:
 1. 2-inch and Smaller: Anvil 65, 70, 104, 260 or 300.
 2. Larger than 2-inch: Anvil 260.
- F. Other Insulated Horizontal Pipe with Hangers Outside of Insulation:
 1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
 2. Larger than 2-inch: Anvil 260.
- G. Riser Clamps Copper Pipe:
 1. 4-inch and Smaller: Anvil CT-121, CT-121C or 261C.
 2. Larger than 4-inch: Anvil 261C.
- H. Riser Clamps Other Piping: Anvil 261.

2.04 PIPE ROLLERS, INSULATION PROTECTION SHIELDS AND INSULATION PROTECTION SADDLES

- A. Pipe Rollers: Anvil 174 or 274 as required. Size for pipe plus insulation for insulated pipe.
- B. Insulation Protection Shields: Anvil 167.
- C. Insulation Protection Saddles: Anvil 160 through 166A as required. Saddles for copper pipe, factory or field copper plated.

2.05 BUILDING ATTACHMENTS

- A. Beam Hangers:
 1. On piping 6-inch and smaller: Anvil 86 with retaining clip Figure 89.
 2. On piping larger than 6-inch: Anvil 228, or 292.
- B. Inserts:
 1. Anvil 152 malleable iron or 281 steel inserts.
 2. Inserts sized for required rod to support load being carried.
- C. Expansion Plugs: Similar and equal to Phillips red-head self-drilling flush shell selected for safety factor of 4.
- D. Powder actuated fasteners with silencers as approved by Architect.

PART 3 - EXECUTION

3.01 HANGERS AND SUPPORTS

A. General:

1. Install support systems as detailed and in accordance with manufacturer's recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required and as detailed on the Drawings.
2. Provide adjustable hangers for pipes complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., except where specified otherwise.
3. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping and do not support piping from other piping.
4. Except as otherwise indicated for exposed continuous pipe runs, install hangers, and supports of same type and style as installed for adjacent similar piping.
5. Install cast iron piping in accordance with Cast Iron Soil Pipe Industry (CISPI) Standards.
6. Support piping within 2-feet of each change of direction on both sides of fitting.

B. Insulated Piping Systems:

1. Refer to Section 22 07 00, Plumbing Insulation, for insulation requirements.
2. Insulated Piping Systems with Vapor Barrier Insulation:
 - a. Install hangers outside of insulation.
 - b. On piping 1-1/2-inch and larger, provide insulation protection shields at each support location.
3. Insulated Piping Systems with Non-Vapor Barrier Insulation: As specified for Insulated Piping Systems with Vapor Barrier Insulation.
4. Insulation Protection:
 - a. Band insulation protection shields firmly to insulation to prevent slippage.
 - b. Tack weld insulation protection saddles to steel pipe. Braze saddles to copper pipe.

C. Vertical Piping:

1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.
2. Riser clamps on steel pipe to be directly welded to pipe. Riser clamps on copper pipe to be installed directly under fitting.
3. Risers that are not subject to thermal change to be supported at each floor of penetration.

4. Risers that are subject to thermal change require engineered supports. Size supports to carry forces exerted by piping system when in operation. Riser supports follow provisions described in Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment.

D. Horizontal Piping:

1. Trapeze Hangers:
 - a. Multiple pipe runs where indicated supported on channels with rust resistant finish.
 - b. Provide necessary rods and supporting steel.
2. Support Spacing:
 - a. Provide support at minimum spacing per MSS SP-69-1996 Pipe Hangers and Supports - Selection and Application:

- 1) Support piping within 2-feet of each change in direction.

- 2) Steel Pipe, Copper Tubing:

Minimum Pipe Size	Maximum Span Steel	Maximum Span Copper	Rod Size
1-inch and smaller	7-feet	5-feet	1/4-inch
1-1/4-inch to 2-inch	8-feet	8-feet	3/8-inch
2-1/2-inch to 3-inch	11-feet	9-feet	1/2-inch
4-inch to 5-inch	14-feet	12-feet	1/2-inch
6-inch	17-feet	14-feet	1/2-inch
8-inch or larger	19-feet	16-feet	5/8-inch

- 3) Plumbing Piping: Support in accordance with local plumbing code.
- 4) Plastic Pipe: Supported a maximum of 3-feet on center for piping 1-inch and smaller and 4-feet on center for piping 1-1/4-inch and larger with rod sizes as recommended by the manufacturer.
- 5) Piping provided with acoustical lagging wrap supported a maximum of 5-feet on center. Install hangers outside of acoustical lagging.

E. Building Attachments:

1. Fastening or attaching to steel deck (without concrete fill) is prohibited. It will be necessary to support piping from structural members, beams, joists, or provide intermediate angle iron supporting members between joists. Supports may be attached to concrete filled steel deck with load limitations shown on the structural drawings or otherwise obtained from the structural engineer.
2. Provide horizontal bracing on horizontal runs 1-1/2 inch and larger and exceeding 50-feet in length at 75-foot intervals and as required to provide stabilized piping systems.
3. Provide additional structural steel angles, channels, or other members required to support piping where structures do not occur as required for proper support.
4. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.

END OF SECTION

SECTION 22 05 48

VIBRATION AND SEISMIC CONTROLS 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, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 22, Plumbing Section 22 05 00, Common Work Results for Plumbing, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Neoprene Waffle Pad, Type 1
 - 2. Restrained Neoprene Mount, Type 2
 - 3. Springs, Type 3
 - 4. Springs with Restraints, Type 4
 - 5. Base with Springs, Type 5
 - 6. Inertia Base with Springs, Type 6
 - 7. Isolating Spring Hangers, Type 7
 - 8. Isolating Neoprene Hangers, Type 8
 - 9. Isolating Sleeves
 - 10. Seismic Restraints
 - 11. Flexible Sphere Connector
 - 12. Flexible Hose Connector
 - 13. Expansion Joint/Seismic Connector
- B. Related Sections include:
 - 1. Section 22 05 29 Hangers, Supports and Anchors for Plumbing

1.03 QUALITY ASSURANCE

- A. Select a single manufacturer and furnish isolation required, except packaged equipment with integral isolators meeting all the isolation and seismic requirements of this specification.
- B. Isolation performance requirements are indicated in the specifications. All deflections indicated are nominal static deflections for specific equipment supported.
- C. Seismic snubbers, restrained isolator housings, and cable system components have anchorage preapproval OPA number from OSHPD in the State of California verifying the maximum certified load ratings.
- D. Isolator Stability and Rated Capacity:
 - 1. Spring diameters not less than 0.8 of the compressed height of the spring at rated load.
 - 2. Springs have a minimum additional travel to solid equal to 50 percent of the rated deflection.
- E. Seismic Restraints:
 - 1. Restraint of equipment and piping to be in accordance with the current state and local Building Code.
 - 2. Calculations in accordance with current state and local Building Code.

1.04 SUBMITTALS

- A. Submit the following:
 - 1. Submit Shop Drawings showing complete details of construction for steel and concrete bases including:
 - a. Equipment mounting holes.
 - b. Dimensions
 - c. Isolation selected for each support point
 - d. Details of mounting brackets for isolator
 - e. Weight distribution for each isolator
 - f. Code number assigned to each isolator
 - 2. Submit product data and calculation sheets for isolators, showing:
 - a. Size, type, load rating, and rated deflection of each required isolator.
 - b. Percent of vibration transmitted based on the lowest disturbing frequency of the equipment.
- B. Installation report as specified in PART 3 of this Section.
- C. Operation and maintenance data.

1.05 EQUIPMENT VIBRATION ISOLATION

- A. Provide a balanced set of vibration isolators for each piece of equipment listed in the Equipment Schedules.

- B. Isolation work to include, but not necessarily be limited to, the following:
 - 1. Isolation support of motor-driven equipment.
 - 2. Inertia base frames in conjunction with isolation.
 - 3. Isolation support of piping and piping risers.
 - 4. Penetration isolation of pipework and conduits through walls, floors, or ceilings.
 - 5. Flexible connections of piping to equipment.
- C. Each piece of rotating equipment must meet a reasonable criterion for maximum vibration levels at each bearing, while in operation. The criteria for varying operating speeds are given as follows:
 - 1. Rotating equipment operating peak vibration velocities must not exceed 0.08 in./sec.
 - 2. If it is discovered that the operating vibration velocities exceed this criteria, the equipment repaired or replaced at no expense to the owner until approval of the equipment is given by the engineer.
- D. Provide components or materials not specially mentioned herein, but necessary to the proper vibration isolation of the equipment.

1.06 CONTRACTOR RESPONSIBILITY

- A. Vibration isolation devices, including auxiliary steel bases and pouring forms, designed and furnished by a single manufacturer or suppliers.
- B. Adequately restrain equipment and piping to resist seismic forces. Design and select restraint devices to meet seismic requirements as defined in the latest issue of the International Building Code under Earthquake Design and applicable state and local codes.
- C. Selection, installation, adjustment and performance of vibration isolators which will meet the requirements given on the plans or in the specifications.
- D. Provide Engineering drawings, details, supervision, and instruction to assure proper installation and performance.
- E. Provide whatever assistance necessary to ensure correct installation and adjustment of the isolators.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. General:
 - 1. Amber Booth
 - 2. Mason Industries, Inc.

3. Kinetics Corporation
 4. Vibrex
 5. Approved equal, meeting the conditions and requirements specified herein.
- B. Neoprene Waffle Pad, Type 1:
1. Mason Type Super W or Super WM
 2. HG Grommet; Similar Amber-Booth
 3. Kinetics Corporation
- C. Restrained Neoprene Mount, Type 2:
1. Mason Type BR
- D. Springs, Type 3:
1. Mason Type SLF
 2. Amber-Booth Type SW
 3. Kinetics Corporation
 4. Vibrex
- E. Springs with Restraints, Type 4:
1. Mason type SSLR or SLRS with seismic restraints
 2. Amber-Booth
 3. Kinetics Corporation Model FYS
 4. Vibrex
- F. Base with Springs, Type 5:
1. Mason
 2. Amber-Booth
 3. Kinetics Corporation
 4. Vibrex
- G. Inertia Base with Springs, Type 6:
1. Mason
 2. Amber-Booth

3. Kinetics Corporation
 4. Vibrex
- H. Isolating Spring Hangers, Type 7:
1. Mason 30N
 2. Amber-Booth
 3. Consolidated Kinetics
 4. Vibrex
- I. Isolating Neoprene Hangers, Type 8:
1. Mason HD
 2. Amber-Booth
 3. Consolidated Kinetics
 4. Vibrex
- J. Isolating Sleeves:
1. Potter-Roemer PR Isolators
 2. Grinnell Semco Trisolators
- K. Flexible Sphere Connector:
1. Mason Type SFU, SFDEJ or SFEJ
- L. Flexible Hose Connector:
1. Mason Type BSS, FFL, MN, CPS or CPSB
 2. HCl
 3. Metraflex

2.02 NEOPRENE WAFFLE PAD, TYPE 1

- A. 3/4-inch thick neoprene waffle pads with pattern repeating on 1/2-inch centers.
- B. Select Duro rating for maximum deflection at average load rating.
- C. Include load distribution steel plate as required.
- D. Include anchor bolt grommet as required.

2.03 RESTRAINED NEOPRENE MOUNT, TYPE 2

- A. Bridge-bearing neoprene mountings have a minimum static deflection of 0.2-inches and all directional seismic capability.
- B. Ductile iron casting containing two separated and opposing molded neoprene elements.
- C. Prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation.
- D. Compound shock absorbing neoprene materials to bridge-bearing specifications.

2.04 SPRINGS, TYPE 3

- A. Free standing springs without housings.
- B. 1/4-inch thick molded neoprene cup with steel reinforcement washer or neoprene acoustical friction pads between base plate and support.
- C. Leveling bolt mounting with height saving brackets.
- D. Springs mounted outboard of channels.
- E. Attach baseplate screws using neoprene bushings and washers.
- F. Spring diameters not less than 0.8 of the compressed height of the spring at rated load.

2.05 SPRINGS WITH RESTRAINTS, TYPE 4

- A. Same as springs except housing with seismic restraints to be added.
- B. Seismic restraint with molded all directional neoprene bushings an integral part of isolator.
- C. Seismic restraint selected for minimum safety factor of 2 from ultimate seismic capacity.
- D. Spring mount must have neoprene cup or pad inside the seismic housing to allow anchoring of the housing baseplate without short circuiting pad.

2.06 BASE WITH SPRINGS, TYPE 5

- A. Steel Isolating Frame:
 - 1. Mason WFSL with WF steel beams with a minimum depth of 10 percent of the span between supports.
 - 2. Provide external height saving brackets.

2.07 INERTIA BASE WITH SPRINGS, TYPE 6

- A. Inertia Bases:
 - 1. Mason BMK or KSL with 1/2-inch square bar reinforcing, integral height saving brackets and steel templates with anchor bolts sleeves.

2. Bases must be sized to fit stanchions for pump elbows or suction diffusers.
3. Depth of base equal to 8 percent of the span between supports, 6-inch minimum.

2.08 ISOLATING SPRING HANGERS, TYPE 7

- A. Combination rubber-in shear and steel spring isolators installed on the hanger rods.
- B. Proper deflection to allow the piping to deflect as a unit with the pump isolators.
- C. Hangers designed for 30 degree angular movement.
- D. Minimum Deflection: 1-inch

2.09 ISOLATING NEOPRENE HANGERS, TYPE 8

- A. Double deflection neoprene hangers, minimum static deflection of 0.35-inches.
- B. Provide projecting bushing to prevent steel to steel contact.

2.10 ISOLATING SLEEVES

- A. Provided for piping through walls and floors of penthouses and chiller room.
- B. Size for piping as required.

2.11 SEISMIC RESTRAINTS

- A. General Requirements:
 1. Provide for equipment and piping, both supported and suspended.
 2. Bracing of piping in accordance with the code and with the provisions set forth in the SMACNA seismic restraint manual.
 3. Structural requirements for the restraints, including their attachment to the building structure, reviewed and approved by the structural engineer.
 4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.
- B. Supported Equipment:
 1. All-directional seismic snubbers consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene.
 2. Replaceable bushing and a minimum of 1/4-inch thick. Rated loadings not to exceed 1000 psi.
 3. Incorporate an air gap of 1/4-inch be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces.
 4. Removeable snubber end caps to allow inspection of internal clearances. Neoprene bushings rotated to ensure no short circuits exist before systems are activated.

5. Snubber Mason Industries, Inc. Type Z-1225

C. Bracing of Pipes:

1. Provide seismic bracing of all piping as detailed below to meet the building code requirements:
 - a. Exception:
 - 1) Piping suspended by individual hanger's 12-inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced where the following criteria are met.
 - a) Seismic braces are not required on high deformability piping when the $I_p=1.0$ and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 3-inches diameter or less.
 - b) Seismic braces are not required on high deformability piping when the $I_p=1.5$ and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 1-inch diameter or less.
2. Seismic braces for pipes on trapeze hangers may be used.
3. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints, or where pipes connect to equipment.
4. Cast iron pipe of all types, glass pipe, and any other pipe jointed with a shield and clamp assembly, where the top of the pipe is 12-inches or more from the supporting structure, braced on each side of a change in direction of 90 degrees or more. Riser joints on unsupported sections of piping braced or stabilized between floors.
5. Vertical Risers:
 - a. Laterally supported with a riser clamp at each floor.
 - b. For buildings greater than six stories high or for piping subject to thermal change risers engineered individually.

D. Suspended Equipment and Piping:

1. Seismic cable restraints consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint.
2. Pre-stretch cable to achieve a certified minimum modulus of elasticity. Cable end connections steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement.
3. Cable Assemblies: Mason Industries, Inc Type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod and the clevis or SCBV if clamped to a beam.
4. Steel angles, sized to prevent buckling, clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies Mason Industries, Inc. Type SRC or UC.
5. Pipe clevis cross-bolt braces are required in all restraint locations. Special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross brace Mason Industries, Inc. Type CCB.

2.12 FLEXIBLE SPHERE CONNECTOR

- A. Flexible EPDM pipe connectors manufactured of multiple plies of Kevlar tire cord fabric and EPDM; both molded and cured in hydraulic rubber presses. Do not use steel wire or rings as pressure reinforcement.
- B. Connectors up to and including 2-inch diameter may have a single sphere and threaded ends. Connectors 2-1/2-inch and larger manufactured with twin spheres up to 12-inches and a single sphere on larger sizes and floating steel flanges recessed to lock the connectors raised face EPDM flanges.
- C. Rated a minimum of 150 psi at 220 degrees F. Pre-extended as recommended by the manufacturer to prevent additional elongation under pressure.

2.13 FLEXIBLE HOSE CONNECTOR

- A. Flexible stainless steel hoses manufactured using type 304 stainless steel hose and braid with one fixed and one floating raised face carbon steel plate flange.
- B. Sizes 2-1/2-inch and smaller may have threaded male nipples or copper sweat ends. Grooved ends are acceptable in all sizes in grooved piping systems. Weld ends are not acceptable. Copper sweat end hoses for water service all copper or bronze construction.
- C. Close pitch annular corrugations for maximum flexibility and low stiffness. Tested hose stiffness at various pressures must be included in the submittals.
- D. Capable of continuous operation at 150 psi and system test pressure when installed in piping systems.
- E. Same size as the pipe it connects and have pipe thread connectors on both ends with male or female end adapters as required.

2.14 EXPANSION JOINT/SEISMIC CONNECTOR

- A. T304 stainless steel hose and braid, Schedule 40 radius elbows and 180 degree bend, flange or weld end Schedule 40 fittings. ASA certified when used for natural gas service. Metraflex Metaloop only.
- B. Connector accepts differential support displacement without damaging pipe, equipment connections, or support connections.

PART 3 - EXECUTION

3.01 GENERAL

- A. Do not install equipment or pipe which makes rigid contact with the building.
- B. Installation or use of vibration isolators must not cause any change of position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping maintained in a rigid position during installation. Load not transferred to the isolator until the installation is complete and under full operational load.

- C. Correct, at no additional cost, all installations which are defective in workmanship or materials.

3.02 PREPARATION

- A. Treat isolators, including springs, hardware, and housing, with a corrosion protective coating of epoxy powder or electro galvanizing.
- B. Coat steel frames exposed to weather with a rustproof metal primer.
- C. Provide hot dipped galvanizing on steel frames as indicated on the plans for corrosion protection in severe conditions.

3.03 INSTALLATION

- A. General:
 - 1. Install isolation where indicated on the Drawings by type and location and where indicated below.
 - 2. Mark assigned code number on isolators and bases to assure placement in the proper location.
 - 3. Anchor isolator seismic housing baseplate to floor.
 - 4. Provide rubber grommets and washers to isolate the bolt from the building structure. Do not destroy the isolation efficiency destroyed when bolting the isolators to the building structure.

3.04 SEISMIC RESTRAINTS

- A. General:
 - 1. Install and adjust seismic restraints so that the equipment and piping support is not degraded by the restraints.
 - 2. Restraints must not short circuit vibration isolation systems or transmit objectionable vibration or noise.
- B. Supported Equipment:
 - 1. Each vibration isolation frame for supported equipment have a minimum of four seismic snubbers mounted as close as possible to the vibration isolators and/or the frame extremities.
 - 2. Care must be taken so that the 1/4-inch air gap in the seismic restraint snubber is preserved on all sides in order that the vibration isolation potential of the isolator is not compromised. This requires that the final snubber adjustment be completed after the vibration isolators are properly installed and the installation approved.
- C. Bracing of Pipes:
 - 1. Branch lines may not be used to brace main lines.

2. Transverse Bracing: Maximum 40-feet, except where a lesser spacing is indicated in the SMACNA tables for bracing of pipes
3. Longitudinal bracing at 80-feet maximum except where a lesser spacing is indicated in the tables. In pipes where thermal expansion is a consideration, an anchor point may be used as the specified longitudinal brace provided that it has a capacity to resist both the seismic load and the additional force induced by expansion and contraction.
4. A rigid piping system not be braced to dissimilar parts of the building or to two dissimilar building systems that may respond differently during an earthquake.
5. Transverse bracing for one pipe section may also act as longitudinal bracing for a pipe section of the same size connected perpendicular to it if the bracing is installed within 24 inches of the elbow or tee.
6. Subject to confirmation by field inspection, seismic bracing is not required on piping when the piping is supported by rod hangers and the hangers in the entire run are 12-inches or less in length from the top of the pipe to the supporting structure, hangers are detailed to avoid bending of the hangers and their attachments and provisions are made for piping to accommodate expected deflections.

D. Suspended Equipment, Piping, Cable Method:

1. Adjust cables to a degree of slackness approved by the Structural Engineer.
2. Uplift and downward restraint nuts and Mason type RW neoprene covered steel rebound washers for the Type 6 hangers adjusted with a maximum 1/4-inch clearance.

3.05 FIELD QUALITY CONTROL

- A. Installation Report: Isolation manufacturer's representative confirms that isolation is installed correctly and submit report stating that isolators are installed as shown on Shop Drawings, isolators are free to work properly, and that installed deflections are as scheduled and as specified.

END OF SECTION

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SECTION 22 05 53

IDENTIFICATION 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, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 22, Plumbing Section 22 05 00, Common Work Results for Plumbing, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Valve Identification
 - 2. Piping Markers
 - 3. Equipment Identification

1.03 SUBMITTALS

- A. Submit the following:
 - 1. Valve Tag Directory: Submit for approval prior to fabrication of valve tags.
 - 2. Equipment Nameplate Directory: Submit for approval prior to fabrication.
 - 3. Operating and Maintenance Data: Include a copy of valve tag and equipment nameplate directories in each set of Operating and Maintenance manuals.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Piping Markers:
 - 1. W.H. Brady
 - 2. Seton
 - 3. Marking Systems, Inc. (MSI)
 - 4. Other Manufacturers: Submit substitution request.

2.02 VALVE IDENTIFICATION

A. Valve Tags:

- General: Identify valves with metal tags, legends to be stamped or embossed. Indicate function of the valve and its normal operating position.

56 HW	(NUMBER AND CONTENT OF PIPE)
ISOLATION	(VALVE FUNCTION)
NO	(NORMAL OPERATION POSITION)

- Size: Valve tags 2-inch diameter with 1/4-inch high letters.
- Material: Use 0.04-inch brass tags.
- Automatic Valves and Regulating Valves: Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicaid, or equal. Form letters by exposing center ply.
- Buildings Systems: Contact the Owner for coordination with existing building tagging system and supplementary information required for specific systems before valve tagging begins.

- B. Valve Tag Directory: Include tag number, location, exposed or concealed, service, valve size, valve manufacturer, valve model number, and normal operating position of valve.

2.03 PIPING MARKERS

- A. Label pipes with all-vinyl, self-sticking labels or letters.
- B. For pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters.
- C. For sizes from 3/4 to 2-inch outside diameter, 3/4-inch letters, above 2-inches outside diameter, 2-inch letters.
- D. Identify and color-code pipe markers as follows with black directional arrows.

PLUMBING SERVICE	PIPE MARKER*	BACKGROUND COLOR
COLD WATER	DOMESTIC COLD WATER	GREEN
HOT WATER	DOMESTIC HOT WATER SUPPLY	YELLOW
	DOM. HOT WATER RECIRC	YELLOW OR GREEN
SANITARY WASTE	SANITARY WASTE	GREEN
STORM DRAIN	STORM DRAIN	GREEN
OVERFLOW DRAIN	OVERFLOW DRAIN	GREEN
VENT	VENT	GREEN
* Directional arrow applied adjacent to pipe marker indicating direction of flow.		
** Provide custom marker labels for piping for which no standard manufactured marker is available. Submit sample for approval.		

2.04 EQUIPMENT IDENTIFICATION

A. Nameplates:

- Tag pumps, converters, and miscellaneous items of mechanical equipment with engraved nameplates.

2. 1/16-inch thick, 3-inch by 5-inch laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
 3. Identify unit with code number as shown on Drawings and area served.
- B. Equipment Nameplate Directory:
1. List pumps, and other equipment nameplates.
 2. Include Owner and Contractor furnished equipment.
 3. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

PART 3 - EXECUTION

3.01 VALVE IDENTIFICATION

- A. Valve Tags:
1. Attach to valve with a brass chain.
 2. Valve tag numbers continuous throughout the building for each system.
 3. Obtain a list for each system involved from the Owner.
- B. Valve Tag Directory: Post final copy in Operation and Maintenance Manual.

3.02 PIPING MARKERS

- A. Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:
1. Every 20-feet along continuous exposed lines.
 2. Every 10-feet along continuous concealed lines.
 3. Adjacent to each valve and stub-out for future.
 4. Where pipe passes through a wall, into and out of concealed spaces.
 5. On each riser.
 6. On each leg of a T.
 7. Locate conspicuously where visible.
 8. Provide pipe identification (over insulation) for reclaimed water systems in accordance with current local codes and rulings.
- B. Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above.

- C. Apply arrow labels indicating direction of flow. Arrows to be the same color and sizes as identification labels.
- D. Install tags on specialty gas piping valves with brass chain.

3.03 EQUIPMENT IDENTIFICATION

- A. Nameplates: Attach to prominent area of equipment, with sheet metal screws, brass chain, or contact cement as applicable.
- B. Nameplate Directory: Post final copy in Operation and Maintenance Manual.

END OF SECTION

SECTION 22 05 90

PRESSURE TESTING FOR PLUMBING SYSTEMS

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.
- B. The provisions of Division 22, Plumbing Section 22 05 00, Common Work Results for Plumbing, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Pressure Testing of Piping System

1.03 QUALITY ASSURANCE

- A. Code Compliance: Perform required tests in the presence of the authority having jurisdiction.
- B. Owner Witness: Perform all tests in the presence of the Owner's representative.
- C. Engineer Witness: The Engineer or Engineer's representative reserves the right to observe all tests or selected tests to assure compliance with the specifications.
- D. Simultaneous Testing: Test observations by the authority having jurisdiction, the Owner's Representative, and the Engineer's representative need not occur simultaneously.

1.04 SUBMITTALS

- A. Submit the following test reports:
 - 1. Certificate of completion, inspection and test by authority having jurisdiction on required piping systems.
 - 2. Certificate of test approval by Owner's representative on all systems.
 - 3. Engineer's representative will record witnessed tests.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.01 GENERAL

- A. Piping:
 - 1. Test prior to concealment, insulation being applied, and connection to equipment, fixtures, or specialties.
 - 2. Conduct tests with all valves but those used to isolate the test section 10 percent closed.
- B. Leaks: Repair leaks and retest until stipulated results are achieved.
- C. Notification:
 - 1. Advise the Construction Manager 72 hours in advance of each test.
 - 2. Failure to so notify will require test to be rescheduled.
- D. Testing Equipment: Provide necessary pumps, gauges, connections, and similar items required to perform the tests.

3.02 TESTING REQUIREMENTS

- A. Domestic Water Systems:
 - 1. Test entire system by closing openings in piping except highest opening and filling system with water to point of overflow.
 - 2. Keep water in system under test for a minimum of 45 minutes before inspection starts.
 - 3. Test at full working pressure for 2 hours with no drop allowed. Locate and repair leaks.
- B. Piping - General:
 - 1. Test piping as noted below, with no leaks or loss in pressure for time indicated.
 - 2. Testing Procedure:
 - a. Check systems to assure compliance with revision Drawings. Check pressure and temperature rating of all valves to assure compliance with Owner's design standard.
 - b. Check safety valves for pressure settings. In the event adjustments or corrections are required to assure conformance with drawings, they should be made prior to proceeding with the testing activity. Do not exceed pressure ratings of installed equipment.
 - c. Install and test gauges and test medium source connections made to convenient process connections. After completion of testing, the gauges and source connection removed and the specified process attachments replaced as shown on drawings.
 - d. Test joints with bubble leak detecting solution when pressure reading indicates leakage. The specified test pressure held as previously specified without loss in pressure.
 - e. Use gauges cleaned for O2 service.

END OF SECTION

SECTION 22 05 93

TESTING, ADJUSTING, AND BALANCING FOR PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 22, Plumbing Section 22 05 00, Common Work Results for Plumbing, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes Testing and Balance of the following:
 - 1. Domestic Hot Water Recirculation Systems
- B. Related Sections include:
 - 1. Section 23 09 00, Instrumentation and Controls for HVAC

1.03 QUALITY ASSURANCE

- A. Acceptable Testing and Balancing Firms:
 - 1. RSA Analysis
 - 2. National Air Balance
 - 3. AIRCO Commercial Services
 - 4. United Mechanical Incorporated
- B. Other Firms: Submit substitution requests prior to bid date.
- C. Testing and Balancing Firm Qualifications:
 - 1. Procure the services of an independent balance and testing agency, approved by the Architect, which specializes in the balancing and testing of plumbing, heating, ventilating, and air conditioning systems, to balance, adjust and test water circulating and air moving equipment and air distribution or exhaust systems as herein specified.
 - 2. Testing agency to provide proof of having successfully completed at least five projects of similar size and scope.
 - 3. Testing and balancing work done under direct supervision of registered professional engineer who has been employed by the Agency a minimum of one year prior to start of project.

- D. Industrial Standards:
 - 1. NEBB, American Society of Heating, Refrigerating
 - 2. Air Conditioning Engineers (ASHRAE)
 - 3. American National Standards Institute (ANSI) as follows:
 - a. NEBB: Comply with Procedural Standards for Testing, Adjusting Balancing of Environmental Systems.
 - b. ASHRAE: Comply with recommendations pertaining to measurements, instruments, and testing, adjusting and balancing.
 - c. ANSI:
 - 1) S1.4 Specifications for sound level meters.
 - 2) S1.11 Specifications for Octave-Band and Fractional-Octave-Band analog and digital filters.
- E. Instrument Certification: Instruments used accurately calibrated and certified within six months of balancing and maintained in good working order.
- F. Test Observation: If requested, conduct test in the presence of the Architect or the Architect's representative.
- G. Pre-Balancing Conference:
 - 1. Review with the Engineer prior to starting balancing, general techniques.
 - 2. Conference must occur prior to measuring existing conditions.
 - 3. Measuring of existing conditions must occur prior to any demolition or new work.
 - 4. Review existing conditions and systems to be affected by the project

1.04 SUBMITTALS

- A. Submit the following:
 - 1. Balancing Log:
 - a. Include water outlets, actual field measured water volume, and percentage of design volumes.
 - b. Provide drawings identifying location of outlets.
 - 2. Equipment Data Sheets:
 - a. Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.
 - 3. Additional Data: Submit additional data as provided by Associated Air Balance Council (AABC) Standard forms.
 - 4. Number of Copies: Submit six copies of the above completed information to the Engineer for review and insertion into the Operating and Maintenance Data.
 - 5. Instrument Certification: When requested, submit certificate of calibration for equipment to be used.
- B. Record data on NEBB forms or forms approved by the Architect.

1.05 PROJECT CONDITIONS

- A. Where existing systems are to be adjusted, establish flow rates in all branches prior to making any modifications to system. Submit preliminary report indicating existing conditions prior to making any modifications to existing systems. Adjust central equipment as required and restore unmodified branches and outlets to original condition. Obtain existing system drawings from Owner and become familiar with extent and nature of existing systems.
- B. Do not perform final testing, adjusting, and balancing work until equipment has been completely installed and operating continuously as required.
- C. Conduct testing and balancing with clean strainers and filters in place. Clean strainers, etc., prior to performing hydronic testing and balancing.

1.06 WARRANTIES

- A. In addition to the Requirements of the Contract, include an extended warranty of six months after completion of test and balance work during which time the Architect at his discretion may request a recheck or resetting of any equipment or device listed in the test reports.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.01 DOMESTIC HOT WATER POINT OF USE MIXING VALVES

- A. General: Make measurements in accordance with Industrial Standards specified above. Record on appropriate forms.
- B. Preliminary:
 - 1. List complete data of tested equipment and verify against Contract Documents.
 - 2. Open line valves to full open position.
- C. Distribution:
 - 1. Adjust water flow for design conditions.
 - 2. Set mixing valve to achieve desired leaving water temperature.
 - 3. Set memory stops and mark position of adjuster on balancing valves.

3.02 AUTOMATIC CONTROL SYSTEM

- A. In cooperation with control manufacturer's representative, set and adjust automatically operated devices to achieve required sequence of operations.
- B. Testing organization to verify controls for proper calibration and list controls requiring adjustment by control system installer.

3.03 COORDINATION

- A. Coordinate work with other trades to ensure rapid completion of the project.
- B. Deficiencies noted during the course of balancing in the mechanical installation promptly reported to the Architect to allow corrective action to proceed.
- C. Provide periodic review of progress as requested.

END OF SECTION

SECTION 22 07 00

INSULATION FOR PLUMBING

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.
- B. The provisions of Division 22, Plumbing Section 22 05 00, Common Work Results for Plumbing, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Pipe Insulation
 - 2. Pipe Acoustical Wrap
 - 3. Block Insulation
 - 4. Accessories Piping
- B. Related Sections include:
 - 1. Section 22 05 29, Hangers, Supports and Anchors for Plumbing

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Insulating products prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products within this specification contain these banned substances, provide complying products from approved manufacturers with equal performance characteristics.
 - 2. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723 or ASTM E84.
 - 3. Energy Codes: Local Building and Energy Codes govern where insulation performance requirements for thickness exceeds thickness specified.
- B. Protection: Protect against dirt, water, chemical, or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost.
- C. Source Quality Control:
 - 1. Service: Use insulation specifically manufactured for service specified.
 - 2. Labeling: Insulation labeled or stamped with brand name and number.

3. Insulation and accessories not to provide nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin. Asbestos free and no interaction with corrosively with equipment, piping, or ductwork.

1.04 SUBMITTALS

A. Submit the following:

1. Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Equivalent products by the following:

1. Johns Manville
2. Knauf
3. Owens Corning
4. CertainTeed

B. Use one manufacturer for insulation.

C. Other Manufacturers: Submit substitution request.

2.02 PIPE INSULATION

A. Fiberglass:

1. Split sectional or snapon type with 0.23 per inch maximum thermal conductivity (K-factor) at 75 degrees F mean temperature, 850 degrees F maximum service rating and white, vapor barrier jacket with pressure sensitive closure system.
2. Manufacturer: Johns Manville Microlok HP.

B. Elastomeric:

1. Expanded closed cell, 0.27 per inch maximum K-factor at 75 degrees F mean temperature, 220 degrees F maximum service rating with fitting covers and paintable surface.
2. Manufacturer:
 - a. Armacell AP Armaflex
 - b. Rubatex
 - c. K-Flex
3. Color:
 - a. Concealed Locations: Black
 - b. Exposed Locations: White.

2.03 PIPE ACOUSTICAL WRAP

- A. Barrier
 - 1. Construct 0.10-inch thick mass loaded, limp vinyl sheet bonded to a layer of reinforced aluminum foil on one side.
 - 2. Nominal density of 1 pound per square foot and minimum STC rating of 28.
 - 3. Minimum thermal conductivity value of 0.29 and a rated service temperature range of -40 degrees F to 220 degrees F.
 - 4. Flame spread index of no more than 10 and a smoke development index of less than 40.
- B. Decoupling Layer: Combination of 1-inch fiberglass batting, nonwoven porous scrim-coated glass cloth, quilted together in a matrix of 4-inch diamond stitch pattern which encapsulates the glass fibers.
- C. Composite Material: Fabricated to include a nominal 6-inch wide barrier overlap tab extending beyond the quilted fiber glass to facilitate a leak-tight seal around field joints.

2.04 BLOCK INSULATION

- A. Fiberglass: 1-1/2-inch thick unless specified or shown otherwise with 3 pcf nominal density, 0.23 per inch maximum K-factor at 75°F mean temperature and 450°F maximum operating temperature limit.

2.05 ACCESSORIES PIPING

- A. Adhesives:
 - 1. General: Maximum Flame Spread/Smoke Developed Rating of 25/50, SCAQMD Rule 1168 compliant.
 - 2. Fiberglass: Integral closure system.
 - 3. Calcium Silicate: Benjamin Foster 30-36.
 - 4. Elastomeric: Armacell 520 BLV.
- B. Cements:
 - 1. Insulating: Ryder.
 - 2. Heat Transfer: Chemax Tracit-300.
- C. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.
- D. Pipe Fitting Covers:
 - 1. One piece PVC insulated pipe fitting covers.
 - 2. Zeston, Ceel-Co.

- E. Grooved Coupling Insulation:
 - 1. One piece PVC insulated fitting cover.
 - 2. Zeston, Ceel-Co.
- F. Metal Pipe Jacket: 0.016-inch thick aluminum jacket with formed fitting covers, aluminum snap straps and sealant.
- G. Cloth Facing: Presized fiberglass cloth.
- H. Tapes:
 - 1. Pressure sensitive, weather resistant, and for temperatures up to 150 degrees F.
 - 2. Zeston Z-tape.
- I. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes and adhesives.

PART 3 - EXECUTION

3.01 GENERAL

- A. Workmanship:
 - 1. Installation: Insulation installed in first class, neat professional manner.
 - 2. Applicators: Employed by firm that specializes in insulation work.
- B. Preparation: Surfaces of piping and equipment clean, free of oil or dirt, and dry before insulation is applied.
- C. Stamps: ASME stamps, UL labels, and similar stamps and labels are not covered.

3.02 PLUMBING PIPE AND EQUIPMENT INSULATION APPLIED LOCATIONS

- A. Insulation Applied Locations – Plumbing Piping:

System	Pipe Size	Insulation Type	Insulation Thickness	Notes
Domestic Hot Water Supply/Return, Above Grade	1-1/2-inch and smaller	Fiberglass, all-purpose jacket or Elastomeric	1 1/2-inch	Note 1 Note 2
	Above 1-1/2-inch	Fiberglass, all-purpose jacket	2-inch	Note 1
Note 1: Cover with metal pipe jacket where exposed to weather, and over heat trace cable. Note 2: Elastomeric insulation not allowed over heat trace cable.				

- B. The following piping is not insulated:
 - 1. Domestic cold water

2. Waste and vent, except where heat traced.
 3. Priming lines except where heat traced.
- C. Insulation include the following:
1. Fittings
 2. Unions
 3. Flanges
 4. Mechanical Couplings
 5. Valve Bodies
 6. Valve Bonnets
 7. Piping through Sleeves except Valve Bonnets
 8. Unions and Flanges need not be insulated on the following systems:
 - a. Domestic Hot Water
 - b. Inside Building
- D. Insulate valves and irregular fittings with section of pipe insulation and insulating cement, securely fastened, and finished with 6 ounce canvas and Foster 30-36 lagging adhesive.
- E. Flanges, valves, strainers, not requiring a vapor barrier to insulate with removable replaceable pads fabricated of 1-inch layer of Pittsburgh Corning Temp Mat sandwiched between inner and outer layer of 8 oz. glass cloth held together with stainless staples with sufficient stainless lacing hooks to hold pad firmly to flange or valve with minimum 3-inch overlap onto adjacent pipe insulation using 18 gauge SS lacing wire.
- F. Expansion Joints and Flexible Connectors: Pipe insulation or block of same material and thickness as adjacent piping.

3.03 PIPING INSTALLATION

- A. General:
1. Joints: Coat both sides of complete joining area with applicable adhesive.
 - a. Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except foam plastic, seal with closure system or 3-inch wide tape.
 - b. Butt Joints: Butt lightly together and, except for foam plastic, seal with 3-inch wide tape or butt straps.
 - c. Multiple Layered Insulation: Joints staggered.
 2. Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.
 3. Voids: Fill all voids, chipped corners and other openings with insulating cement or material compatible with insulating material. In insulation with Heat Tracing: Where piping is shown or specified to be heat traced, bed heat tape into heat transfer cement with insulation over heat tape and cement.

4. Seal joints, seams, and fittings of metal watertight jackets at exterior locations.
- B. Fiberglass Insulation: Exterior insulation encased in metal jacket.
- C. Calcium Silicate Insulation:
1. Secure with 18-gauge wire embedded into insulation.
 2. Cover with continuous vapor barrier jacket.
- D. Elastomeric Insulation:
1. Slit full length and snap around pipe.
 2. Make cuts perpendicular to insulating surface leaving no cut section exposed.
 3. Do not stretch insulation to cover joints or fittings.
 4. Seal joints in elastomeric insulation with adhesive.
 5. Exterior insulation painted with two coats of specified paint in accordance with the manufacturer's instructions and encase in metal jacket.
 6. Sealing joints with tape will not be allowed.
- E. Fittings: Insulation specified with continuous vapor barrier, the vapor barrier must not be violated.
1. On Elastomeric Insulation: Fittings covered with covers made up of mitered sections of insulation or with formed pipe fitting covers.
 2. In Other Insulation: Fittings covered with insulation to the same level of the adjoining insulation or fill with insulating cement. Finish with pipe fitting covers or cloth facing and tape.
- F. Unions, Mechanical Joints, Valves, Etc.:
1. General:
 - a. As specified for fittings.
 - b. Minimum thickness same as specified for piping.
 2. Unions: Build up insulation at least 1/2-inch beyond adjoining insulation.
 3. Flanges: With square corners. Where flanges are not insulated, terminate adjacent insulation so flange bolts can be removed.
 4. Flanged Valves: Insulation with square corners.
- G. Vapor Barrier Insulation:
1. Refer to Section 22 05 29, Hangers, Supports, and Anchors for Plumbing for support requirements.
 2. Piping which requires vapor barrier protection of continuous vapor barrier, which may not be pierced or broken.

3. The following piping systems require vapor barrier protection:
 - a. Domestic cold water.
 - b. Industrial cold water.
 - c. Non-potable cold water.
 - d. Other piping systems with a nominal operating temperature below 65 degrees F.
 4. Vapor Barrier Insulation:
 - a. Insulation for pipe requiring vapor barrier protection 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
 - b. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation with continuous vapor barrier jacket at each hanger or roller. Provide pipe shield specified in Section 22 05 29, Hangers, Supports, and Anchors for Plumbing.
- H. Non-Vapor Barrier Insulation:
1. Refer to Section 22 05 29, Hangers Supports and Anchors for Plumbing for support requirements.
 2. For pipe 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
 3. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation. Provide pipe shield specified in Section 22 05 29, Hangers Supports and Anchors for Plumbing.
- I. Acoustical Wrap:
1. Install in accordance with the manufacturer's instructions.
 2. Applied locations for piping systems where specified or indicated on drawings.

3.04 EQUIPMENT INSTALLATION

- A. General: Install true and smooth. Insulation over curved surfaces conform to curves of surface.
1. Access:
 - a. Insulated removable heads, water boxes, pump casings, access, etc., that require service, inspection or maintenance provided with covers or section that are easily removable and replaceable.
 - b. Reinforce openings in adjacent insulation with metal beading. In vapor barriered insulation, coat joints with vapor barrier mastic.
 2. Voids, Depressions and Cavities: Fill voids, chipped corners, and other openings with insulating cement or material compatible with insulating material.
 3. Vapor Barrier Insulation: Barrier not to be pierced or broken.
 - a. Coat defects with vapor barrier mastic and patched with insulation facing or tape.
 - b. Staples brush coated with vapor barrier coating.
 - c. Cover raw edges coated with vapor barrier mastic sealed to equipment surface.
 4. Non-Vapor Barriered Insulation:
 - a. Patch tears with insulation facing or tape.
 - b. Cover and neatly bevel raw edges to equipment surface.

5. Multilayered Insulation: With staggered joints.

B. Fiberglass Block:

1. Anchors: Lug nuts 10 gauge black annealed iron wire welded to metal surfaces.
2. Banding: Block secured to surface with 1/2-inch wide stainless steel bands maximum 18-inches on center and secured to anchors.
3. Insulating Cement: Block covered with insulating cement minimum thickness of 1/2-inch with smooth finish.
4. Vapor Barrier System: Apply continuous coat of vapor barrier mastic.
5. Finish: Finish with cloth facing secured with adhesive and lapped a minimum of 2 inches. Defects touched up with finishing cement.

C. Elastomeric Blanket:

1. Cut insulation to size, make corners with mitering cuts to preclude raw edges, continuously cement insulation to equipment with adhesive.
2. Cement both surfaces of joints and butt tightly together and cover raw edges with two coats of adhesive.

D. Expansion Joints: Covered with larger size pipe insulation to allow full movement and be removable, ends turned back to pipe, coat with vapor barrier mastic on joints in vapor barriered system and finished with cloth facing cemented to insulation with adhesive.

3.05 FIELD QUALITY CONTROL

A. Field Test: Test and approve systems prior to installation of insulation.

B. Existing Insulation:

1. Repair existing insulation damaged during construction.
2. Make neat connections where new and existing insulation meet.
3. Where existing piping, or equipment is removed, cover existing surfaces neatly to match existing.

END OF SECTION

SECTION 22 21 13

PIPE AND PIPE FITTINGS PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Cast Iron Soil Pipe, Service Weight (No-Hub)
 - 2. Cast Iron Soil Pipe, Service Weight (Hub and Spigot)
 - 3. Black Steel Pipe, Schedule 40
 - 4. Galvanized Steel Pipe
 - 5. Copper Pipe
 - 6. Flanged Joints
 - 7. Unions
 - 8. Solder and Brazing
 - 9. Utility Markers
 - 10. Flexible Connector
- B. Related Sections Include:
 - 1. Section 22 25 00, Plumbing Water Treatment

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Piping material and installation to meet requirements of the local plumbing, fire, and building codes and serving utility requirements.
 - 2. Provide chlorination of domestic cold and hot water piping in accordance with County and State health requirements.

- B. Grooved Joint Couplings and Fittings:
 - 1. Products of a single manufacturer.
 - 2. Grooving tools of the same manufacturer as the grooved components.
 - 3. Castings used for coupling housings, fittings, valve bodies, etc., date stamped for quality assurance and traceability.
- C. Pipe Cleaning: If pipe gets plugged or should foaming of water systems occur, disconnect piping, reclean, and reconnect without additional expense to the Owner.
- D. Correct damages to the building or systems resulting from failure to properly clean the system without additional expense to the Owner.
- E. Products with a wetted surface installed in potable water systems UL classified in accordance with ANSI / NSF-61 for potable water service, and certified to the low lead requirements of NSF-372.

1.04 SUBMITTALS

- A. Submit the following:
 - 1. List of piping materials indicating the service it is being used for. (Do not submit piping product data).
 - 2. Product data on mechanical couplings and related components, double wall fuel oil pipe and fittings, and polypropylene waste and vent pipe.
- B. Test Reports and Certificates: Submit certificates of inspections and pipe tests to Owner.
- C. Other: Make certified welders' certificates available.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. As indicated.

2.02 CAST IRON SOIL PIPE, SERVICE WEIGHT (NO-HUB)

- A. General: A code approved hubless system conforming to Cast Iron Soil Pipe Institute Standard 301.
- B. Pipe and Fittings: Service weight hubless cast iron conforming to ASTM A 888, marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International. Tyler, AB&I, or Charlotte.
- C. Gaskets: Compression type conforming to ASTM C 564.
- D. Couplings: Above Grade: Band type coupling in conformance with Cast Iron Soil Pipe Institute (CISPI) 310-90, consisting of stainless steel clamp and corrugated shield assemblies with a neoprene sealing sleeve ANSI A21.6, ANSI A21.10 Fittings.

- E. Service: Above Grade: Sanitary waste, storm and overflow drain.

2.03 CAST IRON SOIL PIPE, SERVICE WEIGHT (HUB AND SPIGOT)

- A. General: Code approved hub and spigot pipe and fitting system conforming to ASTM A74 marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.
- B. Gaskets: Compression type gaskets conforming to ASTM C564.
- C. Service: Below Grade: Sanitary waste, storm and overflow drain.

2.04 BLACK STEEL PIPE, SCHEDULE 40

- A. General:
 - 1. Fittings and joints must be UL listed for use with pipe chosen for use.
 - 2. Listing restrictions and installation procedures per state and local authorities must be followed.
- B. Pipe: Schedule 40 conforming to ASTM A 135 or A 53.
- C. Fittings:
 - 1. 150 pound screwed malleable iron on 2 inches and below, Schedule 40 welding fittings conforming to ASTM A 234 for 2-1/2 inches and above or mechanical couplings on select piping as herein specified.
 - 2. Fittings below grade; welding fittings.
 - 3. Elbows on pumped systems long radius type.
 - 4. Short radius elbows not acceptable for use except as approved on a case by case basis.
- D. Service: Natural gas piping and vent lines.

2.05 GALVANIZED STEEL PIPE

- A. Pipe: Schedule 40 conforming to ASTM A 135 or A 53.
- B. Fittings:
 - 1. 150 pound screwed galvanized malleable iron on 2-inch and below, Victaulic, Gruvlok, Gustin-Bacon, or Mech Line full flow galvanized, grooved end on 2-1/2-inch and above.
 - 2. Provide grooved type gasketed couplings and fittings for pipe 2-1/2-inch and above.
- C. Service: Miscellaneous indirect waste piping.

2.06 COPPER PIPE

- A. Pipe: Hard drawn copper tubing, Class L or K, ASTM B 88.

B. Fittings:

1. Wrought copper, 150 psi; ANSI B16.22 for soldered joints, ANSI B16.50 for brazed joints; Chase, Revere, Mueller or approved equal.
2. System using mechanically extracted collars in main with branch line inserted to not obstruct flow may be used on domestic water piping above ground, similar to T-drill.

C. Service:

1. Domestic hot and cold water piping below ground (Type K, hard drawn) on piping 3 inches and smaller.
2. Domestic hot and cold water piping above ground (Type L, hard drawn) on piping 4 inches and smaller.
3. Trap priming lines (Type L, annealed).
4. Cold water above grade (Type L) on piping 4-inch and smaller.
5. Miscellaneous drains and overflows.

2.07 FLANGED JOINTS

- A. Cast iron or steel for screwed piping and forged steel welding neck for welded line sizes. Pressure rating and drilling match the apparatus, valve, or fitting to which they are attached.
- B. ANSI B16.1; 150 pound for system pressures to 150 psig; 300 pound for system pressures 150 psig to 400 psig.
- C. Gaskets:
 1. Flanged services, except steam and pumped condensate, Garlock 3700 or equal, 1/8-inch thick, non-metallic type.
 2. Steam and pumped condensate; Flexitauclic Style CG or equal, 1/8-inch thick, semi-metallic type.
 3. Make joint using American Standard hexagon head bolts, lock washers, and nuts (per ASTM A307 GR.B) for service pressures to 150 psig; alloy steel stud bolts, lock washer, and American Standard hexagon head nuts (per ASTM A307 GR.B) for service pressures 150 psig to 400 psig.
 4. Use length of bolt required for full nut engagement.
 5. Provide electro-cad plated bolts and nuts on cold and chilled water lines.

2.08 UNIONS

- A. 150 psi malleable iron, brass to iron seat, ground joint, black or galvanized to match pipe. 200 psi WOG bronze, ground joint, solder type for copper tubing.

B. Dielectric Fittings:

1. Nationally listed, have a dielectric thermoplastic interior lining, and meet requirements of ASTM F1545.
2. Suitable for the pressure and temperature to be encountered.

2.09 SOLDER AND BRAZING

A. Brazed Joints:

1. Wrought Copper Piping Fittings: Westinghouse Phos-Copper or Dyna-Flow by J.W. Harris Co., Inc.
2. Applied locations:
 - a. Below grade piping.
 - b. Above grade piping larger than 2-inches for the following services: Cold water, domestic hot and cold water.
 - c. Joints in Domestic Hot and Cold Water Piping: Use mechanically extracted collars. Braze in accordance with Copper Development Association Copper Tube Handbook using BCUP series filler material.

B. Soldered Joints:

1. Wrought Copper Pipe Fittings: All-State 430 with Duzall Flux, Engelhard Silvabrite with Engelhard General Purpose Flux or J.W. Harris Co.
2. Valves, Cast Fittings or Bronze Fittings: Harris Stay-Silv-15 or Handy & Harmon Sil-Fos.
3. Applied locations: Above grade piping 2-inch and smaller for the following services: Domestic hot and cold water, trap priming lines.

2.10 UTILITY MARKERS

- A. Provide plastic tape utility markers over buried piping. Provide identification on tape.
- B. Material to be Brady Identoline plastic tape, 6-inch, Seton, or as approved.

2.11 FLEXIBLE CONNECTOR

A. Expansion Joint/Seismic Connector:

1. T304 stainless steel hose and braid, Schedule 40 radius elbows and 180° bend, flange or weld end Schedule 40 fittings. ASA certified when used for natural gas service. Metraflex Metaloop only.
2. Accept differential support displacement without damaging pipe, equipment connections, or support connections.
3. In steel piping systems, three Victaulic flexible couplings may be used in lieu of a flexible connector for vibration attenuation and stress relief at equipment connections. Place in close proximity to the vibration source.

B. Service:

1. Vent lines
2. Miscellaneous drains and overflows.
3. Domestic hot and cold water piping.

PART 3 - EXECUTION

3.01 PREPARATION

A. Measurements, Lines and Levels:

1. Check dimension at the building site and establish lines and levels for work specified in this Section.
2. Establish inverts, slopes, and manhole elevations by instrument, working from an established datum point. Provide elevation markers for use in determining slopes and elevations in accordance with Drawings and Specifications.
3. Use established grid and area lines for locating trenches in relation to building and boundaries.

3.02 EXCAVATION AND BACKFILL

A. General:

1. Perform necessary excavation and backfill required for the installation of mechanical work in accord with Division 02, Existing Conditions.
2. Repair pipelines or other work damaged during excavation and backfilling.

B. Excavation:

1. Excavate trenches to the necessary depth and width, removing rocks, roots, and stumps. Include additional excavation to facilitate utility crossovers, additional offsets, etc.
2. Excavation material is unclassified.
3. Width of trench adequate for proper installation of piping.
4. Widen the trench if not wide enough for a proper installation.

C. Bedding:

1. Cast iron, steel, and copper piping on full bedded on sand.
2. Place a minimum 4-inch deep layer on the leveled trench bottom for this purpose. Remove the sand to the necessary depth for piping bells and couplings to maintain contact of the pipe on the sand for its entire length.
3. Lay other piping on a smooth level trench bottom so that contact is made for its entire length.

D. Backfill:

1. Place in layers not exceeding 8 inches deep, and compact to 95 percent of standard proctor maximum density at optimum moisture content.
2. Earth backfill free of rocks over 2 inches in diameter and foreign matter. Disposal of excess material as directed.
 - a. Interior: Backfill under interior slabs, bank sand or pea gravel.
 - b. Exterior:
 - 1) Excavated material may be used outside of buildings.
 - 2) The first 4-inches are sand, and final 12-inch layer course soil.

3.03 PIPING INSTALLATION

- A. Install unions in non-flanged piping connections to apparatus and adjacent to screwed control valves, traps, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.
- B. Install piping as to vent and drain. Install according to manufacturer's recommendations.
- C. Support piping independently at apparatus so that its weight not to be carried by the equipment.
- D. Run piping clear of tube cleaning or removal/replacement access area on heat exchangers, water heaters, etc.
- E. Utility Marking:
 1. Installed over the entire length of the underground piping utilities.
 2. Install plastic tape along both sides and the center line of the trenches at the elevation of approximately 12 inches above the top of utility.
- F. Dielectric Fittings:
 1. Provide dielectric couplings, unions, or flanges between dissimilar metals.
 2. Provide dielectric couplings as required to isolate cathodically protected piping and equipment.
- G. No-Hub Couplings: Install per manufacturer's instructions.

3.04 PIPING JOINTS

- A. Pipe and fittings joined using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.
- B. Copper Piping: Pipe cut evenly with cutter, ream to full inside diameter; end of pipe and inside of fitting thoroughly cleaned and polished. Uniformly heat joint and capillary space completely filled with solder or braze material, leaving full bead around entire circumference.
- C. No couplings installed in floor or wall sleeves.

D. Steel Piping:

1. Screwed Joints:
 - a. Pipes cut evenly with pipe cutter reamed to full inside diameter with burrs and cuttings removed.
 - b. Joints made up with Teflon liquid dope or Teflon tape applied to male threads only, leaving two threads bare.
 - c. Joints tightened so that not more than two threads are left showing.
 - d. Junctions between galvanized steel waste pipe and bell of cast iron pipe made with tapped spigot or half coupling on steel pipe to form spigot end and caulked.
2. Flanged Joints:
 - a. Pressure rating of flanges match valve or fitting joined.
 - b. Coat joint gaskets with graphite and oil.

E. Welded Joints:

1. Preparation for Welding: Bevel piping on both ends before welding:
 - a. Use following weld spacing on butt welds:

Nominal Pipe Wall Thickness	Spacing	Bevel
1/4-inch or less	1/8-inch	37-1/2
Over 1/4-inch, less than 3/4-inch	3/16-inch	27-1/2
 - b. Before welding, remove corrosion products and foreign material from surfaces.
2. Welded Joints:
 - a. Joints made by arc-welding process using certified welders.
 - b. Port openings of fittings must match the inside diameter of the pipe to which they are welded.
 - c. Use full radius welding elbows for turns, use welding tees.
 - d. Reducing fittings must be used for size reduction.
 - e. Weldolets may be used for branches up through one-half the pipe size of the main to which they are attached.
 - f. Nipples are not allowed.
3. Welding Operation:
 - a. After deposition, clean each layer of weld metal to remove slag and scale by wire brushing or grinding. Chip where necessary to prepare for proper deposition of next layer.
 - b. Weld reinforcement no less than 1/16-inch not more than 1/8-inch above normal surface of jointed sections. Reinforcement crowned at center and taper on each side to surfaces being joined. Exposed surface of weld present professional appearance and be free of depressions below surface of jointed members.
 - c. Do not weld when temperature of base metal is lower than 0 degrees F. Material to be welded during freezing temperatures made warm and dry before welding is started. Metal warm to the hand or approximately 60 degrees F.
4. Above Grade No-Hub Couplings: Install in accordance with manufacturer recommendations.

3.05 INSTALLATION, PIPE WRAP

- A. Apply per manufacturer's written instructions.
- B. Apply wrapping to fittings in field after installation.

3.06 ADJUSTING AND CLEANING

A. General:

1. Clean interior of piping before installation.
2. Flush sediment out of piping systems after installation before connecting plumbing fixtures to the piping.
3. When placing the water systems in service during construction, clean each system prior to being placed in service.
4. Clean strainers prior to placing in service.

END OF SECTION

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SECTION 22 21 23

PUMPS FOR PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Centrifugal Pumps

1.03 QUALITY ASSURANCE

- A. Select pump impellers such that impellers not greater than minimum impeller size plus 90 percent of the difference between the maximum and minimum impeller size for pump selected.
- B. Select motor to be non-overloading under operating conditions.
- C. Select pump with a minimum efficiency as listed in schedule.

1.04 SUBMITTALS

- A. Submit the following:
 - 1. Product data for each pump including performance curves, pump efficiency, motor data, operating weights, and pressure ratings. Submit control information and wiring diagrams for packaged equipment.
 - 2. Operating and maintenance data for each product specified under this Section.

PART 2 - PRODUCTS

2.01 IN-LINE CIRCULATING PUMPS

- A. Acceptable Manufacturers:
 - 1. Bell and Gossett
 - 2. Armstrong
 - 3. Paco

4. Peerless
5. Grundfos
6. Aurora
7. Other Manufacturers: Submit substitution request.

B. Description:

1. Pipe mounted, integral centrifugal pump and resiliently mounted motor.
2. Rigid or flexible coupling between pump and motor.
3. Mechanical shaft seals.
4. Bronze fitted construction.
5. Rising head characteristics with decrease in volume.
6. Drip-proof construction.
7. Motors:
 - a. 1750 rpm or 3500 rpm maximum speed as scheduled, drip proof.
 - b. Refer to Section 22 05 00 for energy efficient motor requirements.
 - c. Provide totally enclosed motors for pumps located in any ceiling or space used as an air plenum.

PART 3 - EXECUTION

3.01 IN-LINE CIRCULATING PUMP INSTALLATION

- A. Motor in horizontal or vertical depending on normal design of pump.
- B. Provide for convenient access to oil cups and as required by the manufacturer.
- C. Provide valves and specialties as detailed on Drawings.
- D. Lubricate in accordance with manufacturer's instructions before operation.
- E. Support and isolate circulators as specified and as scheduled on the Drawings.

3.02 FIELD QUALITY CONTROL

- A. Field Test for Sump Pump and Sewage Ejector: After installation is complete, conduct a test of the system as follows:
 1. Operate complete pump sequence to assure proper operation of pumps with respect to fluid level in sumps.
 2. Confirm proper operation of lead lag sequencing.
 3. Confirm operation of both remote and local alarm devices.

- B. Field Test for Water Booster: After installation is complete, conduct a test of the system as follows:
1. Operate complete pump sequence to assure proper operation of pumps and regulating valves to maintain scheduled discharge pressure under varying inlet pressure conditions and at design conditions.
 2. Confirm proper operation of lead lag sequencing.
 3. Confirm operation of all safety devices and both remote and local alarm devices.
 4. Confirm proper air charge in hydropneumatic tank.

END OF SECTION

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WSECTION 22 25 00

PLUMBING WATER TREATMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Section 22 05 00, Common Work Results for Plumbing apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Plumbing Water Treatment

1.03 SUBMITTALS

- A. Submit the following:
 - 1. Shop Drawings
 - 2. Product Data
 - 3. Operating and Maintenance Data
 - 4. Certificate of Completion
 - 5. Treatment Reports

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. US Water Services
- B. Nalco
- C. Mogul
- D. Chemax
- E. Chemcoa
- F. DuBois Chemicals
- G. Other Manufacturer/Suppliers: Submit substitution request.

2.02 PLUMBING WATER TREATMENT

A. Domestic Water Chlorination:

1. Chlorination accomplished by personnel in employed of firm licensed to do this type of work.
2. Potable water systems disinfected prior to use as outlined within the current state or local Plumbing Code or as prescribed by the Health Authority, whichever requirements are more stringent.
3. Chemicals: Sodium Hypochlorite 12.5 percent EPA registered for drinking water application.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Plumbing Domestic Water Systems:

1. Provide 1/2-inch injection point on incoming water line immediately after the backflow device.
2. Flush system with fresh water to remove dirt and construction debris.
3. Open fixtures to develop slow rate of flow through system.
4. Injection Sodium Hypochlorite solution at a rate to achieve greater at 100ppm chlorine at fixtures.
5. Flush entire system so no chlorine is present.
6. Submit bacteriological samples to a certified laboratory to certify that the water is suitable for drinking. Deliver certificate stating purity of water to the Architect.

3.02 FINAL ADJUSTMENT

- A. When the systems are accepted by the Owner the chemical treatment supplier to make final adjustments in the required concentrations.
- B. Submit report of indicating initials and final concentrations and system chemistry.

END OF SECTION

SECTION 22 30 00

PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Section 22 05 00, Common Work Results for Plumbing, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Water Heaters
- B. Related Sections include:
 - 1. Section 22 40 00, Plumbing Fixtures

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements: Water heaters to meet state energy code requirements.

1.04 SUBMITTALS

- A. Submit the following:
 - 1. Product data for each item specified.
 - 2. Operating and Maintenance Data

PART 2 - PRODUCTS

2.01 WATER HEATERS

- A. Electric Tankless Water Heater:
 - 1. Acceptable Manufacturer:
 - a. Eemax
 - b. Chronomite
 - c. Envirotech
 - d. Other Manufacturers: Submit substitution request.
 - 2. General: Wall mounted instantaneous water heater complete with but not limited to the following:
 - a. Replaceable element cartridge insert.

- b. Replaceable inlet filter.
 - c. Constant flow regulator.
 - d. Compression type water connections.
 - e. UL listed
3. Reference schedule on drawings for model number, KW rating, voltage, GPM, and rate of temperature rise.

PART 3 - EXECUTION

3.01 ELECTRIC TANKLESS WATER HEATER

- A. Install per manufacturer's installation guidelines and in accordance to applicable codes.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

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.
- B. The provisions of Section 22 05 00, Common Work Results for Plumbing HVAC apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Fixture Trim
 - 2. Plumbing Fixtures
 - 3. Drainage Products

1.03 QUALITY ASSURANCE

- A. Water Closets: Maximum Performance (MaP) score of no less than 800.
- B. Faucets: Certify to NSF/ANSI 61 and California AB1953.
- C. Electric Water Coolers and Drinking Fountains: Certified to NSF/ANSI 61 and California AB1953.
- D. Emergency Eyewash and Emergency Shower Equipment: Comply with ANSI Standard Z358.1.

1.04 SUBMITTALS

- A. Submit the following:
 - 1. Product data for each item specified.
 - 2. Operating and Maintenance Data:
 - a. Sensor Operated Faucets
 - b. Sensor Operated Flush valves.
 - 3. Mounting heights for fixtures.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturers are stated for each fixture specified. The following manufacturers are also acceptable, except when indicated only.
- B. Drainage Products and Carrier Products:
 - 1. J.R. Smith
 - 2. Josam
 - 3. Sioux Chief
 - 4. Zurn
 - 5. Wade
 - 6. Watts Drainage
 - 7. Woodford
 - 8. Mifab
- C. Fixtures:
 - 1. American Standard
 - 2. Kohler
 - 3. Sloan
 - 4. Toto
- D. Seats:
 - 1. Olsonite
 - 2. Church
 - 3. Beneke
 - 4. Bemis
- E. Mixing Valves:
 - 1. Powers
 - 2. Leonard
 - 3. Symmons
 - 4. Chicago

F. Stainless Steel Products:

1. Elkay
2. Just
3. Franke

G. Water Filter

1. Pentek
2. Aqua pure
3. Watts PURE

H. Faucets:

1. Chicago
2. Delta Commercial
3. Symmons
4. Moen Commercial
5. Hansgrohe

I. Metering Faucets:

1. Chicago
2. Symmons

J. Disposals and Hot Water Dispenser:

1. In-Sink-Erator

K. Flush Valves:

1. Sloan
2. Zurn

L. Sensor Operated Flush Valves:

1. Sloan
2. Zurn

M. Sensor Operated Faucets:

1. Sloan
2. Chicago

3. Delta Commercial
 4. Moen Commercial
- N. Shock Arrestors:
1. PPP
 2. J.R. Smith
- O. Trap Primer Stations:
1. PPP.
- P. Exposed Waste and Supply Piping Insulation Kits:
1. Truebro
 2. McGuire
- Q. Other Manufacturers:
1. Submit substitution request.

2.02 FIXTURE TRIM

- A. Supply Stops: Chicago cast brass rigid riser supplies with loose key angle stops, wall flanges, NPT female inlet, chrome plate finish; equivalent NPT McGuire (LK series), Brasscraft (SCR series), or NPT stops by fixture supplier.
- B. Traps:
1. For floor drains, provide coated cast iron P-trap; recessed, screw jointed or bell and spigot.
 2. For other fixtures, provide 17 gauge, chrome plated cast brass P-Traps with solder bushings, and clean-out.
- C. Support Rims:
1. Hudee stainless steel rims, if sink not furnished with integral rim.
- D. Vacuum Breakers:
1. Chicago Faucet
 2. A.W. Cash
 3. Febco, chrome plated.

2.03 PLUMBING FIXTURES

- A. WC-1 Water Closet (ADA):
1. American Standard Aftwall series, vitreous china, floor mounted, elongated bowl, siphon jet action, 1-1/2-inch top spud, white color finish, mounted at ADA mounting height.
 2. Zurn AquaVantage AV series manual exposed dual action flush valve with triple filtered fixed bypass diaphragm. (1.6/1.1 GPF)
 3. Kohler Lustra series white open-front seat, less cover with external check hinge including 300 series stainless steel post and pintles to stop seat at 11 degrees beyond vertical.
 4. J.R. Smith Series 200 chair carrier.
- B. U-1 Urinal (ADA):
1. Kohler Dexter series, vitreous china, wall mounted washout urinal with 3/4-inch top spud, white color finish, mounted at ADA mounting height.
 2. Sloan Ecos Plus series, battery powered, sensor activated flush valve with battery backup, and dual filtered fixed bypass diaphragm. (0.125 GPF)
 3. J. R. Smith Series 600 floor mounted urinal support.
- C. L-1 Lavatory (Commercial, ADA):
1. American Standard Lucerne series, 14-1/4-inch by 10-3/4-inch, vitreous china, self-draining deck, 4-inch centers, wall hung, concealed arm support with grid drain.
 2. Zurn AquaSense series faucet, battery powered by 4 AA batteries, electronic sensor operated, 0.5 GPM spray head, vandal resistant complete.
 3. J.R. Smith Series 700-Z concealed arm, floor mounted carrier or Smith Series 800 wall plate.
 4. Sloan mechanical point of use mixing valve installed below deck.
- D. S-1 Sink:
1. Elkay Lustertone Series, 23-1/2-inch by 18-1/4-inch by 5-3/8-inch single compartment 18 gauge, 3 hole, self-rimming, type 304 stainless steel sink, Perfect Drain Strainer assembly.
 2. Hansgrohe Focus Series faucet with polished chrome plated solid brass body construction, single lever mixing valve, 10-inch cast brass spout, high temperature limit stop, 1.75 GPM pressure compensating laminar flow outlet, vandal resistant complete.
- E. DF-1 Drinking Fountain (ADA):
1. Elkay EZH20 series dual height wall hung water cooler with bottle filling station
 2. Surface mounted
 3. Push pad operated bubblers

4. Anti-microbial bubbler guards
5. Bottle Filler:
 - a. Sensor activated
 - b. 20 second automatic shut-off
 - c. 1.1 GPM
6. Water Chiller:
 - a. 8 GPH, 50 degree F water at 90 degree F ambient and 80 degree F inlet water temperature.
 - b. 120V, single phase, 5 FLA
7. 3000 gallon water filter

2.04 DRAINAGE PRODUCTS

- A. HB-1 Hose Bibb: Chicago 952 Series, chrome-plated, removable key, 3/4-inch hose thread, integral vacuum breaker.
- B. FD-1 Floor Drain: J.R. Smith 2005 Series, round nickel bronze vandal resistant grate, cast iron body with flashing collar and adjustable strainer head and no-hub outlet.
- C. WCO Wall Cleanout: J.R. Smith 4530 Series, round stainless steel vandal resistant cover and screw.
- D. FCO Floor Cleanout: J.R. Smith 4020 Series, round vandal resistant, nickel bronze top.
- E. Trap Priming Valves:
 1. Precision Plumbing Products Prime-time electronic trap priming manifold including but not limited to: atmospheric vacuum breaker, pre-set 24 hour clock, manual over ride, 120V slow closing solenoid valve, calibrated manifold for equal water distribution.
 2. Components pre-installed in recessed steel cabinet with SS access door.
- F. Water Hammer Arrester: Precision Plumbing Products Model SC (Maintenance-Free).

PART 3 - EXECUTION

3.01 FIXTURE TRIM

- A. Provide plumbing fixture trim where applicable on fixtures, including but not limited to supply stops, traps, support rims, flush valve, and vacuum breakers.
- B. Provide rough-in and final piping connection to fixtures. Carefully review construction documents to assure that fixtures are provided with necessary services for a complete operating system.
- C. Rigidly secure rough-in piping, carriers and supports, and other service piping to structure.

3.02 PLUMBING FIXTURES

- A. Americans with Disabilities Act:
 - 1. Those fixtures indicated by ADA complies with and be installed in accordance with Americans with Disabilities Act Guidelines (ADAAG). Follow building codes where applicable building code requirements are more stringent than ADAAG guidelines.
 - 2. Water Closets:
 - a. Mounting height of ADA water closet 17-inches to 19-inches from floor to top of the toilet seat.
 - b. Mount flush valve for ADA water closets on wide side of enclosure.
 - 3. Lavatories:
 - a. Mounting height of ADA lavatories at a maximum height of 34 inches from floor to rim.
 - b. Provide insulation kits on exposed hot water and waste piping beneath ADA lavatories.
 - 4. Sinks: Provide insulation kits on exposed hot water and waste piping beneath ADA sinks.
 - 5. Urinals: Mounting height of ADA water closet at a maximum height of 17-inches from floor to to rim.
- B. Fixture Mounting Heights: Fixtures standard rough-in catalogued heights unless shown otherwise on the Architectural Drawings.
- C. Water Supplies: When both hot and cold water to a fixture is required, connect the hot on the left and the cold on the right.
- D. Floor Mounted Supports and Chair Carriers:
 - 1. Secure floor mounted supports and chair carriers to slab with a minimum of 1/2-inch bolts.
 - 2. Install supports and carriers per manufacturer's installation instructions.
- E. Lavatories:
 - 1. Public Toilet Room: Grid strainers.
 - 2. Those lavatories indicated as ADA are ADA compatible. Coordinate with Architect to verify if wall hung lavatories are to be installed at ADA height.
- F. Floor Drain and Floor Sinks:
 - 1. Set top flush with finished floor.
 - 2. Provide flashing clamp for drain bodies installed in floors provided with waterproof membranes.

- G. Cleanout:
 - 1. Where shown or required.
 - 2. Cover set flush with finished surface.
- H. Water Hammer Arresters: Provide where shown and where recommended by Plumbing Drainage Institute (PDI).
- I. Water Coolers and Drinking Fountains:
 - 1. Water-bearing materials comply with the Safe Drinking Water Act of 1986 and the Lead Contamination Control Act of 1988. The waterway system of the unit manufactured of copper components and other completely lead-free materials.
 - 2. Water cooler refrigerants will be non-CFC.
 - 3. Provide fixture manufacturer's wall mounting plate or floor mounted support for wall-hung water coolers or drinking fountains.
- J. Mixing Valves: Provide piping connections per manufacturer's installation instructions.
- K. Wall hung lavatories with pop-up waste assemblies: Verify there is no vertical pull rod assembly conflict with lavatory backsplash prior to submitting product data.

3.03 PRIMING VALVES

- A. Prime floor drains, floor sinks and similar traps. Use minimum 3/8-inch type K annealed copper tubing. Primer line to be continuous and without joints.
- B. Where priming valves are installed in finished rooms, conceal in wall and provide access panel.
- C. Coordinate locations of electronic trap primer stations with electrical contractor for 120V service.

END OF SECTION

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.
- C. Sections of Division 23, HVAC are interrelated. When interpreting any direction, material, and method specified in any section of Division 23, HVAC, consider it within the entirety of Work in Division 23, HVAC.

1.02 SUMMARY

- A. The intent of Division 23, HVAC Specifications and the accompanying Drawings is to provide a complete and workable facility with complete systems as shown, specified and required by applicable codes. Include Work specified in Division 23, HVAC and shown on the accompanying Drawings, including appurtenances, connections, etc., in the finished job.
- B. The Division 23, HVAC Specifications and the accompanying Drawings are complementary. Items shown on the Drawings are not necessarily included in the Specifications and vice versa. Specifications supersede drawings in case of conflict.
- C. Imperative language is frequently used in Division 23, HVAC Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.
- D. The Drawings that accompany the Division 23, HVAC Specifications are diagrammatic. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Offsets and transitions assumed at a minimum at each duct crossing, structural penetrations through shear walls or beams, structural grids where ceiling heights are restricted, and at piping mains. Follow the Drawing as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Building, subject to approval, and without additional cost to the Owner. The right is reserved to make any reasonable changes in outlet location prior to roughing-in, without cost impact.

1.03 RELATED WORK

- A. The General and Supplemental Conditions apply to this Division, including but not limited to:
 - 1. Drawings and specifications.
 - 2. Public ordinances, permits.
 - 3. Include payments and fees required by governing authorities for work of this Division.

- B. Division 01, General Requirements, General Requirements, applies to this Division.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Products and equipment prohibited from containing pentabrominated, octabrominated, and decabrominated diphenyl ethers. Where products or equipment within this specification contain these banned substances, provide complying products and equipment from approved manufacturers with equal performance characteristics.
2. General: Work and materials conforms to the local and State codes, and Federal, State and other applicable laws and regulations.
3. Contractor responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.

B. Materials and equipment: New and defective free. Work good quality, free of faults and defects and in conformance with the Contract Documents.

C. Apparatus built and installed to deliver its full rated capacity at the efficiency for which it was designed.

D. The entire mechanical system and apparatus operate at full capacity without objectionable noise or vibration.

E. Install equipment level and true. Housekeeping pads and curbs account for floor or roof slope.

F. Materials and Equipment:

1. Each piece of equipment furnished meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
3. Furnish materials and equipment of size, make, type, and quality herein specified.
4. Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements or any other differences which impact the project.

G. Workmanship:

1. General: Install materials in a neat and professional manner.
2. Manufacturer's Instructions: Follow manufacturer's directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division 23, HVAC Specifications, obtain clarification before starting work.

H. Cutting and Patching:

1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
2. Additional openings required in building construction made by drilling or cutting. Use of jackhammer is specifically prohibited.
3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
4. Do not pierce beams or columns without permission of Architect and then only as directed.
5. Restore new or existing work cut or damaged to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces repaired, refinished, and left in condition existing prior to commencement of work.

1.05 SUBMITTALS

A. Shop Drawings:

1. Indicate the general layout of the piping, ductwork, and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare Shop Drawings of piping, ductwork and equipment installations. Shop Drawings new drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. Drawings the same size as Architect's Drawings with title block similar to Contract Drawings and identifying Architect's Drawing number or any reference drawings. Fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
2. Prepared in two-dimensional format.
3. Include but are not limited to:
 - a. Complete floor plans with sheet metal and HVAC piping to a minimum of 1/4-inch equals 1-foot scale.
 - b. Sheet metal and HVAC piping of mechanical and fan rooms to a minimum of 1/2-inch equals 1-foot scale.
 - c. Sections of congested areas to a minimum of 1/2-inch equals 1-foot scale.
 - d. Controls and Instrumentation: Scale and drawing sizes to suit controls supplier.
 - e. Fabricated Equipment: Scale and drawing sizes to suit contractor except equipment not less than 1/4-inch equals 1-foot scale.
 - f. Superplot plans of above ground work with a colored overlay of trades including, but not limited to, HVAC piping, HVAC equipment, plumbing piping and equipment, sprinklers, lighting, lighting controls, cable tray, fire alarm devices, electrical power conduit, and ceiling system to a minimum of 1/2-inch equals 1-foot scale.
 - g. Superplot plans of below ground work with a colored overlay of trades including, but not limited to, structural footings and foundation, HVAC piping, civil piping, plumbing piping, and power conduit to a minimum of 1/2-inch equals 1-foot scale.
 - h. Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.

- i. Slab penetration drawings of HVAC, plumbing, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1-foot scale.
 - j. Fabrication drawings of radiant ceiling panels, architectural metal ceiling, including panel penetrations for lighting, sprinkler heads, fire alarm devices, and any other penetrations.
4. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.

B. Product Data:

1. In general, submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications and data sheets. Data sheets include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable.
2. List the name of the motor manufacturer and service factor for each piece of equipment.
3. Indicate equipment operating weights including bases and weight distribution at support points.
4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.

C. Submission Requirements:

1. Shop Drawings and Product Data:
 - a. Refer to Division 01, General Requirements for additional requirements related to submittals.
 - b. Submit electronic copies of shop drawings and product data for Work of Division 23, HVAC in PDF format with each item filed under a folder and labeled with its respective specification section number, Article and paragraph and mark if applicable.
 - c. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
 - d. The bulk of the shop drawings and product data, excepting Controls and Instrumentation, included with the original submittal. Controls and Instrumentation submittals may lag but complete when submitted. Partial submittals will not be accepted. Other stragglers submitted after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned late submittal, insert them in the previously submitted binder.

D. Contractor Responsibilities:

1. Submit submittals one time and are in proper order.
2. Ensure that equipment will fit in the space provided.
3. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.06 AS-BUILT DRAWINGS

- A. Provide 3D model and record drawings at the end of the project on CD-ROM.
- B. 3D model in the following format:
 - 1. Revit
- C. Record Drawings: Provide hard copies and pdf format.
 - 1. Drawings include the following:
 - a. Project Specific Title block.
 - b. Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes and Field Coordination.

1.07 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNER'S INSTRUCTIONS

- A. Refer to Division 01, General Requirements for additional requirements.
- B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Literature on 8-1/2-inch by 11-inch sheets or catalogs suitable for side binding. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.
- C. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover phases of control.
- D. Furnish competent engineer knowledgeable in this building system for minimum of five 8-hour days to instruct Owner in operation and maintenance of systems and equipment. Keep a log of this instruction including dates, times, subjects, and those present and present such log when requested by Architect.

1.08 PROJECT CONDITIONS

- A. Existing Conditions: Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work. Include related costs in the initial bid proposal.
- B. Coordinate exact requirements governed by actual job conditions. Check information and report discrepancies before fabricating work. Report changes in time to avoid unnecessary work.
- C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, the City and Utility Company.

1.09 WARRANTY

- A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.

- B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.
- C. Correct warranty items promptly upon notification.

1.10 PROVISIONS FOR LARGE EQUIPMENT

- A. Make provisions for the necessary openings in building to allow for admittance of equipment.

1.11 TEST REPORTS AND CERTIFICATES

- A. Submit one copy of test reports and certificates specified herein to the Architect.

1.12 SUBSTITUTIONS

- A. Submit requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 - PRODUCTS

2.01 ACCESS PANELS

- A. Furnish under this Division as specified in another Division of work.

2.02 PIPE AND DUCT SLEEVES

- A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel, or another pre-approved system.
- B. Interior Wall and Floor Sleeves (fire rated): Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
- C. Exterior Wall Sleeves: Cast iron
- D. On Grade Floor Sleeves: Same as exterior wall sleeves.
- E. Water Tight Sleeves: Combination steel pipe sleeves with water stop and anchor plate; Link Seal Model WS, mated with synthetic rubber links interlocked with bolts and nuts; Link Seal Model LS.

2.03 FLOOR, WALL AND CEILING PLATES

- A. Furnish stamped split type plates as follows:
 - 1. Floor Plates: Cast brass, chromium plated.
 - 2. Wall and Ceiling Plates: Spun aluminum.

2.04 MACHINERY GUARDS

- A. Furnish guards for protection on rotating and moving parts of equipment. Provide guards for metal fan drives and motor pulleys, regardless of being enclosed in a metal cabinet.

- B. Design guards so as not to restrict air flow at fan inlets resulting in reduced capacity.
- C. Provide shaft holes in guards for easy use of tachometers at pulley centers. Guards easily removable for pulley adjustment or removal and changing of belts.
- D. Meet OSHA requirements including back plates.
- E. Provide inlet and outlet screens on fans in plenums or where exposed to personnel.

2.05 ELECTRICAL EQUIPMENT

- A. General: Equipment and installed work as specified under Division 26, Electrical.
- B. Coordinate with the electrical Drawings and electrical contractor for minimum electrical equipment bracing requirements based on the available fault current rating at the bus of the panelboard or switchboard serving the piece of equipment. Provide equipment with a Short Circuit Current Rating (SCCR) that meets the bracing requirement.
- C. Motors – AC Induction:
 - 1. Furnish as integral part of driven equipment.
 - 2. Drip proof induction type with ball bearings unless noted otherwise.
 - 3. Motors 1 hp and above premium energy efficient type, except for emergency equipment motors.
 - 4. Built to NEMA Standards for the service intended.
 - 5. Rated for voltage specified, suitable for operation within the range of 10 percent above to 10 percent below the specified voltage.
 - 6. Energy Efficient Motors:
 - a. Baldor
 - b. Westinghouse
 - c. General Electric
 - d. Or approved equal.
 - 7. Meet the efficiency standards identified in the table below as determined using the IEEE Method B test at full load.

MINIMUM MOTOR EFFICIENCIES					
		RPM IEEE 112B Efficiency			
HP	KW	900	1200	1800	3600
1	0.75	--	82.5	85.5	80.0
1.5	1.15	--	86.5	86.5	85.5
2	1.53	--	87.5	86.5	86.5
3	2.3	84.0	89.5	89.5	88.5
5	3.8	85.5	89.5	89.5	89.5
7.5	5.6	87.5	91.7	91.7	91.0
10	7.5	88.5	91.7	91.7	91.7
15	7.5	88.5	91.7	92.4	91.7
20	15.9	90.2	92.4	93.0	92.4
25	18.8	91.0	93.0	93.6	93.0
30	22.5	91.0	93.6	94.1	93.0

40	30.0	91.7	94.1	94.5	93.6
50	37.5	92.4	94.1	94.5	94.1
60	45.0	93.0	94.5	95.0	94.1
75	56.3	93.0	95.0	95.4	94.5
100	75.0	93.0	95.4	95.4	95.0
125	93.8	94.5	95.4	95.4	95.4
150	112.5	94.5	95.8	95.8	95.4
200	150.0	94.5	95.8	96.2	95.8
250	187.5	94.5	95.1	96.2	95.1
300	225.0	94.5	95.3	96.2	95.3
350	225.0	94.5	95.3	96.2	95.3
400	300.0	94.5	95.4	96.2	95.4
450	337.5	94.5	95.5	96.2	95.5
500	375.0	94.5	95.6	96.2	95.6

8. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage, and phase.
 9. Refer to individual product sections for additional motor requirements.
 10. Furnish motors on belt drive equipment of nominal nameplate horsepower not less than 120 percent of equipment brake horsepower required for performance specified.
 11. Built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors have quick trip devices.
 12. Motors controlled by variable frequency drives inverter duty rated and have Class F insulation or better. Withstand repeated voltage peaks of 1600 volts with rise times of 0.1 microseconds and greater in accordance with NEMA Standard MG1 Part 31.
 13. Motors served from variable frequency drives equipped with shaft grounding system which provides a path for current to flow between the shaft and motor frame. SGS or equal.
 14. Motors located in environment air plenums not tied to air handling functions totally enclosed type motors.
 15. Motors installed on cooling towers totally enclosed type TEFC.
- D. Motors – Electronic Commutation (EC):
1. Furnished as integral part of driven equipment.
 2. Permanently lubricated with ball bearings unless noted otherwise.
 3. Internal motor circuitry converts AC power supplied to the motor to DC power to operate the motor.
 4. Speed controllable down to 20 percent of full speed.
 5. Motor efficiency at a minimum of 85 percent at all speeds.
 6. Refer to Equipment Schedules on the Drawings for motor horsepower, voltage, and phase.

7. Refer to individual product sections for additional motor requirements.
 8. Built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors have quick trip devices.
 9. Motors located in environment air plenums not tied to air handling functions totally enclosed type motors.
- E. Starters: Provided under Division 26, Electrical, suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.
- F. Equipment Wiring:
1. Interconnecting wiring within or on a piece of mechanical equipment provided with the equipment unless shown otherwise.
 2. This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.
- G. Control Wiring: Control wiring for mechanical equipment provided under Section 23 09 00, Instrumentation and Controls for HVAC.
- H. Codes: Electrical equipment and products bear the UL label as required by governing codes and ordinances.

PART 3 - EXECUTION

3.01 ACCESS PANELS

- A. Install in accord with manufacturer's recommendations, coordinated with architectural features.
- B. Provide 2-hour fire rated doors where required bearing the UL label.
- C. Furnish 18-inch by 18-inch panels for ceilings and for access to equipment in soffits and shafts, and 12-inch by 12-inch for walls unless indicated otherwise.
- D. Furnish where indicated and where required to access valves, fire/smoke dampers, trap primers, shock arresters, and other appurtenances requiring operation, service or maintenance. Submit proposed locations for review prior to installation.

3.02 SLEEVES

- A. Interior Floor and Wall Sleeves:
1. Provide sleeves large enough to provide 3/4-inch clearances around pipe or ductwork.
 2. Where pipe or ductwork is insulated, insulation pass continuously through sleeve with 3/4-inch clearance between insulation and sleeve.
 3. Penetrations through mechanical room and fan room floors watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved system.

- B. Sleeves Through Rated Floors and Walls: Similar to interior sleeves except install fire rated system approved by Authority Having Jurisdiction and Owners insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping or duct material, size and service.
- C. Sleeves specified or indicated at fire damper penetrations take precedence over this article.
- D. Exterior Wall Sleeves Below Grade:
 - 1. Provide water tight sleeves. Install at pipes entering building below grade and where shown.
 - 2. Adjust to provide positive hydrostatic seal.
 - 3. Follow manufacturer's procedure for installing and tightening seal.
 - 4. Secure sleeves against displacement.
- E. On Grade Floor Sleeves: Same as below grade exterior wall sleeves, caulked from inside.
- F. Exterior Wall Sleeves Above Grade: Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.
- G. Layout work prior to concrete forming. Do cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.
- H. Floor sleeves maintain a water barrier by providing a water tight seal or they extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated.
- I. Do not support pipes by resting pipe clamps on floor sleeves. Supplementary members provided so pipes are floor supported.
- J. Special sleeves detailed on drawings take precedence over this Section.

3.03 CLEANING

- A. General: Clean mechanical equipment, piping and ductwork of stampings and markings (except those required by codes), iron cuttings, and other refuse.
- B. Painted Surfaces: Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.
- C. Additional requirements are specified under specific Sections of this Division.

3.04 EQUIPMENT PROTECTION

- A. Keep pipe, ductwork and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, ductwork, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated fixtures, equipment, or apparatus to original conditions or replace at no cost to the Owner.

- B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.
- C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.05 ACCESSIBILITY

- A. General: Locate valves, thermometers, cleanout fittings and other indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.
- B. Thermometers and Gauges: Install thermometers and gauges so as to be easily read from the floors, platforms, and walkways.

3.06 FLOOR, WALL, AND CEILING PLATES

- A. Install on piping and ductwork passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe and duct.
- B. Secure wall and ceiling plates to pipe, insulation, or structure.
- C. Plates not to penetrate insulation vapor barriers.
- D. Plates not required in mechanical rooms or unfinished spaces.

3.07 PAINTING

- A. General: Coordinate painting of mechanical equipment and items with products and methods in conformance with the appropriate Division of Work, Painting. Exposed work under this division receives either a factory painted finish or a field prime coat finish, except:
 - 1. Exposed copper piping.
 - 2. Aluminum jacketed outdoor insulated piping.
- B. Equipment Rooms and Finished Areas:
 - 1. Insulation: Not painted.
 - 2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, and Equipment Bases: Paint one coat of black enamel.
 - 3. Steel Valve Bodies and Bonnets: One coat of black enamel.
 - 4. Brass Valve Bodies: Not painted.
 - 5. Equipment:
 - a. One coat of grey machinery enamel.
 - b. Do not paint nameplates.
 - 6. Grilles, Diffusers, Registers: Paint sheet metal and visible ductwork behind grilles, diffusers and registers flat black.

- C. Concealed Spaces (above ceilings, not visible):
 - 1. Insulation: Not painted.
 - 2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.
- D. Exterior Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.
- E. Roof Mounted Equipment: Paint two coats of exterior machinery enamel. Color as selected by Architect. Where factory standard finish is indicated in the equipment specification, it is assumed that the standard finish is painted.
- F. Exterior Black Steel Pipe: Wire brush and apply two coats of rust-inhibiting primer and one coat of exterior enamel. Painting schemes comply with ANSI A13.1.

3.08 ADJUSTING AND CLEANING

- A. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.
- B. Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.

3.09 ELECTRICAL EQUIPMENT

- A. Ductwork or piping for mechanical systems not serving electrical space not installed in switchgear room, transformer vault, telephone room, or electric closet except as indicated.
- B. Ductwork or piping for mechanical systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

3.10 EQUIPMENT CONNECTIONS

- A. Make final connections to equipment specified in sections other than Division 23, HVAC of the specifications and Owner furnished equipment in accordance with manufacturer's instructions and shop drawings furnished and as indicated.
- B. Piping:
 - 1. Connections include steam supply, steam vent, and condensate.
 - 2. Provide valves and specialties as specified and as detailed on the Drawings. Provide increasers, reducers, and any other fittings required for complete installation.
 - 3. Support piping connections independently to prevent undue strain on equipment.
- C. Ductwork: Make exhaust connections to fume hoods, emergency generator radiators, and any other processing, laboratory, or kitchen equipment in strict accordance with manufacturer's instructions.

- D. Engine Exhaust: Make connections as necessary for complete working installation to the emergency generators as indicated and specified.

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SECTION 23 05 14

VARIABLE FREQUENCY DRIVES FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Variable Frequency Drives
- B. Related Section include:
 - 1. Section 23 09 00, Instrumentation and Controls for HVAC

1.03 SUBMITTALS

- A. Submit the following:
 - 1. Product data on variable frequency drives and related components.
 - 2. Startup log/check list showing successful operation.
 - 3. Operation and maintenance data.

PART 2 - PRODUCTS

2.01 VARIABLE FREQUENCY DRIVES

- A. Acceptable Manufacturers:
 - 1. Reliance
 - 2. Toshiba
 - 3. ABB
 - 4. Emerson
 - 5. Yaskawa
 - 6. Square D

7. Siemens
8. Saftronics
9. Allen-Bradley
10. Danfoss
11. Cerus
12. Other Manufacturers: Submit substitution request.

B. General Description:

1. Variable Frequency AC Motor Drive (VFD):
 - a. Pulse width modulated (PWM) inverter type.
 - b. Designed to convert 60 Hz input power to adjustable frequency output power to provide positive speed control to standard induction motors.
 - c. Dedicated variable torque design for specific use with centrifugal loads.
2. Provide completely solid state variable frequency power and logic unit.
3. Speed control to be stepless throughout the range under variable torque load on continuous basis. Speed controlled by remote building energy management system providing 4-20MA input signal to drive and remote start/stop signal. Coordinate with Section 23 09 00, Instrumentation and Controls for HVAC.
4. Provide adjustable frequency control with diode bridge/capacity input designed to provide high, constant power factor of 0.95 regardless of load or speed and eliminate SCR line noise.
5. Equipment will be designed and manufactured in accordance with applicable current NEMA and IEEE recommendations and be designed for installation per NEC. Equipment will be UL listed and bear the UL label.
6. Control suitable for operation in ambient temperatures of 32 degrees F to 104 degrees F.
7. Factory tested with an AC induction motor 100 percent loaded and temperature cycled within an environmental chamber at 104 degrees F.

C. Self-Protection and Reliability Features:

1. Adjustable current limit to 60 percent to 110 percent of drive rating.
2. Adjustable instantaneous overcurrent trip.
3. Under voltage trip.
4. Over temperature trip.
5. Short circuit protection phase to phase and phase to ground faults phase rotation insensitive.
6. Momentary power loss, more than 17 milliseconds.

7. Transient protection against normal transients and surges in incoming power line.
8. Orderly shutdown in event of any of above conditions, drive designed to shut down safely without component failure.
9. Provide visual indication and manual reset.

D. Standard Features:

1. Drive Logic: Microprocessor based
2. Control Logic: Isolated from power circuitry.
3. Standalone operation to facilitate start up and troubleshooting procedures.
4. UL 508C listed for drives serving a single motor or UL 508A listed for drives serving multiple motors, for use on distribution systems with 22,000 AIC.
5. Output voltages equal to applied input voltage.
6. Isolated signal inputs.
7. Frequency Stability. Output frequency will be held to +0.1 percent of maximum frequency regardless of load, +10 percent input voltage change or temperature changes within ambient specification.
8. Built-in digital display indicates output frequency, voltage, and current and provides indication of over current, over voltage, current limit, ground fault, over temperature, input power on, minimum or maximum speed adjustment, power on, fault condition. Display on panel face.
9. Start/Stop Control - Controlled decelerated stop.
10. Primary and secondary fused for a control circuit transformer.
11. Minimum and maximum speed control.
12. Adjustable Accel/Decel - independently adjustable 10-100 second.
13. Hand-Off auto switches.
14. Programmable Auto Restart - after power outage.
15. Provide fused disconnect, including auxiliary contacts to isolate control circuit when disconnect is in "off" position, except fused disconnects not required where packaged equipment is provided with a single point connection with single point disconnect and internal overcurrent protection for VFD and motors.
16. Remote contacts for fault, and on/off status.
17. Adjustable motor output voltage.
18. Analog output voltage of 0-10 VDC, -20 MA proportional to control output frequency.

19. Provide a NEMA 1 enclosure for indoor applications and NEMA 3R enclosure for outdoor applications to isolate each motor starter and control section with its associated disconnect switch.
20. Manual speed control for each motor.
21. Manual bypass (3 contactor) to provide ability to service control while motor is operational.
22. Provide RF, and EMI, noise suppression network to limit RF and EM interference.
23. Provide isolated analog output signals for volts, amps, and frequency, from each VFD for connection to the building energy management system.
24. Provide line (input) reactors.
25. Provide output filters for VFD's located more than 25 conductor feet from the motor they serve. Output reactors permit VFD's to be located up to 350-feet from the motors they serve.
26. Design VFD to catch spinning load in forward and reverse direction.
27. Harmonic Calculations: Perform on manufacturer supplied Harmonic Analysis program to provide conformance with IEEE 519-1992.

E. Communications:

1. Provide factory installed communication chip for direct network connection to DDC Control System specified in Section 23 09 00, Instrumentation and Controls for HVAC. Interface allows for control and interface functions specified herein and in Section 23 09 00, Instrumentation and Controls for HVAC. Interface control functions and information includes, but not be limited to the following:
 - a. Start/Stop
 - b. Change Directions
 - c. Drive Fault
 - d. Drive Fault Codes
 - e. Reset Drive
 - f. Percent Output
 - g. Speed
 - h. Power
 - i. Drive Temp
 - j. KWH
 - k. Run Time
2. Provide isolated analog output signals for volts, amps and frequency from each VFD for connection to the DDC Control System specified in Section 23 09 00, Instrumentation and Controls for HVAC.
3. Provide RS485 communications port and programming software capability.

F. Drives for smoke control systems:

1. The drive must be protected in an environment that meets manufacturer recommendation.

2. Do not permit the motor to run into the service factor of the motor.
3. Settings for drive operation and proper speed control cannot be stored in volatile memory subject to loss in a power loss.
4. Smoke detection system must meet UL 864 standard, UL 508.
5. The VFD must be capable of operation from a contact closure from an alarm panel. When override/alarm panel is active:
 - a. Drive operates at a preset speed.
 - b. Drive ignores keypad commands to include Auto, OFF, or Hand Mode or even removal of keypad panel.
 - c. Drive ignores commands from communication links.
 - d. Drive ignores digital inputs except override activation/deactivation, Run Enable and Start Enable.
 - e. Drive displays message indicating it is operating in override operation.
 - f. No safeties are to be wired to the VFD. The VFD is only used for smoke and purge control. The VFD is to ignore faults when operating in Override Mode.

PART 3 - EXECUTION

3.01 VARIABLE FREQUENCY DRIVE INSTALLATION

- A. Install VFD in accordance with manufacturer's written installation instructions.
- B. Install on strut support stand.
- C. Provide one drive for each motor as scheduled.

3.02 START UP

- A. General: Comply with manufacturer's instructions for startup.
- B. Provide under direct supervision of the manufacturer's representative with factory trained personnel.

3.03 FIELD QUALITY CONTROL

- A. Prior to installation, manufacturer's representative coordinate variable speed drive control interface with the controls contractor and verify that intended installation (controls, wiring, etc.) complies with the manufacturer's recommendations.
- B. Field Test: Except where initial variable speed drive operation clearly shows the performance meets or exceeds the requirements, test to show compliance. Tests performed by the manufacturer's representative in the presence of the Engineer.

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SECTION 23 05 19

METERS AND GAUGES FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Thermometers - Water
 - 2. Pressure Gauges - General
 - 3. Differential Pressure Gauges
 - 4. Water Meter

1.03 SUBMITTALS

- A. Submit the following:
 - 1. Products listed in this section.
 - 2. Water flow meters, include graph of output signal vs. gpm for each device.
 - 3. Operating and Maintenance Data.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Thermometers - Water:
 - 1. Ashcroft
 - 2. Weiss
 - 3. Terice
 - 4. Marsh
 - 5. Weksler

6. Tel-Tru
 7. Other Manufacturers: Submit substitution request.
- B. Pressure Gauges - General:
1. Marsh
 2. Ashcroft
 3. Weiss
 4. Trerice
 5. Weksler
 6. Tel-Tru
 7. Other Manufacturers: Submit substitution request.
- C. Differential Pressure Gauges:
1. Between Rooms: Dwyer magnahelic Model 2000-00, 0-0.25 inches of water range.
 2. Across Filters: Dwyer magnahelic Model 2002-AF, 0-2.0 inches of water range with air filter gauge accessory package.
- D. Water Meter:
1. Hersey
 2. Badger
 3. Sparling.
 4. Other Manufacturers: Submit substitution request.

2.02 THERMOMETERS - WATER

- A. Direct drive 4-1/2-inch dial type, stainless steel case, separable sockets, stem length to penetrate minimum of 1/2 pipe diameter, adjustable face, extension necks where required to clear insulation.

- B. Range:

HVAC Systems	Temperature	Graduations
Heating Water	30-240 degrees F	2 degrees F

2.03 PRESSURE GAUGES - GENERAL

- A. Description: 4-1/2-inch dial, molded black polypropylene turret case.

- B. Range:

HVAC Systems	Pressure	Graduations
Heating Water	0-100 psi	1 psi

2.04 DIFFERENTIAL PRESSURE GAUGES

- A. Description: Surface mounted diaphragm-actuated dial type with zero pointer adjustment. Provide 4-inch minimum dial diameter with black figures on a white background.
- B. Tubing: Copper; polytube may be used if concealed inside walls.

2.05 WATER METER

- A. Description:
 - 1. Disc type meter, bronze split casing, magnetic drive.
 - 2. Heavy duty gear train, completely sealed, circular meter, totalize in cubic feet with sweep hand.
 - 3. Comply with AWWA performance standards.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

- A. Provide meters and gauges where shown on Drawings.
- B. Install gauges and meters as required and as recommended by equipment manufacturer or their representative.
- C. Extend connections, wells, cocks, or gauges to a minimum of 1-inch beyond insulation thickness of the various systems.
- D. Locate gauges so that they may be conveniently read at eye level or easily viewed and read from the floor or from the most likely viewing area, i.e., platform, catwalk, etc.
- E. Install instruments over 6-feet-6-inches above floor, to be viewed from the floor, with face at 30 degrees to horizontal.

3.02 INSTALLATION - PRESSURE GAUGES

- A. Provide instrument gauge cock at inlets.
- B. Locate pressure gauge taps for measuring pressure drop or increase across pumps, coils, etc., as close to the device as possible.

3.03 WATER METER

- A. Installed in accord with manufacturer's recommendations and as shown on the Drawings.

END OF SECTION

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SECTION 23 05 23

GENERAL DUTY VALVES AND SPECIALTIES FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Gate Valves
 - 2. Globe Valves
 - 3. Check Valves
 - 4. Ball Valves
 - 5. Butterfly Valves
 - 6. Balancing Valve
 - 7. Automatic Flow Control Valves
 - 8. Pressure Independent Control Valve
 - 9. Specialty Valves
 - 10. System Specialties
 - 11. Integrated Coil Piping Connector
 - 12. Diaphragm Expansion Tank System
 - 13. Bladder Expansion Tank System
 - 14. Water Buffer Tank
 - 15. Air Separator – High Efficiency Coalescing
 - 16. N-Line Air Purger
 - 17. Pressure Reducing Valve (Closed Hydronic System Feed)
 - 18. Water Relief Valves

19. Strainers
20. Suction Diffusers
21. Triple Duty Valve
22. Water Filters
23. Differential Pressure Regulator Valve

1.03 SUBMITTALS

- A. Submit product data.
- B. Submit balancing valve schedule with manufacturer, model, size, flow rate and pressure drop.
- C. Submit automatic flow control valve schedule with manufacturer, model, size, flow rate and pressure drop.
- D. Submit pressure independent control valve schedule with manufacturer, model, size, flow rate and pressure drop.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER VALVES

- A. General: Where only NIBCO figure numbers are listed, equivalent products by those specified below are acceptable.
- B. Gate Valves:
 1. Apollo
 2. Victaulic
 3. Crane
 4. Kennedy
 5. Stockham
 6. Milwaukee
 7. Walworth
 8. Hammond
- C. Globe Check:
 1. Apollo
 2. Victaulic
 3. Crane

4. Kennedy
5. Stockham
6. Milwaukee
7. Walworth
8. Hammond

D. Check Valves:

1. Mueller
2. Metraflex
3. Victaulic
4. Bell and Gossett
5. Milwaukee
6. Gruvlok.

E. Ball Valves:

1. Gruvlok
2. Apollo
3. Crane
4. Hammond
5. Milwaukee
6. Victaulic

F. Butterfly Valves:

1. Apollo
2. Victaulic
3. Gruvlok
4. Crane
5. Walworth
6. Milwaukee
7. Metraflex

G. Balancing Valve:

1. DeZurik
2. Homestead
3. Bell and Gossett
4. Armstrong
5. Walworth
6. Taco
7. Wheatley
8. Tour & Andersson
9. Victaulic
10. Gruvlok
11. NIBCO

H. Automatic Flow Control Valves

1. Griswold
2. Flow Design
3. Other Manufacturers: Submit substitution request.

I. Pressure Independent Control Valve

1. Belimo.
2. Oventrop.
3. Other Manufacturers: Submit substitution request.

J. Specialty Valves

K. System Specialties

1. Manual Air Vents:
 - a. Coin type
 - b. Dole 9
 - c. Or approved equal.
2. Automatic Air Vents:
 - a. Hoffman 78
 - b. Amtrol
 - c. Armstrong
 - d. Spirax-Sarco Engineering
 - e. Spirotherm Spirotop

- f. Other Manufacturers: Submit substitution request.
- 3. Pressure/Temperature Test Plug:
 - a. Peterson Engineering, Inc.
 - b. Universal Lancaster
 - c. Sisco
 - d. Trerice
 - e. Other Manufacturers: Submit substitution request.
- L. Integrated Coil Piping Connector
 - 1. Griswold Controls
 - 2. HCi
- M. Diaphragm Expansion Tank System
 - 1. Amtrol
 - 2. Bell & Gossett
 - 3. Armstrong
 - 4. Wheatley
 - 5. Taco
 - 6. Other Manufacturers: Submit substitution request.
- N. Bladder Expansion Tank System
 - 1. Amtrol, Bell & Gossett
 - 2. Armstrong
 - 3. Wheatley
 - 4. Taco
 - 5. Other Manufacturers: Submit substitution request.
- O. Air Separator – High Efficiency Coalescing
 - 1. Spirotherm Spirovent.
 - 2. CALEFFI.
 - 3. Other Manufacturers: Submit substitution request.
- P. N-Line Air Purger
 - 1. American Air Purger Model 720 eliminator.
 - 2. Other Manufacturers: Submit substitution request.

Q. Pressure Reducing Valve (Closed Hydronic System Feed)

1. Bell & Gossett
2. Armstrong
3. Taco
4. Amtrol
5. Cash Acme
6. Other Manufacturers: Submit substitution request.

R. Water Relief Valves

1. Consolidated
2. Kunkle Valve
3. B&G, Armstrong
4. Cash Acme
5. Other Manufacturers: Submit substitution request.

S. Strainers

1. General:
 - a. NIBCO
 - b. Armstrong
 - c. McAlear Mfg. Co.
 - d. Sarco, Inc.
 - e. Steamflo
 - f. Mueller
 - g. R.P. & C. Company
 - h. Titan Flow Control
 - i. Other Manufacturers: Submit substitution request.
2. Grooved Coupling Systems:
 - a. Gruvlok
 - b. Victaulic

T. Suction Diffusers

1. General
 - a. Bell & Gossett
 - b. Armstrong
 - c. Taco
 - d. Amtrol
 - e. Wheatley
 - f. Paco
 - g. Mueller
 - h. Other Manufacturers: Submit substitution request.

2. Grooved Piping Systems:
 - a. Gruvlok
 - b. Victaulic

U. Triple Duty Valve

1. General:
 - a. B&G Triple Duty Valve
 - b. Armstrong
 - c. Amtrol
 - d. Wheatley
 - e. Paco
 - f. Mueller
 - g. Taco
 - h. Other Manufacturers: Submit substitution request.
2. Grooved Piping Systems
 - a. Gruvlok
 - b. Victaulic

V. Water Filters

1. Pall
2. Millipore
3. Other Manufacturers: Submit substitution request.

W. Differential Pressure Regulator Valve

1. Jordan Mark 67D
2. Hoffman
3. Clayton
4. Other Manufacturers: Submit substitution request.

X. Other Manufacturers: Submit substitution request.

Y. Use one manufacturer on valves.

Z. Threaded, flanged, soldered, or grooved valve ends, as applicable to piping system. Refer to Section 23 21 13, Pipe and Pipe Fittings HVAC for allowable fittings.

2.02 GATE VALVES

- A. Bronze Gate: Bronze body, bronze trim, bronze screwed bonnet; solid wedge, 150 psi steam rating (use bonnet on steam service), 300 psi WOG, NIBCO 134.
- B. Bronze Gate, High Pressure: Bronze body, bronze union bonnet, solid wedge, 200 psi steam; NIBCO 154.

2.03 GLOBE VALVES

- A. Bronze Globe and Angle Globe: Bronze body, bronze mounted, renewable composition disc, 150 psi rating; NIBCO 235 or 335.

2.04 CHECK VALVES

- A. Horizontal Bronze Swing Check: Bronze body, bronze mounted, regrinding bronze disc, 150 psi steam rating, 300 psi WOG; NIBCO 433-Y.
- B. Vertical and Silent Check Valves:
 - 1. 250 pounds WOG, iron body, stainless steel trim, globe type with flanged ends; NIBCO 960.
 - 2. 300 psig CWP, ductile iron body, stainless steel spring and shaft. Victaulic Series 716.
 - 3. 230 psig CWP, AGS grooved end ductile iron body, stainless steel spring, shaft, and disc, EPDM seat. Victaulic Series W715.
- C. Vertical and Silent Check Valves: 250-lb. WOG, iron body, stainless steel trim, wafer type; NIBCO W-960.

2.05 BALL VALVES

- A. Bronze Ball: Bronze cast body or forged brass, chrome-plated full port ball, with handle, Teflon seat, 300 psi WOG, 150 psi steam; NIBCO 585-70 or Victaulic Series 589.
- B. PVC Ball: PVC Body, trunnion mounted, Teflon seat, Viton seals, socket type connection; True Blue GSR Asahi.

2.06 BUTTERFLY VALVES

- A. Copper Grooved Piping System Butterfly Valve: Nylon coated or Cast bronze body per Copper Development Agency-836, ductile iron disc encapsulated with EPDM coating, lever handle up to 6-inches, gear operator on valves 8-inches and greater, stem length to accommodate insulation, 300 psi water; Victaulic Series 608, per ASTM A-584.
 - 1. Grooved ends manufactured to copper-tubing sizes. Flaring tube or fitting ends to accommodate alternate sized couplings is not permitted.

2.07 BALANCING VALVE

- A. Calibrated:
 - 1. Y-pattern globe style design. Valve to perform the following functions: Precision flow measurement, precision flow balancing, memory stops, positive shut-off to a minimum of 250 psi, drain port suitable for hose bibb fitting. Threaded or solder ends for 1/2-inch through 2-inches. 1/2-inch valve capable of balance to 0.5 GPM. Grooved or flanged ends for 2-1/2-inches through 12-inches. Tour & Andersson, Armstrong CBV, Gruvlok GBV, NIBCO CBV 1710, 737.
 - 2. Size balancing valves based on the published performance curve characteristics for the scheduled flow rate for each location to ensure proper operation at design conditions.

2.08 AUTOMATIC FLOW CONTROL VALVES

- A. Furnish automatic pressure compensating flow control valves.
- B. Valves factory set and calibrated within 5 percent of indicated water flow rate. Provide taps for measuring of flows with quick disconnect valves.
- C. Field adjustable flow rate with adjustable flow control cartridge.
- D. Provide identification tags for each valve indicating type, flow characteristics, etc.
- E. Pressure range for each valve is shown on Drawings.
- F. 150 psi operating pressure.
- G. Provide strainers and isolation valves separately from flow control valves, where required.
- H. Size flow control valves based on the published performance curve characteristics for the scheduled flow rate for each location to ensure proper operation at design conditions.

2.09 PRESSURE INDEPENDENT CONTROL VALVE

- A. Acceptable Manufacturers:
- B. Description:
 - 1. Chilled Water and Heating Water Control Valves: Dynamic, modulating, 2-way control device.
 - 2. Dynamic control valve accurately controls flow, independent of system pressure fluctuation, from 0 to 100 percent full rated flow.

2.10 SPECIALTY VALVES

- A. Gauge Cocks: Brass, tee handle, male to female, 200 psi working pressure, 1/4 inch; Conbraco 41 series.
- B. Drain Valves: Bronze globe valve or full port ball valve, garden hose end, cap and chain 3/4 inch size.

2.11 SYSTEM SPECIALTIES

- A. Automatic Air Vents: Water main type, cast brass body, built-in check valve, 1/8-inch I.P.S. top tapping for moisture discharge, 3/4-inch size, 150 psi operating pressure.
 - 1. General: 1/2-inch N.P.T. fitting to receive either a temperature or pressure probe 1/8-inch O.D., fitted with a color coded and marked cap with gasket.
 - 2. Material: Solid brass with valve core of NORDEL.
 - 3. Rating: Minimum 300 psig at 275 degrees F.
 - 4. Gauges and Thermometers: Supply Owner with two pressure gauge adapters with 1/8-inch O.D. probe and two five-inch stem pocket test thermometers 25 degrees - 125 degrees F for chilled water, 40 degrees -240 degrees F for heating water.

2.12 INTEGRATED COIL PIPING CONNECTOR

- A. Full port forged brass isolation valves with integral union and pressure temperature port, strainer where indicated, flow meter, balance valve with memory stop, air vents, and drains.
- B. Use of integrated flexible braided hoses is not acceptable.
- C. Provide integrated flexible hose assembly. Flexible hoses meet the requirements of Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment.
- D. Use the same manufacturer as approved assembly supplier listed in this section or other approved manufacturers listed for each component in other sections of this specification.
- E. Meet the specifications for each component as listed on other sections of the specification.
- F. Capable of continuous operation at 150 psi and system test pressure when installed in piping systems.
- G. Assembly the same size as the pipe it connects and have pipe thread connectors on both ends with male or female end adapters as required, except the balancing valve may be a smaller size as required to balance the flow.

2.13 DIAPHRAGM EXPANSION TANK SYSTEM

- A. Expansion Tank:
 - 1. Diaphragm type of welded steel, constructed and stamped in accordance with ASME Code for 125 psi working pressure.
 - 2. Support with steel legs or bases for vertical installation or steel saddles for horizontal installation.
 - 3. Precharge with compressed air to minimum fill pressures.

2.14 BLADDER EXPANSION TANK SYSTEM

- A. Expansion Tank:
 - 1. Bladder type of welded steel, constructed and stamped in accordance with ASME Code for 125 psi working pressure.
 - 2. Support with steel legs or bases for vertical installation or steel saddles for horizontal installation.
 - 3. Precharge with compressed air to minimum fill pressures as indicated.
 - 4. Replaceable bladder.

2.15 WATER BUFFER TANK

- A. Vertical tank constructed of heavy gauge carbon steel with internal baffle, welded support stand and drain and vent connections.
- B. Rated for 125 psig working pressure in accordance with ASME Boiler and Pressure Vessel Code Section VIII, Division 1.

- C. Flanged inlet and outlet pipe connections.
- D. Capacity and connection sizes per schedule on Drawings.

2.16 AIR SEPARATOR – HIGH EFFICIENCY COALESCING

- A. Turbulence suppressive type air eliminator to separate microbubbles and to remove stationary air pockets through absorption. Brass or steel body with centerlined inlet and outlet for in-line piping. Valved side tap to bleed large amounts of air during system fill.
- B. Integrated brass venting mechanism on top. Blowdown connection port at bottom.
- C. Maximum working pressure, 150 psi. Maximum working temperature 250 degrees F. Maximum allowable water velocity, 4ft/second. Maximum pressure drop 0.5-feet.
- D. Air elimination efficiency of 100 percent free air, 100 percent entrained air, 99.6 percent dissolved air.
- E. Dirt separation efficiency of 80 percent of particles 30 micron and larger with 100 passes.

2.17 IN-LINE AIR PURGER

- A. Description: Fabricated steel air purger with screwed inlet and outlet, disked air entrapment head, purger, and drain coupling.
- B. Eliminator:
 - 1. Use the same manufacturer capable of eliminating air as fast as it can be separated.
 - 2. Design so air cannot be drawn into the system if negative pressures occur.
- C. Size: Purger to be line size.

2.18 PRESSURE REDUCING VALVE (CLOSED HYDRONIC SYSTEM FEED)

- A. Description: Self-filling type with low inlet pressure check valve, removable strainer, adjustable range, and set point as indicated on the Drawings.
- B. Construction:
 - 1. Iron body for steel piping installation, brass body for copper piping installation.
 - 2. Brass working parts.
- C. Size: 3/4-inch unless shown otherwise.

2.19 WATER RELIEF VALVES

- A. Bronze or steel body, stainless steel or bronze, pressure settings to 160 psi at 250 degrees F, conforming to Section IV of ASME Code, size per manufacturer's recommendations based on Code, setting as indicated; Kunkle Model 537.

2.20 STRAINERS

- A. Wye Pattern:
1. Bronze: Bronze body, 250 psi, 1/16-inch perforated type 304 stainless screen.
 2. Ductile Iron: Ductile iron body, 300 psi, 1/16 or 1/8-inch 304 stainless steel screen.
 3. Cast Iron: Cast iron body, 125 psi, 1/16-inch perforated type 304 stainless screen.
 4. Cast Iron, High Pressure: Cast iron body, 250 psi, 1/16-inch perforated type 304 stainless screen.
- B. Basket Pattern: Semi-steel body, 125 psi WOG, flanged, 1/8-inch perforated type 304 stainless steel screen, closed bottom basket, clamped or bolted cover.

2.21 SUCTION DIFFUSERS

- A. Description:
1. Angle type body with inlet straightening vanes and combination orifice cylinder-diffuser-strainer with 3/16-inch diameter openings.
 2. Provide inlet vane length equal to 2-1/2 times pump connection diameter.
 3. Provide adjustable support foot to carry the weight of suction piping, drain plug, and pressure gauge tap.
- B. Construction:
1. Cast iron body rated for 175 psig operating pressure at 300 degrees F.
 2. Provide steel inlet vanes on closed systems, stainless steel on open systems and domestic water systems.
 3. Provide steel orifice cylinders on closed systems, stainless steel on open systems and domestic water systems.
 4. Provide bronze mesh start-up strainers on closed systems and domestic water systems, none on open systems.
- C. Selection:
1. Outlet Size: Match pump inlet size.
 2. Inlet Size:
 - a. Match pipe size upstream.
 - b. Maximum of 2 psi drop without start-up strainer.

2.22 TRIPLE DUTY VALVE

- A. Description: Straight or angle pattern non-slam check valve with spring loaded disc and calibrated throttling/shut-off feature.

- B. Construction: Cast iron body construction, 175 psi working pressure at 300 degrees F operating temperature.
- C. Selection:
 - 1. Same size as pipe size on Drawings.
 - 2. Maximum pressure drop 5 feet at design flow rate.

2.23 WATER FILTERS

- A. Heating Water:
 - 1. Housing:
 - a. Carbon steel housing suitable for holding two filter elements with quick release EPR O-ring and cartridge seals suitable for operation at 300 degrees F.
 - b. Element seal by tie rod and seal nut onto element gasket.
 - c. Unit rated for 150 psig operation.
 - d. Manufacturer: Pall MCC.
 - 2. Filter Cartridge:
 - a. Industrial style filter cartridge constructed of epoxy resin-impregnated cellulose medium.
 - b. Pleated to provide high surface area with the corrugated medium supported by a perforated 300 series stainless steel core and end caps.
 - c. Filter able to withstand 75 psi differential pressure in normal outside to inside flow direction.
 - d. Nominal filtration rating of 98 percent on particles 10 micrometers and larger.
 - e. Manufacturer: Pall Corporation Epocel Series

2.24 DIFFERENTIAL PRESSURE REGULATOR VALVE

- A. Externally piloted differential pressure regulating valve. Ductile iron construction, stainless steel and bronze trim and 316 SS seats.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide valves at connections to equipment where shown or required for equipment isolation.
- B. Install valves and strainers in accessible locations and same size as connected piping (not the size of the equipment connection), except balancing valves sized by contractor to properly balance the flow.
- C. Provide separate support for valves where necessary.
- D. Provide drain valves in low points in the piping system, at coils and equipment, and as indicated.

3.02 APPLIED LOCATIONS HVAC VALVES

A. In piping 2-inches and smaller:

System	Valve Types				
	Gate	Globe	Swing Check	Ball	Butterfly
Heating Water	At Boiler Only	Bronze	Bronze	Bronze	Not Allowed
Chemical Treatment	Not Allowed	Bronze	Bronze	Bronze	Not Allowed

B. In piping 2-1/2-inches and larger:

System	Valve Types				
	Gate	Globe	Check	Ball	Butterfly
Heating Water	Iron	Iron	Iron, Swing	Not Allowed	Ductile Iron
Chemical Treatment	Iron	Iron	Iron, Swing	Not Allowed	Ductile Iron

C. Calibrated y-pattern globe balancing valves 1/2-inch through 12-inches, on water coils and in piping systems in accordance with manufacturer’s recommendations.

D. Automatic flow control valves on water coils and in piping systems in accordance with manufacturer’s recommendations to automatically balance water flow in piping loops as indicated.

E. Pressure Independent Control Valve on water coils and in piping systems in accordance with manufacturer’s recommendations. Coordinate with Section 23 09 00, Instrumentation and Controls for HVAC.

F. Provide gauge cock for pressure gauges.

G. Provide gate valves with pressure type packing glands for heating water boiler shutoff applications. Meet requirements of ASME Boiler and Pressure Vessel Code, Section IV, Article 7 for Stop Valves.

3.03 VALVE IDENTIFICATION

A. General: Identify valves to indicate their function and system served.

B. See Section 23 05 53, Identification for HVAC Piping and Equipment.

3.04 CHAIN OPERATORS

A. Install valves in equipment rooms or fan rooms used for equipment or coil isolation and more than 8 feet above floor with stem horizontal and equipped with chain wheels and chains extending to 6-feet above floor.

3.05 INSTALLATION

A. Manual Air Vents:

1. Install at high points where automatic air vents are not used, where noted, and where required for proper venting of system.
2. Install in accordance with manufacturer’s recommendations.

B. Automatic Air Vents:

1. Install automatic air vents at high points where air can collect in water systems where indicated. Route drain lines from vent to nearest floor drain.
2. Install 3/4-inch globe shut-off valve ahead of air vent. Install ball valve where bucket drainage is required.

C. Grooved Mechanical Pipe Valve End Connections:

1. Refer to Section 23 21 13, Pipe and Pipe Fittings HVAC for allowed service installations.
2. Install in accordance with the manufacturer's published installation instructions.
3. Mold and produce gaskets by the coupling manufacturer, and suitable for the intended service.
4. The coupling manufacturer's factory trained representative:
 - a. Provide on-site training for the contractor's field personnel in the use of grooving tools and installation of grooved joint products.
 - b. Periodically visit the project site to ensure best practices in grooved installation are being followed.
 - c. A distributor's representative is not considered qualified to conduct the training or field visits.

D. Test Plugs: Install where indicated and in accordance with the manufacturer's recommendations.

E. Coil Connectors:

1. Applied Locations: Integrated coil connectors are prohibited except where specifically indicated below or on the drawings.
2. Make connections in accordance with Section 23 21 13, Pipe and Pipe Fittings HVAC.

F. Expansion Tanks:

1. Support with steel rods and brackets from structure or from structural steel stand as required.
2. Pipe valve drain to over floor drain.

G. Water Buffer Tank:

1. Install as shown on Drawings and in accordance with the manufacturer's recommendations.
2. Insulate per Section 23 07 00, Insulation for HVAC.
3. Pipe valve drain to over floor drain.

H. Air Separator:

1. Install as shown on Drawings and in accordance with the manufacturer's recommendations.

2. Suspend from structure with steel rods or brackets or support from steel stand as required.
 3. Bleed system air at start-up according to manufacturer's recommendations.
- I. In-Line Air Purger:
1. Install purger and eliminator as shown on Drawings and in accordance with the manufacturer's printed recommendations.
 2. Support separately from structure with spring isolators as required.
 3. Install bronze globe shut-off valve between the purger and eliminator.
 4. Pipe discharge to nearest floor drain using Schedule 40 galvanized steel pipe.
- J. Pressure Reducing Valves: Install where indicated and in accordance with manufacturer's recommendations with 3 valve bypass.
- K. Water Relief Valves:
1. Install where indicated, and in accordance with manufacturer's instructions.
 2. Pipe discharge to nearest floor drain using Schedule 40 steel pipe.
- L. Strainer:
1. Provide valved blow off for each strainer of same size as plugs with maximum size of 1-1/2 inches.
 2. Pipe blow off full size and terminate over floor drains except finned tube, reheat coils, fan coils, terminal units, and unit heaters.
 3. Applied Locations HVAC:
 - a. Bronze wye, in piping 2-inch and smaller, medium and high pressure steam and condensate.
 - b. Basket, in piping 2-1/2-inch and larger, condenser water inlet to pumps.
- M. Suction Diffusers:
1. Install on inlets of pumps where indicated in accordance with manufacturer's recommendations.
 2. Support suction diffuser and piping from same surface as pump base is supported unless shown otherwise. Adjust foot so that pump inlet does not carry piping weight.
 3. Pipe pressure gauges to gauge port, and blow down to drain with ball shut-off valve.
 4. After operating pumps for seven days, clean strainer and remove start-up strainer.
- N. Triple Duty Valve:
1. Install on discharge of pumps where indicated.
 2. Support with additional members as required.

- O. Water Filters:
 - 1. Install per manufacturer's recommendations where shown.
 - 2. After system is accepted by Owner, provide one set of filters for each filter station.
- P. Differential Pressure Regulating Valve: Install per manufacturer's recommendations where shown on plans.

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SECTION 23 05 29

HANGERS, SUPPORTS, AND ANCHORS FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Supports
 - 2. Anchors
 - 3. Pipe Rollers, Insulation Protection Shields and Insulation Protection Saddles
 - 4. Building Attachments
 - 5. Roof Mounted Equipment Support
- B. Related Sections include:
 - 1. Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment
 - 2. Section 23 07 00, Insulation for HVAC
 - 3. Section 23 21 13, Pipe and Pipe Fittings HVAC

1.03 QUALITY ASSURANCE

- A. Provide pipe and equipment hangers and supports in accordance with the following:
 - 1. When supports, anchorages, and seismic restraints for equipment, and supports and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor will be responsible for their design.
 - 2. Seismic restraints and anchorages resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
 - 3. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

4. Seismic Restraints:
 - a. Do not introduce excessive stresses in the piping caused by thermal expansion or contraction.
 - b. In accordance with the latest edition of the SMACNA, Seismic Restraint Manual Guidelines for Mechanical Systems” for the Seismic Hazard Level corresponding to the seismic zone in which the project is constructed.
 - c. In accordance with the applicable code.
 - d. Follow provisions described in Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment.
- B. Engineered Support Systems: The following support systems designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.
 1. Supports and seismic restraints for suspended piping and equipment.
 2. Support frames such as pipe racks or stanchions for piping and equipment which provide support from below.
 3. Equipment and piping support frame anchorage to supporting slab or structure.

1.04 SUBMITTALS

- A. Submit the following:
 1. Shop Drawings of contractor fabricated support structures.
 2. Structural Details and Calculations: Submit structural details and calculations substantiating that building structure, anchorages, and fabricated steel braces can safely withstand maximum calculated loads.
 3. No other submittals required under this section.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Supports:
 1. Unistrut
 2. Superstrut
 3. Powerstrut
 4. Kinline
 5. B-Line Systems
 6. AnvilStrut
- B. Anchors:
 1. Anvil

2. Superstrut
 3. B-Line Systems
 4. Tolco
 5. ERICO
- C. Pipe Rollers, Insulation Protection Shields and Insulation Protection Saddles
1. Anvil
 2. Super Strut
 3. B-Line Systems
 4. Tolco
 5. ERICO
- D. Building Attachments
1. Anvil
 2. Elcen
 3. Superstrut
 4. B-Line Systems
 5. Tolco
 6. ERICO
- E. Roof Mounted Equipment Support
1. Greenheck - GES

2.02 SUPPORTS

- A. Fabricate support members from welded standard structural shapes, pipe, and plate to carry the necessary rollers, hangers, and accessories as required. Support piping less than 4-inch pipe size from or by prefabricated roll-formed channels with necessary accessories to adequately support piping system.
- B. Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.
- C. Dissimilar Metal Protection: Hydra-Zorb cushions or Cush-a-strip.
- D. Clamps: Super Strut Series 700 through 702 or AnvilStrut Series 1000 through 1200.

2.03 ANCHORS

- A. Uninsulated Horizontal Copper Piping:
 - 1. 2-inch and Smaller: Anvil CT-65, CT-69, CT-99C.
 - 2. Larger than 2-inch: Anvil 260 field or factory copper plated, plastic coated or other recognized industry methods. Electricians' tape is unacceptable.
- B. Insulated Horizontal Copper Pipe with Hangers Inside of Insulation: Same as Uninsulated Horizontal Copper Pipe.
- C. Insulated Horizontal Copper Pipe with Hangers Outside of Insulation:
 - 1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
 - 2. Larger than 2-inch: Anvil 260.
- D. Other Uninsulated Horizontal Pipe:
 - 1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
 - 2. Larger than 2-inch: Anvil 260.
- E. Other Insulated Horizontal Pipe With Hangers Inside of Insulation:
 - 1. 2-inch and Smaller: Anvil 65, 70, 104, 260 or 300.
 - 2. Larger than 2-inch: Anvil 260.
- F. Other Insulated Horizontal Pipe with Hangers Outside of Insulation:
 - 1. 2-inch and Smaller: Anvil 65, 70, 104 or 260.
 - 2. Larger than 2-inch: Anvil 260.
- G. Riser Clamps Copper Pipe:
 - 1. 4-inch and Smaller: Anvil CT-121, CT-121C or 261C.
 - 2. Larger than 4-inch: Anvil 261C.
- H. Riser Clamps Other Piping: Anvil 261.

2.04 PIPE ROLLERS, INSULATION PROTECTION SHIELDS AND INSULATION PROTECTION SADDLES

- A. Pipe Rollers:
 - 1. Anvil 174 or 274 as required.
 - 2. Size for pipe plus insulation for insulated pipe.
- B. Insulation Protection Shields: Anvil 167.

- C. Insulation Protection Saddles:
 - 1. Anvil 160 through 166A as required.
 - 2. Saddles for copper pipe, factory or field copper plated.

2.05 BUILDING ATTACHMENTS

- A. Beam Hangers:
 - 1. On piping 6-inch and smaller: Anvil 86 with retaining clip Fig. 89.
 - 2. On piping larger than 6-inch: Anvil 228, or 292.
- B. Inserts: Anvil 152 malleable iron or 281 steel inserts. Inserts sized for required rod to support load being carried.
- C. Expansion Plugs: Similar and equal to Phillips "red-head" self-drilling flush shell selected for safety factor of 4.
- D. Powder actuated fasteners with silencers as approved by Architect.

2.06 ROOF MOUNTED EQUIPMENT SUPPORT

- A. Equipment Supports:
 - 1. Welded aluminum or galvanized steel construction suitable for use on insulated (GESR) or non-insulated (GESS) flat roof decks, wood nailer, engineered to support gravity and seismic loads of supported equipment.
 - 2. Account for roof slope to provide level mounting surface for equipment.

PART 3 - EXECUTION

3.01 HANGERS AND SUPPORTS

- A. General:
 - 1. Install support systems as detailed and in accordance with manufacturer's recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required and as detailed on the Drawings.
 - 2. Provide adjustable hangers for pipes complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., except where specified otherwise.
 - 3. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping and do not support piping from other piping.
 - 4. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

5. Support piping within 2-feet of each change of direction on both sides of fitting.

B. Insulated Piping Systems:

1. Refer to Section 23 07 00, Insulation for HVAC for insulation requirements.
2. Insulated Piping Systems with Vapor Barrier Insulation:
 - a. Install hangers outside of insulation.
 - b. On piping 1-1/2-inch and larger, provide insulation protection shields at each support location.
3. Heating Water (over 230 degrees F):
 - a. As specified for Insulated Piping Systems with Vapor Barrier Insulation.
4. Other insulated Piping Systems with Non-Vapor Barrier Insulation:
 - a. At the contractor's option, hangers may be installed inside or outside of insulation for piping 2-inch and smaller.
 - b. If hangers are installed outside of insulation, provide insulation protection shields at support locations on piping 1-1/2-inch and larger.
 - c. On piping larger than 2-inch, provide insulation saddles at each support location.
5. Other insulated Piping Systems with Non-Vapor Barrier Insulation:
 - a. As specified for Insulated Piping Systems with Vapor Barrier Insulation.
6. Insulation Protection:
 - a. Band insulation protection shields firmly to insulation to prevent slippage.
 - b. Tack weld insulation protection saddles to steel pipe. Braze saddles to copper pipe.

C. Vertical Piping:

1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.
2. Riser clamps on steel pipe to be directly welded to pipe. Riser clamps on copper pipe to be installed directly under fitting.
3. Risers that are not subject to thermal change to be supported at each floor of penetration.
4. Risers that are subject to thermal change require engineered supports. Size supports to carry forces exerted by piping system when in operation. Riser supports follow provisions described in Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment.

D. Horizontal Piping:

1. Trapeze Hangers: Multiple pipe runs where indicated supported on channels with rust resistant finish. Provide necessary rods and supporting steel.
2. Support Spacing: Provide support at minimum spacing per MSS SP-69-1996 Pipe Hangers and Supports - Selection and Application:
 - a. Support piping within 2-feet of each change in direction.

b. Steel Pipe, Copper Tubing:

Minimum Pipe Size	Maximum Span Steel	Maximum Span Copper	Rod Size
1-inch and smaller	7-feet	5-feet	1/4-inch
1-1/4-inch to 2-inch	8-feet	8-feet	3/8-inch
2-1/2-inch to 3-inch	11-feet	9-feet	1/2-inch
4-inch to 5-inch	14-feet	12-feet	1/2-inch
6-inch	17-feet	14-feet	1/2-inch
8-inch or larger	19-feet	16-feet	5/8-inch
10-inch	20-feet	18-feet	3/4-inch
12-inch	23-feet	19-feet	7/8-inch
14-inch	25-feet		1-inch
16-inch	27-feet		1-inch

c. Plastic Pipe: Supported a maximum of 3-feet on center for piping 1-inch and smaller and 4-feet on center for piping 1-1/4-inch and larger with rod sizes as recommended by the manufacturer.

d. Provide piping with acoustical lagging wrap supported a maximum of 5-feet on center. Install hangers outside of acoustical lagging.

E. Building Attachments:

1. Fastening or attaching to steel deck (without concrete fill) is prohibited. It will be necessary to support piping from structural members, beams, joists, or provide intermediate angle iron supporting members between joists. Supports may be attached to concrete filled steel deck with load limitations shown on the structural drawings or otherwise obtained from the structural engineer.
2. Provide horizontal bracing on horizontal runs 1-1/2-inch and larger and exceeding 50-feet in length at 75-foot intervals and as required to provide stabilized piping systems.
3. Provide additional structural steel angles, channels, or other members required to support piping where structures do not occur as required for proper support.
4. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points.

F. Roof Mounted Equipment Supports:

1. Select appropriate model for insulated or uninsulated roof deck.
2. Install per manufacturer's instructions.
3. Account for roof slope to provide level mounting service for equipment.

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SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC 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, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Neoprene Waffle Pad
 - 2. Restrained Neoprene Mount
 - 3. Springs
 - 4. Springs With Restraints
 - 5. Base With Springs
 - 6. Inertia Base
 - 7. Isolating Spring Hangers
 - 8. Isolating Neoprene Hangers
 - 9. Rooftop Air Handling Unit Isolation Curb
 - 10. Isolating Sleeves
 - 11. Seismic Restraints
 - 12. Flexible Sphere Connector
 - 13. Flexible Hose Connector
- B. Isolation of mechanical equipment as indicated on the Drawings and specified herein.
- C. Seismic restraint of equipment, piping, and ductwork.
- D. Related Sections include:
 - 1. Section 23 05 29, Hangers, Supports and Anchors for HVAC

2. Section 23 31 01, HVAC Ducts and Casing-Low Pressure
3. Section 23 31 02, HVAC Ducts and Casing-Medium Pressure

1.03 QUALITY ASSURANCE

- A. Single manufacturer select and furnish isolation required, except packaged equipment with integral isolators meeting the isolation and seismic requirements of this Specification.
- B. System of vibration isolators and seismic controls designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction.
- C. Isolation performance requirements are indicated in the specifications. Deflections indicated are nominal static deflections for specific equipment supported.
- D. Seismic snubbers, restrained isolator housings and cable system components have anchorage preapproval OPM number from OSHPD in the State of California verifying the maximum certified load ratings.
- E. Isolator Stability and Rated Capacity:
 1. Spring diameters not less than 0.8 of the compressed height of the spring at rated load.
 2. Springs have a minimum additional travel to solid equal to 50 percent of the rated deflection.
- F. Seismic Restraints:
 1. Restraint of equipment, piping and ductwork to be in accordance with the current state and local Building Code.
 2. Calculations in accordance with current state and local Building Code.

1.04 SUBMITTALS

- A. Submit the following:
 1. Submit Shop Drawings showing complete details of construction for steel and concrete bases including:
 - a. Equipment mounting holes.
 - b. Dimensions
 - c. Isolation selected for each support point.
 - d. Details of mounting brackets for isolator.
 - e. Weight distribution for each isolator.
 - f. Code number assigned to each isolator.
 2. Submit product data and calculation sheets for isolators, showing:
 - a. Size, type, load rating, and rated deflection of each required isolator.
 - b. Percent of vibration transmitted based on the lowest disturbing frequency of the equipment.
 3. Structural Details and Calculations: Submit structural details and calculations substantiating that building structure, anchorages, and fabricated steel braces can safely withstand maximum calculated loads.

- B. Installation report as specified in PART 3 of this Section.
- C. Operation and maintenance data.

1.05 EQUIPMENT VIBRATION ISOLATION

- A. Provide a balanced set of vibration isolators for each piece of equipment listed in the Equipment Schedules.
- B. Isolation work to include, but not necessarily be limited to, the following:
 - 1. Isolation support of motor-driven equipment.
 - 2. Inertia base frames in conjunction with isolation.
 - 3. Isolation support of air-handling housings.
 - 4. Isolation support of piping, piping risers, and ductwork.
 - 5. Penetration isolation of pipework, ductwork, and conduits through walls, floors, or ceilings.
 - 6. Flexible connections of ductwork and piping to equipment.
- C. Each piece of rotating equipment must meet a reasonable criterion for maximum vibration levels at each bearing, while in operation. The criteria for varying operating speeds are given as follows:
 - 1. Rotating equipment operating at peak vibration velocities must not exceed 0.08-inch/second.
 - 2. If it is discovered that the operating vibration velocities exceed this criteria, the equipment repaired or replaced at no expense to the owner until approval of the equipment is given by the Engineer.
- D. Provide components or materials not specially mentioned herein, but necessary to the proper vibration isolation of the equipment.

1.06 CONTRACTOR RESPONSIBILITY

- A. Vibration isolation devices, including auxiliary steel bases and pouring forms, design and furnish by a single manufacturer or supplier.
- B. Adequately restrain equipment, piping, and ductwork to resist seismic forces. Design and select restraint devices to meet seismic requirements as defined in the latest issue of the International Building Code under Earthquake Loads and applicable state and local codes.
- C. Have the following responsibilities:
 - 1. Selection, installation, adjustment and performance of vibration isolators which will meet the requirements given on the plans or in the Specifications.
 - 2. Provide Engineering drawings, details, supervision, and instruction to assure proper installation and performance.

3. Provide whatever assistance necessary to ensure correct installation and adjustment of the isolators.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Neoprene Waffle Pad
 1. Mason Type Super W or Super WM and HG Grommet
 2. Kinetics Corporation.
- B. Restrained Neoprene Mount
 1. Mason Type BR
- C. Springs
 1. Mason Type SLF
 2. Amber-Booth Type SW
 3. Kinetics Corporation
 4. Vibrex
- D. Springs With Restraints
 1. Mason Type SSLR or SLRS with seismic restraints
 2. Kinetics Corporation Model FYS
 3. Vibrex
- E. Base with Springs
 1. Mason WFSL
 2. Kinetics Corporation
 3. Vibrex
- F. Inertia Base
 1. Mason BMK or KSL
 2. Kinetics Corporation
 3. Vibrex
- G. Isolating Spring Hangers
 1. Mason 30N, similar Amber-Booth

2. Consolidated Kinetics
3. Vibrex
- H. Isolating Neoprene Hangers
 1. Mason HD
 2. Consolidated Kinetics
 3. Vibrex
- I. Rooftop Air Handling Unit Isolation Curb
 1. Mason RSC, similar Amber-Booth
 2. Kinetics Corporation
 3. Vibrex
- J. Isolating Sleeves
 1. Potter-Roemer PR isolators
 2. Grinnell Semco Trisolators
- K. Seismic Restraints
 1. Mason Industries.
- L. Flexible Sphere Connector
 1. Mason Type SFU, SFDEJ, or SFEJ
- M. Flexible Hose Connector
 1. Mason Type FFL, MN, CPS or CPSB
 2. HCi
 3. Metraflex

2.02 TYPE 1 - NEOPRENE WAFFLE PAD

- A. 3/4-inch thick neoprene waffle pads with pattern repeating on 1/2-inch centers.
- B. Select Duro rating for recommended deflection at average load rating.
- C. Include load distribution steel plate as required.
- D. Include anchor bolt grommet as required.

2.03 TYPE 2 - RESTRAINED NEOPRENE MOUNT

- A. Bridge-bearing neoprene mountings directional seismic capability.

- B. Provide minimum deflection of 0.2-inch.
- C. Ductile iron casting containing two separated and opposing molded neoprene elements.
- D. Elements prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation.
- E. Shock absorbing neoprene materials compounded to bridge-bearing specifications.

2.04 TYPE 3 - SPRINGS

- A. Free standing springs without housings.
- B. Provide minimum deflection of 1-inch.
- C. 1/4-inch thick molded neoprene cup with steel reinforcement washer or neoprene acoustical friction pads between base plate and support.
- D. Mounting: Leveling bolts with height saving brackets.
- E. Springs mounted outboard of channels.
- F. Attach baseplate screws using neoprene bushings and washers.
- G. Diameter not less than 0.8 of the compressed height of the spring at rated load.
- H. Additional travel to solid equal to 50 percent of the rated deflection.
- I. Submittals to include the following:
 - 1. Spring Diameters
 - 2. Deflection
 - 3. Compressed Spring Height
 - 4. Solid Spring Height

2.05 TYPE 4 - SPRINGS WITH RESTRAINTS

- A. Same as springs except housing with seismic restraints to be added.
- B. Seismic restraint with molded directional neoprene bushings an integral part of isolator.
- C. Seismic restraint selected for minimum safety factor of 2 from ultimate seismic capacity.
- D. Spring mount must have neoprene cup or pad inside the seismic housing to allow anchoring of the housing baseplate without short circuiting pad.
- E. Minimum clearance of 1/4-inch maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action.
- F. Restraining Bolts: Neoprene bushing between the bolt and the housing.
- G. Limit stops out of contact during normal operation.

2.06 TYPE 5 - BASE WITH SPRINGS

- A. Steel base with wide flange beams and springs.
- B. Provide minimum clearance of 1-inch.
- C. Depth of base equal to 10 percent of the span between supports, 6-inch minimum.
- D. Provide external height saving brackets.

2.07 TYPE 6 – INERTIA BASE

- A. Steel Inertia Base with 1/2-inch square bar reinforcing, for field grout.
- B. Provide minimum clearance of 1-inch.
- C. Bases must be sized to fit stanchions for pump elbows or suction diffusers.
- D. Depth of base equal to 8 percent of the span between supports, 6-inch minimum.
- E. Provide integral height saving brackets and steel templates with anchor bolts sleeves.

2.08 TYPE 7 - ISOLATING SPRING HANGERS

- A. Combination rubber-in shear and steel spring isolators installed on the hanger rods.
- B. Provide minimum deflection of 1-inch.
- C. Proper deflection to allow the piping to deflect as a unit with the equipment isolators.
- D. Neoprene element and the cup neoprene bushing bushings projecting through the steel box.
- E. Hangers designed for 30 degree angular movement.
- F. Minimum Deflection: 1-inch

2.09 TYPE 8 – ISOLATING NEOPRENE HANGERS

- A. Double deflection neoprene hangers.
- B. Provide minimum static deflection of 0.35-inch.
- C. Provide projecting bushing to prevent steel to steel contact.

2.10 TYPE 9 – ROOFTOP AIR HANDLING UNIT ISOLATION CURB

- A. Rooftop unit spring isolation curb.
- B. Provide minimum deflection of 2-inches.
- C. Steel springs laterally stable and rest on 1/4-inch thick neoprene acoustical pads.
- D. Hardware plated and the springs provided with a rust resistance finish.

- E. Curb waterproofing consists of a continuous flexible flashing attached over the lower curb waterproofing.
- F. Spring locations accessibility to adjust springs.
- G. Curb provides continuous support for equipment and be constructed to resiliently resist wind and seismic forces.
- H. Construction of curb must not enable rigid connection between vibrating equipment and building structure.
- I. Provide provisions for sloped roof, plenum curb, tall curb, and duct openings where required by installation conditions.

2.11 ISOLATING SLEEVES

- A. Provide for piping through walls and floors of penthouses and chiller room. Size for piping as required.

2.12 SEISMIC RESTRAINTS

A. General Requirements:

- 1. Provided for equipment, piping and ductwork, both supported and suspended.
- 2. Bracing of piping and ductwork in accordance with the code and with the provisions set forth in the SMACNA seismic restraint manual.
- 3. The structural requirements for the restraints, including their attachment to the building structure, reviewed and approved by the Structural Engineer.
- 4. Attachments to supported or suspended equipment must be coordinated with the equipment manufacturer.

B. Supported Equipment:

- 1. All-directional Seismic Rubbers: Interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene.
- 2. Replaceable bushing and minimum of 1/4-inch thick. Rated loadings not to exceed 1000 psi.
- 3. An air gap of 1/4-inch incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces.
- 4. Snubber End Caps:
 - a. Removable to allow inspection of internal clearances.
 - b. Rotated neoprene bushings be rotated to ensure no short circuits exist before systems are activated.
- 5. Snubber: Mason Industries, Inc. Type Z-1225

C. Bracing of Pipes:

1. Provide seismic bracing of piping as detailed below to meet the building code requirements:
 - a. Exception: Piping suspended by individual hangers need not be braced where the following criteria are met.
 - 1) Distance between the top of the pipe to the bottom of the support structure is 12-inches or less.
 - 2) Seismic braces are not required on high deformability piping when the $I_p=1.0$ and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 3-inch diameter or less.
 - 3) Seismic braces are not required on high deformability piping when the $I_p=1.5$ and provisions are made to avoid impact with larger pipe or mechanical components or to protect the pipe in the event of such impact and the nominal pipe size is 1-inch diameter or less.
2. Seismic braces for pipes on trapeze hangers may be used.
3. Provide flexibility in joints where pipes pass through building seismic joints or expansion joints, or where pipes connect to equipment.
4. Cast iron pipe of types, glass pipe, and any other pipe joined with a shield and clamp assembly, where the top of the pipe is 12-inches or more from the supporting structure, braced on each side of a change in direction of 90 degrees or more. Riser joints on unsupported sections of piping braced or stabilized between floors.
5. Vertical risers laterally supported with a riser clamp at each floor. For buildings greater than six stories high or for piping subject to thermal change risers engineered individually.

D. Bracing of Ductwork:

1. Brace rectangular ducts with cross sectional areas of 6 square feet and larger. Brace flat oval ducts in the same manner as rectangular ducts. Brace round ducts with diameters of 28-inches and larger. Brace flat oval ducts the same as rectangular ducts of the same nominal size.
2. Exception: No bracing is required if the duct is suspended by hangers 12-inches or less in length, as measured from the top of the duct to the bottom of the support where the hanger is attached.
3. Transverse bracing occurs at the interval specified in the SMACNA tables or at both ends if the duct run is less than the specified interval. Install at each duct turn and at each end of a duct run, with a minimum of one brace at each end.
4. Longitudinal bracing occur at the interval specified in the SMACNA tables with at least one brace per duct run. Transverse bracing for one duct section may also act as longitudinal bracing for a duct section connected perpendicular to it if the bracing is installed within four feet of the intersection of the ducts and if the bracing is sized for the larger duct. Duct joints conform to SMACNA duct construction standards.
5. Install duct flex connections at equipment connections to accept expected differential displacement and protect the equipment connection from damage.

- E. Suspended Equipment and Piping and Ductwork:
1. Seismic cable restraints consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint.
 2. Cable must be pre-stretched to achieve a certified minimum modulus of elasticity. Cable end connections steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement.
 3. Cable assemblies type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod and the clevis or SCBV if clamped to a beam, as manufactured by Mason Industries, Inc.
 4. Steel angles or strut, sized to prevent buckling, clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies type SRC or UCC as manufactured by Mason Industries, Inc.
 5. Pipe clevis cross-bolt braces are required in restraint locations. Special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross brace type CCB as manufactured by Mason Industries, Inc.

2.13 FLEXIBLE SPHERE CONNECTOR

- A. Flexible EPDM pipe connectors manufactured of multiple plies of Kevlar tire cord fabric and EPDM; both molded and cured in hydraulic rubber presses. No steel wire or rings used as pressure reinforcement.
- B. Connectors up to and including 2-inch diameter may have a single sphere and threaded ends. Connectors 2-1/2-inch and larger manufactured with twin spheres up to 12-inches and a single sphere on larger sizes and floating steel flanges recessed to lock the connectors raised face EPDM flanges.
- C. Rated a minimum of 150 psi at 220 degrees F. Connections pre-extended as recommended by the manufacturer to prevent additional elongation under pressure.

2.14 FLEXIBLE HOSE CONNECTOR

- A. Manufactured using type 304 stainless steel hose and braid with one fixed and one floating raised face carbon steel plate flange.
- B. Sizes 2-1/2-inch and smaller may have threaded male nipples or copper sweat ends. Grooved ends are acceptable in sizes in grooved piping systems. Weld ends are not acceptable. Copper sweat end hoses for water service use copper or bronze construction.
- C. Close pitch annular corrugations for maximum flexibility and low stiffness. Tested hose stiffness at various pressures must be included in the submittals.
- D. Continuous operation at 150 psi and system test pressure when installed in piping systems.
- E. Same size as the pipe it connects and have pipe thread connectors on both ends with male or female end adapters as required.

PART 3 - EXECUTION

3.01 GENERAL

- A. Do not install any equipment or pipe which makes rigid contact with the building. "Building" includes slabs, beams, studs, walls, etc.
- B. The installation or use of vibration isolators must not cause any change of position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping maintained in a rigid position during installation. Do not transfer the load to the isolator until the installation is complete and under full operational load.
- C. Correct, at no additional cost, installations which are defective in workmanship or materials.

3.02 PREPARATION

- A. Treat isolators, including springs, hardware and housing, with a corrosion protective coating of epoxy powder or electro galvanizing.
- B. Coat steel frames exposed to weather with a rustproof metal primer.
- C. Provide hot dipped galvanizing on steel frames as indicated on the plans for corrosion protection in severe conditions.

3.03 INSTALLATION

- A. General:
 - 1. Install isolation where indicated on the Drawings by type and location and where indicated below.
 - 2. Mark assigned code number on isolators and bases to assure placement in the proper location.
 - 3. Anchor isolator seismic housing baseplate to floor.
 - 4. Provide rubber grommets and washers to isolate the bolt from the building structure. Do not destroy the isolation efficiency when bolting the isolators to the building structure.
- B. Application of type of isolators needs to verified with EOR, ASHRAE requirements from Applications – Noise and Vibration Control, or as specified by project acoustical and vibration control consultant.
- C. Type 1 – Neoprene Waffle Pad:
 - 1. Service:
 - a. Boilers
 - b. Floor Mounted Indoor Air Handling Units
 - c. Floor Mounted Air Conditioners
 - d. Floor Mounted Heat Pumps

- D. Type 2 – Restrained Neoprene Mount:
 - 1. Service:
 - a. Boilers
 - b. Roof Exhaust Fans
 - c. Ceiling Exhaust Fans
 - d. Inline Centrifugal Fans
- E. Type 4 – Springs with Restraints:
 - 1. Service:
 - a. Boilers
- F. Type 5 – Base with Springs:
 - 1. Service:
 - a. Centrifugal Fans
 - b. Indoor Air Handling Units Mounted to Building Structure
- G. Type 6 – Inertia Base with Springs:
 - 1. Service:
 - a. Centrifugal Pumps:
 - 1) Fill with concrete to provide base weight equal to 2 times supported weight, including equipment, piping, and fluid.
 - 2) Support heels of pump suction and discharge elbows from base.
 - 3) Secure pump and heel supports with inserts and grout.
- H. Type 7 – Isolating Spring Hangers:
 - 1. Service:
 - a. In-Line Circulating Pumps
 - b. Piping rigidly connected to rotating equipment
 - c. Inline Centrifugal Fans
 - d. Split-System Air Conditioning Unit
 - e. Split-System Heat Pump
- I. Type 8 – Isolating Neoprene Hanger:
 - 1. Service:
 - a. In-Line Circulating Pumps
 - b. Split-System Air Conditioning Unit
 - c. Split-System Heat Pump
- J. Type 9 – Rooftop Air Handling Unit Isolation Curb:
 - 1. Service:
 - a. Rooftop Mounted Air Handling Units

3.04 SEISMIC RESTRAINTS

- A. General:
 - 1. Install and adjust seismic restraints so that the equipment, piping, and ductwork support is not degraded by the restraints.

2. Restraints must not short circuit vibration isolation systems or transmit objectionable vibration or noise.

B. Supported Equipment:

1. Each vibration isolation frame for supported equipment has a minimum of four seismic snubbers mounted as close as possible to the vibration isolators and/or the frame extremities.
2. Care must be taken so that the 1/4-inch air gap in the seismic restraint snubber is preserved on all sides in order that the vibration isolation potential of the isolator is not compromised. This requires that the final snubber adjustment be completed after the vibration isolators are properly installed and the installation approved.

C. Bracing of Pipes:

1. Branch lines may not be used to brace main lines.
2. Transverse bracing 40 feet maximum, except where a lesser spacing is indicated in the SMACNA tables for bracing of pipes
3. Longitudinal bracing 80-feet maximum except where a lesser spacing is indicated in the tables. In pipes where thermal expansion is a consideration, an anchor point may be used as the specified longitudinal brace provided that it has a capacity to resist both the seismic load and the additional force induced by expansion and contraction.
4. Fuel oil, gas, cast iron pipe of types, glass pipe and any other pipes joined with four band shield and clamp assembly braced at 1/2 the spacings shown above.
5. A rigid piping system not braced to dissimilar parts of the building or to two dissimilar building systems that may respond differently during an earthquake.
6. Transverse bracing for one pipe section may also act as longitudinal bracing for a pipe section of the same size connected perpendicular to it if the bracing is installed within 24-inches of the elbow or tee.
7. Branch lines may not be used to restrain main lines.
8. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.
9. Subject to confirmation by field inspection, seismic bracing is not required on piping when the piping is supported by rod hangers and the hangers in the entire run are 12-inches or less in length from the top of the pipe to the supporting structure, hangers are detailed to avoid bending of the hangers and their attachments and provisions are made for piping to accommodate expected deflections.

D. Bracing of Ductwork:

1. Transverse restraints occur at 30-foot intervals or at both ends of the duct run if less than the specified interval. Install at each duct turn and at each end of a duct run.

2. Longitudinal restraints occur at 60-foot intervals with at least one restraint per duct run. Transverse restraints for one duct section may also act as a longitudinal restraint for a duct section connected perpendicular to it if the restraints are installed within 4 feet of the intersection of the ducts and if the restraints are sized for the larger duct. Duct joints conform to SMACNA duct construction standards.
 3. Hanger straps must be positively attached to the duct within 2-inches of the top of the duct with a minimum of two number 10 sheetmetal screws.
 4. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
 5. Walls, including gypsum board nonbearing partitions, which have ducts running through them, may replace a typical transverse brace. Provide solid blocking around duct penetrations at stud wall construction.
 6. Install unbraced ducts with a 6-inch minimum clearance to vertical ceiling hanger wires.
- E. Suspended Equipment, Piping, and Ductwork Cable Method:
1. Adjust cables to a degree of slackness approved by the Structural Engineer.
 2. The uplift and downward restraint nuts and Mason type RW neoprene covered steel rebound washers for the Type 6 hangers adjusted so there is a maximum 1/4-inch clearance.
 3. C-clamps for attachment to the bottom of I-beams must incorporate a restraining strap.

3.05 FIELD QUALITY CONTROL

- A. Installation Report: Isolation manufacturer's representative confirm that isolation is installed correctly and submit report stating that isolators are installed as shown on Shop Drawings, isolators are free to work properly, and that installed deflections are as scheduled and as specified.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC 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, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Valve Identification
 - 2. Piping Markers
 - 3. Equipment Identification
 - 4. Concealed Equipment Identification

1.03 SUBMITTALS

- A. Submit the following:
 - 1. Valve Tag Directory: Submit for approval prior to fabrication of valve tags.
 - 2. Equipment Nameplate Directory: Submit for approval prior to fabrication.
 - 3. Operating and Maintenance Data: Include a copy of valve tag and equipment nameplate directories in each set of Operating and Maintenance manuals.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Piping Markers:
 - 1. W.H. Brady
 - 2. Seton
 - 3. Marking Systems, Inc. (MSI)
 - 4. Other Manufacturers: Submit substitution request.

B. Concealed Equipment Identification:

1. W.H. Brady
2. Seton
3. Other Manufacturers: Submit substitution request.

2.02 VALVE IDENTIFICATION

A. Valve Tags:

1. General: Identify valves with metal tags, legends to be stamped or embossed. Indicate the function of the valve and its normal operating position; i.e.,

56 HW	(NUMBER AND CONTENT OF PIPE)
ISOLATION	(VALVE FUNCTION)
NO	(NORMAL OPERATION POSITION)

2. Size: Valve tags 2-inch diameter with 1/4-inch high letters.
3. Material: Use 0.04-inch brass tags.
4. Automatic Valves and Regulating Valves:
 - a. Use 1/16-inch thick laminated 3-ply plastic, center ply white, outer ply red, lamicoid, or equal.
 - b. Form letters by exposing center ply.
5. Buildings Systems: Contact the LinkedIn for coordination with existing building tagging system and supplementary information required for any specific system before valve tagging begins.

B. Valve Tag Directory:

1. Tag Number
2. Location
3. Exposed or Concealed
4. Service
5. Valve Size
6. Valve Manufacturer
7. Valve Model Number
8. Normal Operating Position of Valve

2.03 PIPING MARKERS

- A. Label pipes with vinyl, self-sticking labels or letters.
- B. For pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters.

- C. For sizes from 3/4 to 2-inch outside diameter, 3/4-inch letters, above 2-inches outside diameter, 2-inch letters.
- D. Identify pipe markers and color coded as follows with black directional arrows.

HVAC SERVICE	PIPE MARKER *	BACKGROUND COLOR
HEATING WATER	HEATING WATER SUPPLY	YELLOW OR GREEN
	HEATING WATER RETURN	YELLOW
REFRIGERANT SUCTION	REFRIGERANT SUCTION	YELLOW
REFRIGERANT LIQUID	REFRIGERANT LIQUID	GREEN
REFRIGERANT HOT GAS	REFRIGERANT HOT GAS	YELLOW

* Directional arrow applied adjacent to pipe marker indicating direction of flow.

2.04 EQUIPMENT IDENTIFICATION

- A. Nameplates:
 - 1. Tag pumps, air handling supply units, fans, terminal units, converters, and miscellaneous items of mechanical equipment with engraved nameplates.
 - 2. 1/16-inch thick, 3-inch by 5-inch laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
 - 3. Identify unit with equipment tag as shown on Drawings and area served.
 - 4. Permanently identify access points to fire dampers, smoke dampers, and combination fire and smoke dampers on the exterior of the duct by a label with letters 1/2-inch in height reading the following:
 - a. Fire Damper
 - b. Smoke Damper
 - c. Fire/Smoke Damper
 - 5. Label constructed from same material as equipment nameplates.
- B. Equipment Nameplate Directory:
 - 1. List Pumps
 - 2. Air Handlers
 - 3. Terminal Units
 - 4. Other Equipment Nameplates
- C. Include Owner and Contractor furnished equipment.
- D. List the following on the nameplate:
 - 1. Designation
 - 2. Model Number
 - 3. Location of Equipment
 - 4. Area Served or Function

5. Disconnect Location
6. Normal Position of HOA Switch

2.05 CONCEALED EQUIPMENT IDENTIFICATION

- A. Adhesive Laminated Tape:
 1. 3/4 width transparent clear tape with black lettering.
 2. Lettering in ALL CAPS Helvetica font 24 point.

PART 3 - EXECUTION

3.01 VALVE IDENTIFICATION

- A. Valve Tags:
 1. Attach to valve with a brass chain.
 2. Valve tag numbers continuous throughout the building for each system.
- B. Valve Tag Directory: Post final copy in Operation and Maintenance Manual.

3.02 PIPING MARKERS

- A. Unless recommendations of ANSI A13.1, 1981 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:
 1. Every 20-feet along continuous exposed lines.
 2. Every 10-feet along continuous concealed lines.
 3. Adjacent to each valve and stubout for future.
 4. Where pipe passes through a wall, into and out of concealed spaces.
 5. On each riser.
 6. On each leg of a T.
 7. Locate conspicuously where visible.
- B. Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above.
- C. Apply arrow labels indicating direction of flow.
- D. Arrows the same color and sizes as identification labels.

3.03 EQUIPMENT IDENTIFICATION

- A. Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.

- B. Nameplate Directory: Post final copy in Operation and Maintenance Manual.

3.04 CONCEALED EQUIPMENT IDENTIFICATION

- A. Where valves or equipment are located above ceilings or behind walls provide adhesive tape indicating the item (valve tag, equipment tag, etc.) at the access location (T-bar ceiling grid, access door, etc.).
- B. Applicable equipment includes, but is not limited to, the following:
 - 1. Terminal Units
 - 2. Fans
 - 3. Isolation Valves
 - 4. Fire Smoke Dampers
 - 5. Pumps
 - 6. Control Valves

END OF SECTION

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SECTION 23 05 90

PRESSURE TESTING FOR HVAC SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes: Pressure testing of piping and ductwork systems.

1.03 QUALITY ASSURANCE

- A. Code Compliance: Perform required tests in the presence of the authority having jurisdiction.
- B. Owner Witness: Perform tests in the presence of the Owner's representative.
- C. Engineer Witness: The Engineer or Engineer's representative reserves the right to observe tests or selected tests to assure compliance with the specifications.
- D. Simultaneous Testing: Test observations by the authority having jurisdiction, the Owner's representative and the Engineer's representative need not occur simultaneously.

1.04 SUBMITTALS

- A. Submit the following:
 - 1. Test Reports:
 - a. Submit certificate of completion, inspection and test by authority having jurisdiction on required piping systems.
 - b. Submit certificate of test approval by Owner's representative on systems.
 - c. For ductwork testing, submit the Test Report.
 - d. Contain description of the testing procedure and results, including recommendation for any remedial actions needed.
 - e. The Engineer's representative will record witnessed tests.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.01 GENERAL

- A. Piping: Test prior to concealment, insulation being applied, and connection to equipment, fixtures, or specialties. Conduct tests with valves but those used to isolate the test section 10 percent closed.
- B. Ductwork: Test prior to connection to equipment and before applying insulation.
- C. Leaks: Repair leaks and retest until stipulated results are achieved.
- D. Notification: Advise the Construction Manager 72 hours in advance of each test. Failure to so notify will require test to be rescheduled.
- E. Testing Equipment: Provide necessary pumps, gauges, connections and similar items required to perform the tests.

3.02 TESTING REQUIREMENTS

- A. Medium Pressure Ductwork:
 - 1. Test ductwork systems at 4-inch static pressure, using a Pacific Air Products Port-O-Lab or Rolok, or a McGill Airflow leak detective testing machine or approved equivalent.
 - 2. Conduct testing in accordance with latest published version of the SMACNA HVAC Air Duct Leakage Test Manual.
 - 3. Prior to testing verify that ductwork has been sealed to meet the SMACNA Seal Class A. for joints, seams and at duct wall penetrations.
 - 4. Leakage less than or meet the requirement of the following SMACNA Leakage Classes:
 - a. Rectangular Metal – Class 6
 - b. Round or Flat Oval – Class 3
 - 5. Maximum allowable leakage is defined as Cubic Feet per Minute (CFM) air leakage per 100 square feet surface area of duct section tested.
 - 6. Test ductwork.
- B. Low Pressure Ductwork:
 - 1. Test systems at 2-inch static pressure, using a Pacific Air Products Port-O-Lab or Rolok, or a McGill Airflow leak detective testing machine or approved equivalent.
 - 2. Conduct testing in accordance with latest published version of the SMACNA HVAC Air Duct Leakage Test Manual.
 - 3. Prior to testing verify ductwork has been sealed to meet the SMACNA Seal Class C. for joints.
 - 4. Less than or meet the requirement of the following SMACNA Leakage Classes:
 - a. Rectangular Metal – Class 24
 - b. Round or Flat Oval – Class 12

5. Maximum allowable leakage is defined as CFM air leakage per 100 SF surface area of duct section tested.
6. Test representative sample totaling no less than 25 percent of the installed ductwork.

C. Ductwork for Smoke Control Systems:

1. Leak test ducts to 1.5 times the maximum design pressure.
2. Leakage not to exceed 5 percent of design flow.

D. Piping - General: Test piping as noted below, with no leaks or loss in pressure for time indicated. Repair or replace defective piping until tests are completed successfully:

HVAC Systems	Test Pressure	Test Medium	Test Duration
Refrigerant piping	300 psig	Nitrogen	4 hours
Heating water	150 psig	Water	4 hours
* The outer casing field welds at piping closures field tested for leaks. Pressurize with compressed air at 15 psig and apply a soap solution and check for leaks.			

END OF SECTION

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SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Testing and Balancing of Air Systems
 - 2. Testing and Balancing of Hydronic Systems
 - 3. Testing and Balancing of Miscellaneous Mechanical Equipment
- B. Related Sections include:
 - 1. Section 22 08 00, Commissioning for Plumbing
 - 2. Section 23 09 00, Instrumentation and Controls for HVAC

1.03 QUALITY ASSURANCE

- A. Acceptable Testing and Balancing Firms:
 - 1. RSA Analysis
 - 2. National Air Balance
 - 3. AIRCO Commercial Services
 - 4. United Mechanical Incorporated
- B. Other Firms: Submit substitution requests prior to bid date.
- C. Testing and Balancing Firm Qualifications:
 - 1. Procure the services of an independent balance and testing agency, approved by the Architect, which specializes in the balancing and testing of plumbing, heating, ventilating, and air conditioning systems, to balance, adjust and test water circulating and air moving equipment and air distribution or exhaust systems as herein specified.

2. Testing agency to provide proof of having successfully completed at least five projects of similar size and scope. Perform test under direct supervision of registered professional engineer who has been employed by the Agency a minimum of one year prior to start of project.
 3. Certification: Certified by National Environmental Balancing Bureau (NEBB).
- D. Industrial Standards: Conform to NEBB, American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), and American National Standards Institute (ANSI) as follows:
1. NEBB: Comply with Procedural Standards for Testing, Adjusting Balancing of Environmental Systems.
 2. ASHRAE: Comply with recommendations pertaining to measurements, instruments, and testing, adjusting and balancing.
 3. ANSI:
 - a. S1.4 Specifications for sound level meters.
 - b. S1.11 Specifications for Octave-Band and Fractional-Octave-Band analog and digital filters.
- E. Instrument Certification: Accurately calibrate and certify instruments used within six months of balancing and maintained in good working order.
- F. Test Observation: Conducted in the presence of the Architect or the Architect's representative.
- G. Pre-Balancing Conference:
1. Prior to starting balancing, general techniques review with the Engineer. This conference must occur prior to measuring existing conditions.
 2. Measuring of existing conditions must occur prior to any demolition or new work.
 3. The conference will review existing conditions and systems to be affected by the project.

1.04 SUBMITTALS

- A. Submit the following:
1. Balancing Log: Include air and water outlets, actual field measured air and water volume, and percentage of design volumes. Provide drawings identifying location of outlets.
 2. Equipment Data Sheets: Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.
 3. Additional Data: Submit additional data as provided by Associated Air Balance Council (AABC) Standard forms.
 4. Number of Copies: Submit six copies of the above completed information to the Engineer for review and insertion into the Operating and Maintenance Data.
 5. Instrument Certification: When requested, submit certificate of calibration for equipment to be used.

- B. Record data on NEBB forms or forms approved by the Architect.

1.05 PROJECT CONDITIONS

- A. Where existing systems are to be adjusted, establish flow rates in branches prior to making any modifications to system. Submit preliminary report indicating existing conditions prior to making modifications to existing systems. Adjust central equipment as required and restore unmodified branches and outlets to original condition. Obtain existing system drawings from Owner and become familiar with extent and nature of existing systems.
- B. Do not perform final testing, adjusting, and balancing work until heating, ventilating, and air conditioning equipment has been completely installed and operating continuously as required.
- C. Conduct air testing and balancing with clean filters in place. Clean strainers, etc., prior to performing hydronic testing and balancing.

1.06 WARRANTIES

- A. In addition to the Requirements of the Contract, include an extended warranty of six months after completion of test and balance work during which time the Architect at his discretion may request a recheck or resetting of any equipment or device listed in the test reports.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Balance to maximum measured flow. Deviation from specified values of ± 10 percent at terminal device and ± 5 percent at equipment, or mean sound level deviation of 15 decibels. Advise Engineer if deficiencies are generally noted to enable proper corrective actions.

3.02 AIR SYSTEMS

- A. General: Make measurements in accord with Industrial Standards specified above. Record on appropriate forms.
- B. Preliminary:
 - 1. Identify and list size, type, and manufacture of equipment to be tested including air outlets and inlets.
 - 2. Use manufacturer's ratings for equipment to make required calculations except where field test shows ratings to be impractical.
- C. Central System:
 - 1. Set speed to provide air volume at farthest run without excess static pressure. Provide additional sheaves and belts as required to accomplish speed adjustment.
 - 2. Read and adjust air supply, return, and exhaust fan units to deliver design conditions at minimum OSA and at 100 percent OSA.

3. Adjust automatic dampers, outside air, return air, and exhaust dampers for design conditions.
 4. Read static air pressure conditions on air handling equipment including filter and coil pressure drops and total pressure across the fan. A Dwyer Series 400 air velocity meter only used for final static pressures at equipment and where critical readings are required.
 5. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
 6. Read and record motor data and amperage draw.
 7. For variable volume systems, establish minimum static pressure required at sensing point to permit operation over entire VAV range. Adjust supply and return fan speed so that at maximum demand the associated VFD is controlling the motor of motor nameplate RPM to 100 percent. Adjust return fan speed so that return air volumes track with supply air volume minus exhaust air volume.
- D. Distribution:
1. Evaluate building and room pressure conditions to determine adequate supply and return air conditions. Balance building to be slightly positive to outdoors.
 2. Evaluate building and room pressure conditions to determine adequate performance of the system to maintain temperatures without draft.
 3. Perform multipoint pitot traverses to confirm instrumentation, shaft tightness, fan operation, etc. Pitot traverses performed using a Dwyer Series 400 air velocity meter only with applicable duct probe.
 4. Mark balancing dampers.
- E. Fire Life Safety Systems:
1. Balance, adjust, and test the stair and elevator pressurization components in order to pass the city test as described in Section 23 09 00, Instrumentation and Controls for HVAC. Rebalance the system as necessary until it passes the city tests.

3.03 HYDRONIC SYSTEMS

- A. General: Make measurements in accord with Industrial Standards specified above. Record on appropriate forms.
- B. Preliminary:
1. List complete data of tested equipment and verify against Contract Documents.
 2. Open line valves to full open position, close coil by-pass stop valves, then set mixing control valve to full coil flow.
 3. For each pump:
 - a. Verify rotation.
 - b. Test and record pump shut-off head.
 - c. Test and record pump wide-open head.

4. Verify proper system pressures.
 5. Verify air vents in high points of water are properly installed and operating freely.
- C. Central Equipment:
1. Check conditions at coils for required performance at design conditions.
 2. Check conditions at all primary source equipment for performance of design conditions.
 3. Read and record pump heads, motor data, and amperage draw.
- D. Distribution:
1. Read and adjust water flow for design conditions.
 2. Set memory stops and mark position of adjuster on balancing valves.

3.04 AUTOMATIC CONTROL SYSTEM

- A. In cooperation with control manufacturer's representative, set and adjust automatically operated devices to achieve required sequence of operations.
- B. Testing organization verifies controls for proper calibration and list controls requiring adjustment by control system installer.

3.05 COORDINATION

- A. Coordinate work with other trades to ensure rapid completion of the project.
- B. Promptly report deficiencies noted during the course of air balancing in the mechanical installation to the Architect to allow corrective action to proceed.
- C. Provide periodic review of progress as requested.

END OF SECTION

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SECTION 23 07 00

INSULATION FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Pipe Insulation
 - 2. Ductwork Blanket Insulation
 - 3. Ductwork Board Insulation
 - 4. Duct Insulation, Internal
 - 5. Duct, Pipe and Terminal Unit Acoustical Wrap
 - 6. Duct Enclosure, Fire Rated
 - 7. Accessories Piping
 - 8. Accessories Ductwork
- B. Related Sections include:
 - 1. Section 23 05 29, Hangers, Supports and Anchors for HVAC
 - 2. Section 23 31 01, HVAC Ducts and Casing – Low Pressure
 - 3. Section 23 31 02, HVAC Ducts and Casing – Medium Pressure

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Prohibit insulating products from containing pentabrominated, octabrominated, and decabrominated diphenyl ethers. Where products within this specification contain these banned substances, provide complying products from approved manufacturers with equal performance characteristics.
 - 2. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723 or ASTM E84.

3. Energy Codes: Local Building and Energy Codes govern where insulation performance requirements for thickness exceeds thickness specified.

B. Protection:

1. Protect against dirt, water, chemical, or mechanical damage before, during, and after installation.
2. Repair or replace damaged insulation at no additional cost.

C. Source Quality Control:

1. Service: Use insulation specifically manufactured for service specified.
2. Labeling: Insulation labeled or stamped with brand name and number.
3. Insulation and accessories not to provide nutritional or bodily use to fungi, bacteria, insects, rats, mice, or other vermin, not to react corrosively with equipment, piping, or ductwork, and asbestos free.

1.04 SUBMITTALS

A. Submit the following.

1. Product Data: For each type including density, conductivity, thickness, jacket, vapor barrier, and flame spread and smoke developed indices.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

1. Pipe Insulation:
 - a. Fiberglass:
 - 1) Johns Manville Microlok HP
 - b. Calcium Silicate:
 - 1) Johns Manville Thermo-12 Gold
 - c. Elastomeric:
 - 1) ArmacellAP Armaflex
 - 2) Rubatex
 - 3) K-Flex
 - d. Cellular Glass:
 - 1) Pittsburgh Corning Foamglas
 - 2) Pittwrap SS Jacket
2. Ductwork Blanket Insulation:
 - a. Fiberglass:
 - 1) Johns Manville Microlite Type 100
 - b. Semi-Rigid Fiberglass:
 - 1) Johns Manville Micro-Flex
 - c. Elastomeric:
 - 1) Armacell Armaflex

3. Ductwork Board Insulation:
 - a. Semi-Rigid Fiberglass:
 - 1) Micro-Aire Duct Board Type LP
 - b. Rigid Fiberglass:
 - 1) Johns Manville Diffuser Board

4. Duct Insulation, Internal:
 - a. Round Ductwork:
 - 1) CertainTeed
 - 2) Johns Manville
 - b. Rectangular Ductwork:
 - 1) CertainTeed
 - 2) Johns Manville
 - 3) Knauf
 - 4) Owens Corning

5. Duct, Pipe and Terminal Unit Acoustical Wrap:
 - a. Kinetics Noise Control model KNM-100ALQ.

6. Duct Enclosure, Fire Rated:
 - a. Johns Manville
 - b. Firemaster
 - c. Fyrewrap

2.02 PIPE INSULATION

- A. Fiberglass: Split sectional or snap-on type with 0.23 per-inch maximum thermal conductivity (K-factor) at 75 degrees F mean temperature, 850 degrees F maximum service rating and white, vapor barrier jacket with pressure sensitive closure system.

- B. Calcium Silicate: Sectional with 14 pcf nominal density, 0.40 maximum K-factor at 300 degrees F mean temperature and 1200 degrees F maximum service rating.

- C. Elastomeric:
 1. Expanded closed cell, 0.27 per-inch maximum K-factor at 75 degrees F mean temperature, 220 degrees F maximum service rating with fitting covers and paintable surface.

 2. Color:
 - a. Concealed Locations: Black
 - b. Exposed Locations: White.

- D. Cellular Glass:
 1. Light weight rigid glass foam insulation, 0.34 per-inch maximum K factor at 75 degrees F mean temperature, 900 degree degrees F maximum service rating.

 2. Field applied jacketing, woven glass fabric, bituminous resin, poly-ethylene film.

- E. Polyurethane Foam:
 1. Cellular rigid polyurethane foam insulation, minimum 90 percent closed cell, 2 pcf density, compressive strength of 30 psi at 75 degrees F, 0.16 per-inch maximum K-factor at 75 degrees F mean temperature, 230 degrees F maximum service rating.

- F. High Temperature Polyurethane Foam:
 - 1. Cellular rigid polyurethane foam insulation, minimum 90 percent closed cell, 2 pcf density, compressive strength of 35 psi, 0.16 per-inch maximum K-factor at 75 degrees F mean temperature, 400 degrees F maximum service rating.
 - 2. Insulation capable of handling intermittent temperature spikes of 450 degrees F for one hour.
- G. Mineral Wool: Sectional mineral wool, 8 psf density, 0.31 per-inch maximum K-factor at 75 degrees F temperature, 1200 degrees F maximum service rating.

2.03 DUCTWORK BLANKET INSULATION

- A. Fiberglass: 1.0 pcf nominal density, 0.25 per-inch maximum K-factor at 75 degrees F mean temperature, 250 degrees F minimum operating temperature limit.
 - 1. Exposed: FSK facing (foil scrim Kraft) or vinyl - white appearance.
 - 2. Concealed with Vapor Barrier: FSK reinforced foil and paper.
 - 3. Concealed without Vapor Barrier: Facing not required.
- B. Semi-Rigid Fiberglass: 2.5 pcf nominal density, 0.24 per-inch maximum K-factor, at 75 degrees F mean temperature, 250 degrees F minimum operating temperature limit.
 - 1. Exposed: FSK facing (foil scrim Kraft) or vinyl-white appearance.
 - 2. Concealed with Vapor Barrier: FSK reinforced foil and paper.
 - 3. Concealed without Vapor Barrier: Facing not required.
- C. Elastomeric: Expanded closed cell sheets, 0.27 per-inch maximum K-factor at 75 degrees F mean temperature and 220 degrees F minimum operating temperature limit.

2.04 DUCT INSULATION, INTERNAL

- A. Fiberglass Duct Liner.
 - 1. Thermal Conductance: k-0.23 in accordance with ASTM C518 and ASTM C177 at 75 degrees F mean temperature.
 - 2. Maximum Operating Temperature: 250 degrees F as determined by ASTM C 411.
 - 3. Maximum Air Velocity: 6,000 fpm as determined by ASTM C 1071.
 - 4. Fungi Resistance:
 - a. Does not breed or promote as determined by ASTM C1338.
 - b. No growth as determined by ASTM G21.
 - 5. Bacteria Resistance: No growth as determined by ASTM G22.
 - 6. Flame-spread index of 25 or less as determined by ASTM E 84 or UL 723.
 - 7. Smoke development index of 50 or less as determined by ASTM E 84 or UL 723.

8. Acoustical Absorption Coefficients:
 - a. NRC value as tested in accordance with ASTM C423, type A mounting:
 - 1) 1-inch thickness: Minimum NRC 0.70
 - 2) 2-inch thickness: Minimum NRC 0.90

2.05 DUCT, PIPE AND TERMINAL UNIT ACOUSTICAL WRAP

- A. Barrier:
 1. Construct barrier of a 0.10-inch thick mass loaded, limp vinyl sheet bonded to a layer of reinforced aluminum foil on one side.
 2. Nominal density of 1 pound per square-foot and minimum STC rating of 28.
 3. Minimum thermal conductivity value of 0.29 and a rated service temperature range of -40 degrees F. to 220 degree F.
 4. Flame spread index of no more than 10 and a smoke development index of less than 40.
- B. Decoupling Layer:
 1. Combination of 1-inch fiberglass batting, non-woven porous scrim-coated glass cloth, quilted together in a matrix of 4-inch diamond stitch pattern, which encapsulates the glass fibers.
- C. Composite Material: Fabricated to include a nominal 6-inch wide barrier overlap tab extending beyond the quilted fiber glass to facilitate a leak-tight seal around field joints.

2.06 DUCT ENCLOSURE, FIRE RATED

- A. Johns Manville:
 1. 2-hour Rated: Johns Manville, Super Firetemp M, minimum 3-inch thickness, ASTM E2336, 2-hour rated assembly.
 2. 1-hour Rated: Johns Manville, Super Firetemp L, minimum 2-1/4-inch thickness, ASTM E2336, 1-hour rated assembly.
 3. Joint: Johns Manville, Super Calstik adhesive, modified sodium silicate adhesive.
- B. Firemaster: Thermal Ceramics Firemaster duct wrap ceramic fiber blanket, minimum 3-inch total thickness, ASTM E2336, 2-hour rated assembly.
- C. Firewrap: Unifrax Firewrap duct wrap fiberglass blanket, 1-1/2-inch thickness for 1-hour rated assembly, 3-inch thickness for 2-hour rated assembly. ASTM E2336.

2.07 ACCESSORIES PIPING

- A. Adhesives:
 1. General: Maximum Flame Spread/Smoke Developed Rating of 25/50, SCAQMD Rule 1168 compliant.
 2. Fiberglass: Integral closure system.

3. Calcium Silicate: Benjamin Foster 30-36.
 4. Elastomeric: Armacell 520 BLV.
- B. Cements:
1. Insulating: Ryder.
 2. Heat Transfer: Chemax Tracit-300.
- C. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.
- D. Pipe Fitting Covers: One piece PVC insulated pipe fitting covers. Zeston, Ceel-Co.
- E. Grooved Coupling Insulation: One piece PVC insulated fitting cover. Zeston, Ceel-Co.
- F. Metal Pipe Jacket: 0.016-inch thick aluminum jacket with formed fitting covers, aluminum snap straps and sealant.
- G. Cloth Facing: Presized fiberglass cloth.
- H. Tapes: Pressure sensitive, weather resistant, and for temperatures up to 150 degrees F. Zeston Z-tape.
- I. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes, and adhesives.

2.08 ACCESSORIES DUCTWORK

- A. Adhesives:
1. General: Maximum Flame Spread/Smoke Developed Rating of 25/50, SCAQMD Rule 1168 compliant.
 2. Fiberglass: Benjamin Foster 85-62, Design Polymerics 2501/2502
 3. Elastomeric: Armacell 520 BLV
 4. Duct Insulation, Internal: Foster 85-62, Design Polymerics 2501/2502
- B. Weld Pins: Duro-Dyne with NC-1 nylon stop clips
- C. Cements:
1. Insulating: Ryder.
 2. Heat Transfer: Chemax Tracit-300
- D. Wire Mesh: 1-inch mesh with 20 gauge annealed steel wire.
- E. Mastic: Chicago Mastic:
1. Vapor Barrier: 17-475
 2. Outdoor Mastic: 16-110 white

- F. Cloth Facing: Presized fiberglass cloth
- G. Tapes: Pressure sensitive, weather resistant, and for temperatures up to 150 degrees F. Zeston Z-tape.
- H. Paint: Ultraviolet resistant latex paint with special adherence capabilities to the PVC fitting covers, elastomeric, aluminum facing, Kraft paper, tapes, and adhesives.

PART 3 - EXECUTION

3.01 GENERAL

- A. Workmanship:
 - 1. Installation: Insulation installed in first class, neat professional manner.
 - 2. Applicators: Employ by firm that specializes in insulation work.
- B. Preparation: Surfaces of piping, ductwork, and equipment clean, free of oil or dirt, and dry before insulation is applied.
- C. Stamps: ASME stamps, UL labels, and similar stamps and labels not covered.

3.02 HVAC PIPE AND EQUIPMENT INSULATION APPLIED LOCATIONS

A. Insulation Applied Locations – HVAC Piping:

System	Pipe Size	Insulation Type	Insulation Thickness	Notes
Heating Water (to 200 degrees F)	1-1/4-inch and smaller	Fiberglass	1-1/2-inch	Note 1
	1-1/2-inch and above	Fiberglass	2-inch	Note 1
Heating Water (to 250 degrees F)	3-1/2-inch and smaller	Fiberglass	2-1/2-inch	Note 1
	4-inch and above	Fiberglass	3-inch	Note 1
Refrigerant Suction Hot Gas	1-1/4-inch and smaller	Elastomeric	1-inch	Note 3
	1-1/2-inch and above	Elastomeric	1-1/2-inch	Note 3
Variable Refrigerant Flow (VRF) System Refrigerant Piping	1-inch and smaller	Elastomeric	1/2-inch	Note 4
	1 1/8-inch and above	Elastomeric	1-inch	Note 4
Air Separators and Storage Tanks	All	Fiberglass	3-1/2-inch	
	All	Elastomeric	3-1/2-inch	Note 3
Note 1: Cover with metal pipe jacket where exposed to weather and over heat trace cable. Note 2: Refer to specification 23 20 14 for additional pre-insulated piping systems requirements. Note 3: Elastomeric insulation not allowed over heat trace cable. Note 4: Or per VRF manufacturer installation recommendations.				

- B. The following piping is not insulated:
 - 1. Refrigerant relief valve discharge.
- C. Include fittings, unions, flanges, mechanical couplings, valve bodies, valve bonnets, piping through sleeves, except valve bonnets, unions and flanges need not be insulated on the following systems:
 - 1. Hot water heating inside building.
- D. Piping insulation is not required between the control valve and coil on run-outs when the control valve is located within 4-feet of the coils and the pipe size is 1-inch or less.
- E. Valves, humidifier bodies, and irregular fittings insulated with section of pipe insulation and insulating cement, securely fastened, and finished with 6 ounces canvas and Foster 30-36 lagging adhesive.
- F. Option on flanges, valves, strainers, not requiring a vapor barrier to insulate with removable replaceable pads fabricated of 1-inch layer of Pittsburgh Corning Temp Mat sandwiched between inner and outer layer of 8 ounces glass cloth held together with stainless staples with sufficient stainless lacing hooks to hold pad firmly to flange or valve with minimum 3-inch overlap onto adjacent pipe insulation using 18 gauge SS lacing wire.
- G. Expansion Joints and Flexible Connectors: Pipe insulation or block of same material and thickness as adjacent piping.
- H. Boiler Breeching and Steel Stack: Insulate with 2-inch thick calcium silicate block.
- I. Gas Flues: 1-1/2-inch thick calcium silicate block.

3.03 PIPING INSTALLATION

- A. General:
 - 1. Joints: Coat both sides of complete joining area with applicable adhesive.
 - a. Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except foam plastic, seal with closure system or 3-inch wide tape.
 - b. Butt Joints: Butt lightly together and, except for foam plastic, seal with 3-inch wide tape or butt straps.
 - c. Multiple Layered Insulation: Joints staggered.
 - 2. Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.
 - 3. Voids:
 - a. Fill voids, chipped corners and other openings with insulating cement or material compatible with insulating material.
 - b. In insulation with Heat Tracing: Where piping is shown or specified to be heat traced, bed heat tape into heat transfer cement with insulation over heat tape and cement.
 - 4. Seal joints, seams, and fittings of metal watertight jackets at exterior locations.
- B. Fiberglass Insulation: Exterior insulation encased in metal jacket.

- C. Calcium Silicate Insulation:
1. Secure with 18-gauge wire embedded into insulation.
 2. On systems with vapor barrier, coat complete with vapor barrier mastic.
 3. Cover with cloth facing secured with applicable adhesive.
 4. Exterior insulation encased in metal jacket.
- D. Cellular Glass Insulation (pre-insulated piping):
1. Install per manufacturer's instructions.
 2. Factory apply insulation and jacket to carrier piping and fittings.
 3. Apply bituminous wrap jacket.
 4. Installation to be liquid and vapor tight.
- E. Elastomeric Insulation:
1. Slit full length and snap around pipe.
 2. Make cuts perpendicular to insulating surface leaving no cut section exposed.
 3. Do not stretch insulation to cover joints or fittings.
 4. Seal joints in elastomeric insulation with adhesive.
 5. Exterior insulation painted with two coats of specified paint in accordance with the manufacturer's instructions and encase in metal jacket.
 6. Sealing joints with tape will not be allowed.
- F. Polyurethane Foam Insulation (pre-insulated piping):
1. Install per manufacturer's instructions.
 2. Factory apply insulation and jacket to carrier piping and fittings.
 3. Spray applied or injected with one shot into the annular space between carrier pipe and jacket
 4. Liquid and vapor tight insulation.
- G. Mineral Wool Insulation (pre-insulated piping):
1. Install per manufacturer's instructions.
 2. Insulation and jacket factory applied to the carrier piping and fittings.
 3. Band sectional insulation on pipe with stainless steel banding on 18 centers.
 4. Liquid and vapor tight insulation.

- H. Fittings: Insulation specified with continuous vapor barrier, the vapor barrier must not be violated.
 - 1. On Elastomeric Insulation: Fittings covered with covers made up of mitered sections of insulation or with formed pipe fitting covers.
 - 2. In Other Insulation: Fittings covered with insulation to the same level of the adjoining insulation or fill with insulating cement. Finish with pipe fitting covers or cloth facing and tape.
- I. Unions, Mechanical Joints, Valves, etc.:
 - 1. General:
 - a. As specified for fittings.
 - b. Minimum thickness same as specified for piping.
 - 2. Unions: Build up insulation at least 1/2-inch beyond adjoining insulation.
 - 3. Flanges: With square corners. Where flanges are not insulated, terminate adjacent insulation so flange bolts can be removed.
 - 4. Flanged Valves: Insulation with square corners.
- J. Vapor Barrier Insulation:
 - 1. Refer to Section 23 05 29 Hangers, Supports, and Anchors for HVAC, for support requirements.
 - 2. Piping which requires vapor barrier protection has a continuous vapor barrier, which may not be pierced or broken. The following piping systems require vapor barrier protection:
 - a. Chilled water including radiant cooling water.
 - b. Brine water.
 - c. Refrigerant suction.
 - d. Other piping systems with a nominal operating temperature below 65 degrees F.
 - 3. Vapor Barrier Insulation.
 - a. Insulation for pipe requiring vapor barrier protection 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
 - b. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation with continuous vapor barrier jacket at each hanger or roller. Provide pipe shield specified in Section 23 05 29, Hangers, Supports, and Anchors for HVAC.
- K. Non-Vapor Barrier Insulation:
 - 1. Refer to Section 23 05 29 for support requirements.
 - 2. At contractor's option, insulation may be interrupted at supports. Butt insulation tight to support.
 - 3. If contractor elects to continue insulation at supports, installation as specified for piping systems with vapor barrier installation.
 - 4. Void between saddle and pipe filled with insulation.

L. Non-Vapor Barrier Insulation:

1. Refer to Section 23 05 29, Hangers, Supports, and Anchors for HVAC for support requirements.
2. For pipe 1-1/4-inch or smaller, insulation continuous through pipe hangers and rollers.
3. For pipe 1-1/2-inch and larger, 18-inch section of calcium silicate, same thickness as pipe insulation. Provide pipe shield specified in Section 23 05 29, Hangers, Supports, and Anchors for HVAC.

3.04 EQUIPMENT INSTALLATION

A. General: Install true and smooth. Insulation over curved surfaces conform to curves of surface.

1. Access: Insulated removable heads, water boxes, pump casings, access, etc., that require service, inspection or maintenance provided with covers or section that are easily removable and replaceable. Reinforce openings in adjacent insulation with metal beading. In vapor barriered insulation, coat joints with vapor barrier mastic.
2. Voids, Depressions and Cavities: Voids, chipped corners and other openings filled with insulating cement or material compatible with insulating material.
3. Vapor Barriered Insulation: Where insulation is specified to have a vapor barrier. No broken or pierced barrier.
 - a. Coated with vapor barrier mastic and patched with insulation facing or tape.
 - b. Staples brush coated with vapor barrier coating.
 - c. Raw edges coated with vapor barrier mastic covered and cover sealed to equipment surface.
4. Non-Vapor Barriered Insulation:
 - a. Patch with insulation facing or tape.
 - b. Cover raw edges and neatly bevel to the equipment surface.
5. Multilayered Insulation: With staggered joints.

B. Calcium Silicate and Fiberglass Block:

1. Anchors: Lug nuts 10 gauge black annealed iron wire welded to metal surfaces.
2. Banding: Block secured to surface with 1/2-inch wide stainless steel bands maximum 18-inches on center and secured to anchors.
3. Insulating Cement: Block covered with insulating cement minimum thickness of 1/2-inch with smooth finish.
4. Vapor Barriered System: On vapor barriered system, apply continuous coat of vapor barrier mastic.
5. Finish: Finish with cloth facing secured with adhesive and lapped a minimum of 2-inches. Defects touched up with finishing cement.

C. Elastomeric Blanket:

1. Cut insulation to size, make corners with mitering cuts to preclude raw edges, continuously cement insulation to equipment with adhesive.
2. Cement both surfaces of joints and butt tightly together and cover raw edges with two coats of adhesive.

D. Expansion Joints:

1. Covered with larger size pipe insulation to allow full movement and be removable, ends turned back to pipe, coat with vapor barrier mastic on joints in vapor barriered system, and finished with cloth facing cemented to insulation with adhesive.

E. Boiler Breeching, Steel Stacks and Gas Flues:

1. As specified under calcium silicate block except air space 1-inch from metal with air space vented to room and atmosphere.

3.05 DUCT INSULATION APPLIED LOCATIONS

A. General:

1. External insulation with continuous vapor barriers unless specifically noted otherwise.
2. Internally lined completely to grille or diffuser or to indicated terminal points. Dimension shown are net inside of liner.
3. Internally lined ductwork need not be externally insulated.
4. In addition to locations described in specification, internally line medium, low, return and exhaust air ductwork where shown on drawings.

B. Insulation Applied Location – HVAC Ductwork:

System	Location	Duct Type	Insulation Type	Thickness	Notes
Medium Pressure Supply*	Exposed or Visible (Including above a cloud ceiling)	Rectangular	Internally Lined	1-1/2-inch	
		Round/Oval	Internally Lined	1-1/2-inch	
	Concealed or in mechanical rooms	All	Fiberglass Blanket	1-1/2-inch	
	Exposed Outside Building Envelope	All	Internally Lined	3-inch	
	15-foot upstream and downstream of fans	All	Internally Lined	1-1/2-inch unless otherwise indicated	
		Rectangular	Internally Lined	1-1/2-inch	

System	Location	Duct Type	Insulation Type	Thickness	Notes
Low Pressure Supply*	Exposed or Visible (Including above a cloud ceiling)	Round	Internally Lined	1-1/2-inch	Note 3
	Concealed or in mechanical rooms	All	Fiberglass Blanket	1-1/2-inch	
	Exposed Outside Building Envelope	All	Internally Lined	3-inch	Note 3
	Under Slab Ductwork	All	Internally Lined	2-inch	
	Downstream of Air Terminal Units	All	Internally Lined	1-1/2-inch	Note 1 Note 3
	15-feet upstream and downstream of fans	All	Internally Lined	1-1/2-inch unless otherwise indicated	Note 3
Return Air* (not insulated except)	Concealed Outside Building Envelope	All	Externally insulated without vapor barrier	2-inch	
	Exposed Outside Building Envelope	All	Internally Lined	2-inch	Note 3
	Under Slab Ductwork	All	Internally Lined	2-inch	Note 3
	15-feet upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	Note 3
Exhaust Air* (not insulated except)	15-feet upstream and downstream of fans	All	Internally Lined	1-inch unless otherwise indicated	Note 3
	In Toilet Rooms, 10-foot downstream of exhaust grilles	All	Internally Lined	1-inch	Note 3
Outside Air (untempered)	Exposed or Visible (Including above a cloud ceiling)	Rectangular	Internally Lined	2-inch	
		Round	Internally Lined	2-inch	Note 3
	Concealed or in mechanical rooms	All	Fiberglass Blanket	2-inch	

System	Location	Duct Type	Insulation Type	Thickness	Notes
Supply and Return Plenums	All	All	Internally Lined	2-inch	Note 2
Transfer Air	All	All	Internally Lined	1-inch	Note 3
<p>* In addition to applied locations listed in this table, provide internally lined ductwork where indicated on drawings. Note 1: Except ductwork downstream of terminal units serving patient care areas in hospitals Note 2: Insulation not required on factory fabricated insulated housings and plenums (AHP). Note 3: Where round or oval ductwork is indicated, provide double walled round/oval ductwork as specified in Section 23 31 02, HVAC Ducts and Casing-Medium Pressure, or provide internally lined rectangular ductwork with equivalent free area may be substituted.</p>					

3.06 DUCTWORK INSTALLATION

A. General:

1. Install in accordance with manufacturer's instruction.
2. Continuous vapor barrier. Coat with vapor barrier mastic and patch with facing or tape. Joints between insulation and access with vapor barrier mastic.
3. Insulation at access panels to be removable or attached to panel with edges of panel and opening reinforced with metal beading.

B. External Blanket Insulation:

1. Insulation secured to ductwork with 20-gauge snap wires 24-inches on center and joints.
2. Joints and seams lapped a minimum of 3-inches and sealed with jacket tape.

C. Board Insulation:

1. Rectangular ducts with weld pins spaced a maximum of 18-inches on center in both directions.
2. Corners made with joints, bending insulation around corners not allowed.
3. Joints and seams butted tight together.
4. Butt joints with 3-inch wide tape.
5. Corners finished with 3-inch wide tape.

D. Internal Duct Liner:

1. Air stream coated surface.
2. Weld pins spaced maximum of 15-inch on center in both directions and within 2-inches of corners and joints. Weld pins flush with liner surface.
3. Complete duct surface coated with adhesive and insulation pressed tightly thereto.
4. Provide edges at terminal points with metal beading and heavily coated with adhesive.

5. Heavily coat joints and corners with adhesive.
 6. Damaged areas replaced or heavily coated with adhesive.
- E. Duct Enclosure - Fire Rated:
1. Installation: Per manufacturer's instructions.
 2. Joints:
 - a. Cement attached boards to one another.
 - b. Butter mating surfaces with a 1/8-inch layer adhesive.
 - c. Secure fiberglass type material with stainless steel banding, Type 304.
 3. Support:
 - a. Duct enclosure may be hung from a conventional trapeze arrangement.
 - b. Provide adequate support at the bottom of vertical runs.
 - c. Multi-Story Vertical Runs: Support Firetemp enclosure at each story penetration with an angle iron collar attached to the Firetemp.
 4. Expansion: Provide adequate clearance at the end of straight runs to allow for expansion of the metal duct inside the enclosure.
- F. Plenums: Insulation on floors protected by wire mesh.
- G. Blank-Off Panels: Insulation, enclosed with sheet metal on all sides. Joints with vapor barrier mastic and taped.
- H. Volume Dampers: Where volume dampers do not allow for continuous insulation, terminate insulation clear of handle sweep, and finish edges to maintain vapor barrier and to prevent damage to the insulation.

3.07 DUCT, PIPE AND TERMINAL UNIT ACOUSTICAL WRAP

- A. Installed in accordance with the manufacturer's instructions.
- B. Applied locations for piping and duct systems:
1. Variable and constant volume terminal units with maximum air volumes over 2000 cfm. Wrap installed such that control devices are easily accessible without circumventing the acoustical value.
 2. Where specified or indicated on drawings.

3.08 FIELD QUALITY CONTROL

- A. Field Test: Test and approve systems prior to installation of insulation.
- B. Existing Insulation:
1. Repair existing insulation damaged during construction.
 2. Make neat connections where new and existing insulation meet.
 3. Where existing piping, ductwork or equipment is removed, cover existing surfaces neatly to match existing.

4. Where existing insulation is damaged or missing, notify the architect prior to performing to work.

END OF SECTION

SECTION 23 09 00

INSTRUMENTATION AND CONTROLS FOR HVAC

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.
- B. The provisions of Division 23, HVAC, Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Control Devices
 - 2. DDC Field Panels
 - 3. Connection to Existing Network
 - 4. BACnet Compatibility
 - 5. Operator Interface System
 - 6. Application Programs
 - 7. Input/Output Functions
 - 8. Uninterruptable Power Supply
 - 9. Energy Management System
- B. Related Sections include:
 - 1. Section 22 05 93, Testing, Adjusting and Balancing for Plumbing
 - 2. Section 23 21 13, Pipe and Pipe Fittings HVAC
 - 3. Section 23 08 00, Commissioning for HVAC

1.03 QUALITY ASSURANCE

- A. Provide control work by single company with specialists in the type of work required, so that only one control manufacturer is responsible for control and automation work for project.
- B. Provide coordination with other contractors or subcontractors for work required by other trades for accomplishment of control work.

- C. Prior to substantial completion, controls contractor must demonstrate to Owner that system is operating per the Specifications and final adjustments have been made as approved.
- D. System, including components and appurtenances, configured and installed to yield a Mean Time Between Failure (MTBF) of at least 1,000 hours.

1.04 SUBMITTALS

- A. System Drawings: Prepare on AutoCAD format and include the following:
 - 1. Equipment installation, block diagrams, and wiring diagrams.
 - 2. DDC panel physical layout and schematics.
 - 3. Sensor and control wiring and installation drawings which identify each component and show interconnected or interlocked components.
 - 4. Material and equipment descriptive material such as catalog cuts, diagrams, performance curves, and other data to demonstrate conformance with specifications.
 - 5. Details of connections to power sources, including grounding.
 - 6. Details of surge protection device installations.
 - 7. Instrumentation and control diagrams.
 - 8. Complete a written description of control sequences.
 - 9. List of connected data points, including DDC panels to which they are connected, and input device (sensor, etc.).
 - 10. Valve and damper schedules indicating flows, pressure drops, CVs, and actuator type.
 - 11. Graphics: System graphics for review prior to implementation of programming.
- B. Equipment Data: Complete data for materials, including field and system equipment.
- C. Software Data:
 - 1. Submittals consist of complete descriptions of system, command, and applications software as specified.
 - 2. Include description of control sequences which are software based using detailed logic flow diagrams.
 - 3. Diagrams indicate logic used to achieve control sequence of calculation specified, and show relationship between control sequence and application software packages specified.
- D. Testing Submittals:
 - 1. Provide test plan and test procedures for approval.

2. Explain in detail, step-by-step actions and expected results to demonstrate compliance with the requirements of this specification and methods for simulating necessary conditions of operation to demonstrate performance of the system.
3. Test plan and test procedures demonstrate capability of system to monitor and control equipment and to accomplish control and monitoring specified.

E. Operation and Maintenance Manuals:

1. Provide three complete sets of manuals bound in loose-leaf binders within 30 days after completing acceptance tests.
2. Identify each manual's contents on cover.
3. Manuals include names, addresses, and telephone numbers of each subcontractor installing equipment and systems and of nearest service representatives for each item of equipment and each system.
4. Place tab sheets at beginning of each chapter or section and at beginning of each appendix.
5. Final copies delivered after completion of the acceptance tests include modifications made during installation, checkout, and acceptance.
6. Operation and Maintenance Manuals to include hardware manual, software manual, operations manual, and maintenance manual.
7. Hardware Manual: Furnish a hardware manual describing equipment provided, including:
 - a. General description and specifications.
 - b. Installation and checkout procedures.
 - c. Equipment electrical schematics and layout drawings.
 - d. System schematics and I-O wiring lists.
 - e. Alignment and calibration procedures.
8. Software Manual:
 - a. Describe furnished software.
 - b. Oriented to programmers and describe calling requirements, data exchange requirements, data file requirements and other information necessary to enable proper integration, loading, testing, and program execution.
 - c. Provide one software manual per Operator's Terminal.
9. Operator's Manual: Provide procedures and instructions for operation of the system, including:
 - a. DDC Panels and Peripherals
 - b. System start-up and shutdown procedures.
 - c. Use of system, command, and applications software.
 - d. Alarm Presentation
 - e. Recovery and Restart Procedures
 - f. Report Generation
 - g. System Schematic Graphics
 - h. Provide one Operator's Manual per Operator's Terminal
10. Maintenance Manual: Provide descriptions of maintenance for equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

11. Acceptance Test Forms: Maintenance manual includes copies of signed-off acceptance test forms.

1.05 ACCEPTANCE TESTING AND TRAINING

A. Site Testing:

1. General: Provide personnel, equipment, instrumentation, and supplies necessary to perform testing. Owner or Owner's representative will witness and sign off on acceptance testing.
2. Acceptance Test: Demonstrate compliance of completed control system with contract documents. Demonstrate using approved test plan, physical and functional requirements.

B. Training:

1. General:
 - a. Conduct training courses for designated personnel in operation and maintenance of system.
 - b. Oriented to specific system being installed under this contract.
 - c. Provide trainee with two additional copies provided for archival at project site.
 - d. Manuals include detailed description of the subject matter for each lesson.
 - e. Delete copies of audiovisuals to Owner.
 - f. Training day is defined as 8 hours of classroom instruction, including two, 15-minute breaks and excluding lunch time, Monday through Friday, during normal first shift in effect at training facility.
 - g. Notification of any planned training given to the Owner's representative at least 15 days prior to the training.
2. Operator's Training I:
 - a. Teach first course at supplier's facility for period of two consecutive training days.
 - b. Upon completion, each student, using appropriate documentation, perform elementary operations with guidance and describe general hardware architecture and functionality of system.
3. Operator's Training II:
 - a. Teach second course at project site for a period of one training day after completion of Contractor's field testing.
 - b. Include instruction on specific hardware configuration of installed system and specific instructions for operating the installed system.
 - c. Upon completion, each student able to start system, operate the system, recover the system after failure, and describe the specific hardware architecture and operation of system.
4. Operator's Training III:
 - a. Teach third course at project site for period of one training day no later than six months after completion of the acceptance test.
 - b. Structure course to address specific topics that students need to discuss and to answer questions concerning operation of system.
 - c. Upon completion, students fully proficient in system operation and have no unanswered questions regarding operation of installed system.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/INSTALLERS

- A. Acceptable Manufacturers/Installers:
 - 1. Automated Logic by Airco Automation
 - 2. Delta Controls by Trinity EMCS
 - 3. Alerton by Syzerco
 - 4. APOGEE system by Siemens Building Technologies.
 - 5. Johnson Controls by JCI
 - 6. Unless otherwise noted, installed by manufacturer.
 - 7. Trane installed by Trane
- B. Other Manufacturers: Submit substitution request.

2.02 SYSTEM DESCRIPTION

- A. General:
 - 1. Provide a complete control system, consisting primarily of electronic direct digital control devices.
 - 2. System consists of modular and distributed microprocessor based control and monitoring units connected together by communications trunks. Capable of global data sharing and communication between controllers.
 - 3. System architecture distributed and not rely on central processing unit (CPU) for sharing point data between controllers, or for control functions requiring data from other controllers.
 - 4. Multipurpose controller(s) consisting of CPU, system program, memory, power supply, and input/output drivers which communicated with terminal equipment controllers through a communications network.
 - 5. Provide operator's interface.
 - 6. Provide equipment, installation, wiring, and accessories as required but not necessarily specified to accomplish operations as described.
- B. Environmental Conditions: The
 - 1. Rate DDC panels and other field equipment for continuous operation under ambient environmental conditions of 35 degrees F to 120 degrees F dry bulb and 10 percent to 95 percent relative humidity, noncondensing.
 - 2. Instrumentation and control elements rated for continuous operation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified or normally encountered for the installation.

3. Install control devices in an enclosure suitable for the installed environment.

C. System Accuracy and Display:

1. DDC system to control space temperature with a range of 50 degrees F to 85 degrees F ± 1 degrees F for conditioned space (display to nearest 0.5 degrees F); 15 degrees F to 130 degrees F ± 1 degrees F for unconditioned space (display to nearest 0.5 degrees F). Return air humidity controlled to 20 percent RH to 35 percent RH ± 3 percent RH.
2. DDC system to control duct temperature with a range of 40 degrees F to 140 degrees F ± 1 degrees F (display to nearest 0.5 degrees F).
3. Water temperature with a range of 30 degrees F to 100 degrees F ± 1 degrees F (display to nearest 0.5 degrees F); the range of 100 degrees F to 300 degrees F ± 2 degrees F (display to nearest 0.5 degrees F); and water temperatures for the purpose of performing BTU calculations using differential temperatures to ± 0.5 degrees F using matched sensors (display to nearest 0.5 degrees F).
4. Pressure with a range for the specific application ± 5 percent of range.

2.03 MATERIALS AND EQUIPMENT

A. Piping:

1. General:
 - a. Label tubing with numbers shown on control drawings.
 - b. Provide sufficient gauges so that the input and output pressures of each device may be determined at or near its location. Show gauges on control diagram. Provide a gauge at each AO point.
 - c. Air Mains: 3/8-inch OD minimum; branch air lines sized 1/4-inch OD minimum. 5/32-inch tubing may be used in multi-tube sheathes only.
 - d. Run piping parallel to established lines, installed in neat and professional manner.
2. In Mechanical Rooms and Other Exposed Locations:
 - a. Hard drawn copper tubing with soldered fittings, with compression fittings only at control instruments and controlled devices.
 - b. At supplier's option, soft copper or polyethylene tubing may be used in accessible areas, supported in an enclosed gutter or conduit.
3. In concealed locations such as above ceilings and within walls of finished spaces, plenum rated polyethylene tubing may be used.
4. Use Type L hard drawn copper tubing for pneumatically actuated smoke dampers and control devices providing smoke control functions.

B. Duplex Instrument Air Supply Station:

1. Provide supply air to HVAC and plumbing control equipment, including terminal units, fan powered boxes, fans, etc. Include devices in air compressor sizing calculations.
2. Provide a complete standby for both the compressor and dryer. Arrange standby compressor to provide required amount of compressed air whenever system pressure drops below temperature control manufacturer's recommended operating pressure. Starting of standby compressor completely automatic to provide uninterrupted service. Sufficient capacity to supply the entire building under normal conditions with compressor running at full load not over 33 percent of the time.

3. Provide reciprocating piston type compressors with design life of not less than 20,000 hours elapsed running time before major overhaul is required. Oil lubricated compressors utilizing cylinder lubrication in which oil is directly introduced into compression chambers or in which crankcase fumes are directed into suction inlets will not be permitted. Oil consumption not to exceed three fluid ounces per 100,000 scfm of delivered air. Piston speeds not to exceed 450-feet per minute.
 4. Provide each compressor with intake air cleaner, discharge stop valve, and pressure relief valve. Relief valve, placed between compressor and the discharge stop valve, set for pressure of 10 psi above control switch cutout pressure. Cleanable and impingement type intake air cleaners.
 5. Each compressor driven by electric motor wound for the current available. Control by pressure operated, enclosed pilot switch connected to motor starter. Pressure switches for start/stop control set to operate between 80 and 100 psi. Equip system with electrical duplex controller, starters, and disconnect switches, thus permitting automatic alternate operation of each system and automatic simultaneous operation upon demands exceeding capacity of either system.
 6. Provide each compressor and motor with a cast iron or steel base mounted on air tank or on separate concrete foundation. Provide vibration isolation per Section 23 05 48, Vibration and Seismic Controls of HVAC Piping and Equipment. ASME approved. Size for no more than 12 compressor starts per hour, 33 percent run time.
 7. Provide compressor with filtering and air drying system on leaving side. Supply at required rate, air having a dew point of not more than 20 degrees F at 20 psi and having entrained particle size of not more than 5 microns. Self contained air drying system, mechanical refrigeration type using air-cooled condenser.
 8. Condensing Unit:
 - a. Provide devices for automatic draining of condensed water and oil.
 - b. Electrically interlocked through relay or temperature sensing device, so whenever condensing unit fails to operate, it will alarm at the operator's terminal.
 9. Moisture Eliminator: Provide before final filter.
 10. Alarm: Alarm activated by air pressure failure.
 11. Refrigeration Unit Motor:
 - a. Suitable for continuous operation at 40 degrees C ambient temperature.
 - b. Capacity rated with ambient temperature.
 - c. Rated with ambient temperature of not more than 120 degrees F and with minimum suction temperature of 35 degrees F.
 - d. In accordance with the Safety Code for Mechanical Refrigeration, USASI-B-9.1.
- C. Controls and Power Wiring:
1. General:
 - a. Electric equipment and wiring in accordance with Division 26, Electrical.
 - b. Manual or automatic control and protective or signal devices required for operation specified, and control wiring required for controls and devices.
 2. Wiring:
 - a. Field and Subfield Panels:
 - 1) Voltage in panels not to exceed 120V.

- 2) Devices wired to higher voltages, mount in suitable individual enclosures or group in separate control panel.
- 3) Coordinate electrical power supply with Division 26, Electrical.
- b. Motor Control Centers: Responsibility for correct voltage of holding coils and starter wiring in pre-wired motor control centers interfacing with automatic controls is included hereunder.
- c. Wiring for DDC systems communications buses two conductor minimum 18 gauge foil-shielded, stranded twisted pair cable rated at 300 VDC or more than 80 degrees C.
3. Communications Links Surge Protection:
 - a. Protect communications equipment against surges induced on communications link.
 - b. Cables and conductors which serve as communications links to have surge protection circuits installed that meet the requirements of REA PE-60d.
4. Communications Links Overvoltage Protection:
 - a. Protect communications equipment against overvoltage on communications link conductors.
 - b. Cables and conductors which serve as communications links have overvoltage protection for voltages up to 480 VAC rms, 60 Hz installed.
 - c. Instrument fuses or fusible resistors are acceptable for this application.
5. Power Line Surge Protection:
 - a. Protect equipment connected to AC circuits from power line surges.
 - b. Do not use fuses for surge protection.
- D. Control Panels:
 1. Provide wall-mounted control panels to contain relays, terminal strips, power supplies and other equipment in building control system.
 2. UL listed, minimum NEMA 1, minimum 14 gauge steel with stiffeners, continuous hinge doors, locking handles, single point latch.
- E. Section 23 52 00, Heating Boilers:
 1. Mount boiler management system (BMS) control panels.
 2. Provide and install wiring required for boiler controls.

2.04 CONTROL DEVICES

- A. Temperature Instruments:
 1. Room Temperature Sensors: Platinum RTD type with accuracy of ± 0.4 degrees F at 70 degrees F; operating range 30 to 120 degrees F; linear to DDC system; single point sensing element in wall-mounted ventilated enclosure with insulating backplate if mounted on exterior wall.
 - a. Sensor not to have digital readout display.
 - b. Sensor has user adjustment based on DDC programmed offset.
 2. Duct Temperature Sensors: Platinum RTD element with accuracy of ± 0.5 degrees F at 32 degrees F, averaging type consisting of array of single point sensing elements, securely mounted in duct or plenum; operating range 0 to 100 degrees F; linear signal; 20-foot element.

3. Outside Air Temperature Sensor: Platinum RTD element with accuracy of ± 0.5 degrees F at 32 degrees F; Range -60 to 100 degrees F, single element, linear, with weather and sun shield for exterior mounting.
 4. Low Temperature Limit Thermostat: Minimum 20-foot capillary sensing element, triggering on low temperature as sensed by any 6-inch segment; snap acting, normally open contacts, manual reset, line voltage.
 5. Liquid Immersion Temperature Sensor: Platinum RTD element, with accuracy of ± 0.5 degrees F at 32 degrees F, stainless steel well and assembly, range 40 to 240 degrees F.
 6. Pneumatic Room Thermostat: Two-pipe relay type with concealed adjustment, and no thermometer, blank cover secured with Allen screws.
- B. Humidity Instruments:
1. Space Humidity Sensors: Operating range 10 to 95 percent relative humidity, accuracy ± 5 percent, surface mounted ventilated enclosure for wall mounting.
 - a. Sensor to not have digital readout display.
 - b. Sensor to have user adjustment based on DDC programmed offset.
 2. Duct Humidity Transmitter: Capacitive type sensor and transmitter, linear output signal, automatic temperature compensating, air filter, ± 2 percent RH accuracy from 0 to 100 percent RH, industrial quality.
- C. Motorized Control Dampers:
1. Multi-blade air foil type, except where either dimension is less than 10 inches a single blade may be used. Maximum blade length to be 48 inches. Provide parallel blades for positive or modulating mixing service and opposed blades for throttling service. Blades to be interlocking, minimum 16 gauge galvanized steel.
 2. Compression type edge seals and side seating stops. Reinforced damper blades have continuous full-length axle shafts, axle to axle linkage, and/or operating jackshafts as required to provide coordinated tracking of blades. Over 25 SF in area to be in two or more sections, with interconnected blades. Maximum air leakage of 3 cfm per square foot at 1-inch wg pressure. Provide automatic dampers except those specified to be provided with units. Tested in accordance with AMCA Standard 500. Based on Ruskin CD-60.
- D. Motorized Valves:
1. Equip with equal percentage with tight shutoff. Two position valves line size (full port two position ball valves), modulating water valves sized at 5 psi drop or as shown on the Drawing.
 2. Screwed ends except 2-1/2-inch and larger valves with flanged ends.
 3. Select valves to modulate smoothly at system pressures and flows.
 4. Select valves with close-off ratings and spring ranges designed to operate at the maximum flows and maximum available pump heads scheduled without leakage.

5. Bubble tight butterfly valves acceptable on 2-1/2-inch lines and above for two-position action only.
 6. Air handling unit heating and cooling coil valves sized for 5 psi drop, unless otherwise noted on drawings.
- E. Valve and Damper Operators:
1. Electronic modulating actuators with low voltage DC or current positioning signal.
 2. Each actuator have the current limiting circuitry incorporated in its design to prevent damage to the actuator.
 3. Provide modulating actuators and accept 0-10 VDC or 2-10 VDC or 4-20 mA input signal.
 4. Actuators provide the minimum torque required for proper close-off against the system pressure for the required application.
 5. Spring return feature permits normally open or normally closed positions of the valve or damper.
 6. Direct shaft mount rotational actuators have external adjustable stops to limit the travel in either direction.
 7. Actuators powered by 24 VAC.
- F. Flow Switches:
1. Provide McDonnell Miller or approved equal.
 2. Install in piping in such a manner so as to eliminate nuisance fluttering.
 3. Provide time delay relays where required to eliminate false alarms when equipment is started.
 4. Differential pressure type.
 5. Current switches set for pump or fan normal current ranges are acceptable.
- G. Electric Solenoid Operated Pneumatic (EP) Valve:
1. EP valves have three part operation -- common, normally open, and normally closed. EP valves.
 2. Rated for 25 psig when used in control system operation at 20 psig or less or rated at 150 psig when used in control system operation from 25 to 100 psig.
- H. Differential Pressure Switch:
1. Required for proof of flow on fans and pumps.
 2. Setpoint adjustable with operating range of 0.5 to 12-inches W.G. for fans, and 5 to 30-feet wc for pumps.
 3. Close when set pressure differential is met or exceeded.

- I. Differential Pressure Transducer:
 - 1. Provides value of pressure drop across filter bank through DDC system.
 - 2. Operating range 0 to 2-inches wc, linear, accurate to ± 2.5 percent of span.
- J. Duct Static Pressure Transmitter:
 - 1. Operating range 0 to 5-inches wc for duct mounted transmitter and 0 to 5-inches wc for fan high limit transmitters.
 - 2. Sensors either diaphragm or rigid element bellows, electronic type.
 - 3. Provide transmitter with stop cock and tubing for attacking portable pressure gauge.
 - 4. Sensing tube securely mounted in duct with appropriate fitting.
 - 5. Accuracy ± 1 percent of span, maximum response time 1 second.
- K. Current Transformer:
 - 1. Current status switch, adjustable setpoint 1-135A, ± 1 percent of range, capable of monitoring motor's status and detection of belt breaking or slipping.
 - 2. Hawkeye 700, or approved equal.
- L. Building Static Pressure Transmitter:
 - 1. Operating range of -0.1 to 0.1-inches wc, linear to DDC system.
 - 2. Sensing tubes located inside and outside building use shielding and/or surge tanks to minimize effects of wind.
 - 3. Accuracy ± 1 percent of span.
- M. Piping Pressure Transmitter:
 - 1. Operating range 0 to 50 psig, linear to DDC.
 - 2. Provide threadolet for mounting to pipe installed by others .
 - 3. Accuracy ± 1 percent of range.
- N. Products of Combustion Detectors: Duct smoke detectors are provided under Division 28, Electronic Safety and Security with single set of SPDT auxiliary contacts for control contractor connection.
- O. Emergency Stop Switch: Red, mushroom type, pull out to operate.
- P. End Switches: Turret head type SPDT. Square D Class 9007, Type C54B2, or equal.
- Q. VAV Actuators:
 - 1. Proportional 24 VAC actuators using a 4 to 20 mA range of control signals.

2. Automatically stop at end of travel and include a permanently lubricated gear train.
3. Furnished by the controls manufacturer and factory installed and tested by the terminal unit manufacturer.

R. Carbon Dioxide Sensor:

1. Infrared sensing, Carbon Dioxide gas monitor. Based on Airtest TR9290 series.
2. Detection Range: 0-2000 ppm
3. Accuracy: +/- 3 percent of measured value
4. Response Time: 2 minutes
5. Outputs: 0-10V, 4-20 mA
6. Calibration: Self-calibrating, calibration not required
7. Power Requirement: 24 VAC/VDC \pm 20 percent, 50-60Hz (half-wave rectified)
8. Operating Temperature Range: 32 degrees F to 122 degrees F
9. Operating Humidity Range: 0 percent - 95 percent RH, Non-Condensing
10. Display: Sensor [be provided] [not be provided] with digital display.

S. Water and Steam Flow Meters:

1. Provide Vortex flow meter that provides output signals, which are linear with the flow rate.
2. Accuracy +/-1 percent of measurement for volumetric flow rates greater than 5 percent of specified maximum flow rate for each building.
3. Flowmeters provide specified accuracy when installed and configured for upstream minimum straight runs of 24 inches.
4. Vortex flow meters will be Intelligent microprocessor-based, with integral LCD digital Display/Configurator allowing complete commissioning and operation without external programming devices.
5. Meter design will permit maintenance and repair of flow sensor and electronics without removing the meter from line or shutting down steam flow.
6. Flowmeter: Turn down ration of 50:1 or higher.
7. Meter have ANSI 150 flanged end connections, wafer style not acceptable.
8. Flange size of the adjoining pipe the same nominal size as the flow meter.
9. Mount flow meter in a straight, unobstructed pipe with a minimum of 10 pipe diameters upstream of the meter and 5 pipe diameters downstream, compensating for any induced flow effects according to manufacturer's recommendations.
 - a. Maximum Operating Pressure: 400 psi
 - b. Output Signal: Analog 4-20mA signal

- c. Supply Voltage: 24VDC
 - d. Interrogation: FoxCom version
 - e. Based on: FoxBoro I/A Series Intelligent Vortex Flow Meter 83
- T. Water Flow Meters: Provide insertion electromagnetic flow meters.
- 1. Accuracy: ± 1 percent of reading from 0.25-20 ft/sec
 - 2. Liquid Temperature Range: 15-300 degrees F
 - 3. Maximum Operating Pressure: 400 psi
 - 4. Output Signal: Analog 4-20mA signal
 - 5. Pipe Size Range: Minimum 3-inch
 - 6. Installation: 15 pipe diameters up and 5 pipe diameters down, or manufactures recommendations
 - 7. Display: Sensor [be provided] [not be provided] with digital display. [Provide BTU meter Onicon system 10]
 - 8. Based On: Onicon F-3500
- U. Natural Gas Sub-Meter
- 1. Electromagnetic flow meter, insertion type.
 - a. Accuracy: ± 1 percent of reading from 500-7000 SFPM
 - b. Output Signal: Analog 4-20 mA signal
 - c. Display: Digital
 - d. Based On: Onicon F-5100
- V. Airflow Stations:
- 1. Air Flow Station (Duct Mounted):
 - a. Acceptable Manufacturers:
 - 1) Ebtron
 - 2) Kurz
 - b. General: Electronic air measuring system consisting of thermistor based sensor grid and microprocessor based electronics.
 - c. Sensor Probes: Thermistors probes and linear ICs, aluminum casing, duct mounted, wiring Teflon or kynar coated and encased, 20 degrees F to 160 degrees F operating range, weather resistant finish, flanged welded aluminum frame.
 - d. Microprocessor and Electronics: Solid state microprocessor, permanent non-volatile memory, regulated power supply, software based system, 0-5 vdc, 0-10 vdc, or 4-20 mA signals, linear flow and temperature outputs, line surge and transient protection.
 - e. Performance:
 - 1) ± 2 percent, ± 20 fpm across total calibrated range of 0 to 5000 fpm, for duct mounted, 0-10,000 fpm for fan inlet mounted, repeatability better than ± 0.4 percent of reading.
 - 2) Pressure drop not tp exceed 0.005-inch wg at 2000 fpm.
 - f. Based On: Ebtron-Duct mounted XP000 series.

2. Air Flow Station (Fan Inlet):
 - a. Acceptable Manufacturers:
 - 1) Ebtron
 - 2) Air Monitor
 - 3) Paragon
 - 4) Pace
 - 5) Or approved equal.
 - b. Fan inlet airflow traverse probe, multiple total and static pressure sensors place at concentric area centers along exterior surface of cylindrical probe, internally connected to averaging manifolds.
 - c. Dual end support swivel brackets suitable for mounting in fan inlet bell, aluminum construction, hard anodized finish.
 - d. Probes capable of producing steady, non-pulsating signals of standard total and static pressure, without need for flow corrections or factors with an accuracy of 3 percent of actual flow over a fan operating range of 6 to 1 capacity turndown.
 - e. Based On: Fan Inlet XF000 series.

3. Automatic Air Flow Station Measuring Damper:
 - a. Acceptable Manufacturers:
 - 1) Ruskin IAQ50X
 - 2) Greenheck AMD-42
 - 3) Tamco/Ebtron Air-IQ
 - 4) Or approved equal.
 - b. Description: Automatic control damper with integral electronic airflow measuring system.
 - c. Dampers:
 - 1) Multi-blade, airfoil type, extruded aluminum.
 - 2) Full-length axle shafts.
 - 3) Damper blades operate in unison.
 - 4) Dampers exceeding 25 SF in area in two or more sections.
 - 5) Assembled depth not to exceed 18 inches.
 - 6) Leakage rating not to exceed 4 cfm/sf at 1-inch static pressure when tested in accordance with AMCA Standard 500D.
 - d. Damper Actuator:
 - 1) 24 VAC electric modulating.
 - e. Air Flow Measurement Assembly: Includes airflow measuring station, controller, and associated tubing and connections.
 - 1) Measuring Range: 300 fpm to 2,000 fpm velocity.
 - 2) Accuracy: ± 5 percent of reading.
 - 3) Solid state microprocessor.
 - 4) Linear flow output.
 - 5) Line surge and transient protection.
 - 6) Input Signal: 0-10 VDC.
 - 7) Output Signal: 0-10 VDC.

W. Airflow Transmitters:

1. Provide transmitter with 4-20 mA output signal, accurate to ± 0.25 percent for full range, range selected based on the actual flow element and expected velocity pressure, and linear output on velocity turndown of 10 to 1. Setra Model C264.

2. Provide a calibration certificate for each unit.

- X. Window Switch: Magnetic contact switch.
 - 1. Acceptable Manufacturers:
 - a. Sentrol
 - b. GE Security
 - c. Other Manufacturers: Submit substitution request
 - 2. Magnetic type contact switch, flush mount, concealed within window frame.
 - 3. Switch provides input to Building Management System on status of window (open/closed).
- Y. Leak Detection System:
 - 1. Provide complete system including alarm module with audible alarm and contacts for connection to building DDC control system, sensing cable, leader cable, jumper cables, end terminations, hold-down clamps and other required accessories.
 - 2. Tracetek by Tyco Thermal Controls, or equal.

2.05 DDC FIELD PANELS

- A. Multipurpose Controllers:
 - 1. Stand-alone microprocessor based panels, enclosed in sturdy metal enclosure with two standard RS232 interface ports, network communications module, power supply, and battery back-up.
 - 2. Panels will be used to connect field sensors and control devices. Fully supervised to detect failures. Construct panel so that functions are implemented on replaceable circuit boards to permit field maintenance. Panels completely field programmable through portable terminal. Minimum 8-hour battery backup system.
 - 3. Link panels with data trunk cable to other controllers and Operator's Terminals to distribute information. Field panels continuously exchange data through trunk cable without requiring output to input wiring between panels. Arrange system so operations are maintained without the central computer being connected to the system.
 - 4. Upon failure of the DDC field panel, including transmission failure, the panel automatically forces the controls to remain in the last command status.
 - 5. Provide a real time clock with calendar maintaining seconds, minutes, hours, and days of the week, accurate to ± 10 seconds per day.
 - 6. Provide sufficient memory to perform specified and shown DDC field panel functions and operations, including spares. Each DDC panel to have 10 percent minimum spare memory board spacing.
 - 7. DDC field panel contain hardware to support power fail automatic restart.
 - 8. Provide locking type mounting cabinets with common keying.
 - 9. DDC field panel have built-in diagnostics to display to operator interface terminal any sensor transmitting signal out of its design range.

10. Control logic done with software resident in each local DDC panel. Auxiliary relays may be used only when required for load contact rating.
11. Panels UL listed.

B. Terminal Equipment Controller:

1. Provide for each piece of equipment, as specified. Include point inputs and outputs as necessary to perform specified control sequences.
2. Each controller performing space temperature control provided with a matching room temperature sensor. Include terminal jack to monitor hardware and software associated with controller.
3. Include setpoint adjustment dial, temperature indicator, and override switch for each sensor.
4. Override Switch:
 - a. Override night setback mode to normal (day) mode when activated by occupant.
 - b. Adjustment dial and override switch may be locked out, overridden, or limited through software from central work station or portable terminal.
5. Independent of other network communications. Receive real time data from central work station or multipurpose controller.
6. Proportional, integral, and derivative (PID) algorithms field adjustable.
7. Data base and sequence of operation programs stored in non-volatile EEPROM and EPROM.
8. Controllers networked through communications link to the multipurpose controller.
9. Power controllers from 24 VAC source. Provide dedicated power source. Coordinate with Division 26, Electrical
10. VAV box controllers include differential pressure transducer connected to manufacturers standard velocity sensor, and include provisions for both automatic and manual calibration of transducer to ensure against drift. Incorporate algorithm to allow for modulation of hot water heating valve, and supplementary hot water radiation valve. Fan-powered terminal units control series or parallel fan as appropriate. Provide fan status proof current switch.

2.06 CONNECTION TO EXISTING NETWORK

- A. General: Communication between peer-to-peer DDC control panels via TCP/IP over the existing Ethernet system.
- B. Provide software and system integration to seamlessly integrate to the existing server for common system graphics, alarming, paging out of alarms via existing paging system.

2.07 BACNET COMPATIBILITY

- A. DDC System and components BACnet Data Communications Protocol compliant.

- B. System fully integrated and installed as a complete package of BACnet compliant controls and instrumentation.
- C. Capable of seamless BACnet integration with existing BACnet compliant devices as well as future BACnet compliant devices.
- D. No portals or third party devices required for integration with existing or future equipment.
- E. Devices utilized in the BACnet interface BACnet Testing Laboratories (BTL) listed and labeled.

2.08 OPERATOR INTERFACE SYSTEM

A. Operator Workstation:

- 1. Provide personal computer that performs data access, operator's commands, alarm management, requests for reports, file generation, diagnostics, and modifications. Control system not dependent on Operator Workstation for operation. Computer to be used for operator interface.
 - a. CPU: Windows compatible computer using current microprocessor technology operating at minimum of 2.8 GHz with 512 MB RAM.
 - b. Display Unit: Minimum 17-inch (nominal) flat screen color monitor, supporting a minimum display resolution of 1280x1024 pixels, with separate controls for color contrast and brightness, and non-reflective screen.
 - c. Video Card: Minimum 64 MB RAM capable of supporting a minimum of 1280x1024 resolution with a minimum of 32 Bit color.
 - d. Drives: Minimum 120 G byte hard disc, CD Read/Write, DVD player.
 - e. Alphanumeric Keyboard and Mouse: Provide an alphanumeric keyboard with standard 96 character ASCII set output. Provide a "mouse" input device with pad.
 - f. Printers: System printers are to be of the color ink jet type operating under software control as specified in the software section of this specification.
 - g. Operating System: Windows XP, 2000 or comparable.

B. Web-Based Access:

- 1. Provide a web-based controls interface with at least 3 user login accounts and password each with the capability of different access privileges that performs data access, operator's commands, alarm notification, requests for reports, file generation, diagnostics, and modifications.
- 2. Controls accessible in mechanical room by direct connection from a laptop to a data port.
- 3. Provide a temporary computer located on-site in the mechanical room until the commissioning, testing, and balancing has been completed.
- 4. Provide a temporary computer located on-site in the mechanical room, with software and capabilities necessary to support commissioning, testing, and balancing and other activities required for project completion.

C. Graphics: Provide a complete graphics package with the following features:

- 1. Provide separate schematic diagram depicting each system. Diagrams to show major components such as fans, dampers, heating and cooling coils, humidifiers, pumps, heat exchangers, chillers, boilers, towers, ductwork, piping, etc., arranged to convey to viewer system configuration and flow of each system.

2. Provide plot plan, riser plan, and selected floor plans of buildings with the location of each mechanical room and major equipment location indicated.
3. Provide symbols superimposed on each schematic to indicate each control device including control valves, damper motors, temperature sensors, pressure sensors, etc. Provide real time dynamic displays of the temperature, humidity, pressure, flow rate, run status, alarm status, and etc., adjacent to each control symbol. Arrange CPU to update each displayed analog and digital value minimum of every 15 seconds.
4. Provide indication of setpoints, with each setpoint value located adjacent to each sensed value.
5. Provide means to allow the user to easily change or add graphics via computer assisted drawing function utilizing freehand mouse.
6. Provide means to allow user to transfer repeated system schematics and symbols between graphics without redrawing them. Provide symbol library arranged to store commonly used symbols.
7. Provide a telescoping or zoom program to allow use to move from plot plan to mechanical room plan to system graphic to control device display by simply clicking the mouse.
8. Provide dual function windowing program to allow user to view a split screen and toggle between simultaneous operations.

D. Trend Data Collection and Historical Data:

1. Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. System point may be trended automatically at time-intervals, time-synchronized intervals, change of value, or by event user-definable.
2. Collect and store trend data on hard disk for future diagnostics and reporting. Automatic trend collection may be scheduled of zones, events, and reports. Archive to network drives or removable disk media for future retrieval.
3. Allow the user to view trended point data. Display data in both tabular and graphical format. Reports may be customized to include individual points or predefined groups of selected points. Provide additional functionality to allow predefined groups of up to 250 trended points to be easily transferred online to Microsoft Excel.
4. Provide the following trend data for review by the commissioning agent:
 - a. Adequate trending data maintained to evaluate system performance and diagnose system problems. Controls Contractor is responsible for trending points necessary to evaluate controlled equipment. Controls Contractor to coordinate with the Cx regarding trend intervals and specific points to be trended. The following systems trended and trend data provided for review by the engineer and commissioning agent at 15-minute intervals unless otherwise directed.
 - b. Building electrical, natural gas, domestic water, heating water flow.
 - c. Monitored temperatures including but not limited to space, supply, return, outside air, mixed air, chilled water, heating water, steam, pumped condensate, and etc.
 - d. Occupancy modes as they apply to each piece of controlled equipment including but not limited to optimal start, occupied, unoccupied, temporarily occupied (override, etc.), night low limit, night high limit, night purge.
 - e. Motor run commands and motor proofs for fans and pumps.

- f. VFD Speeds for controlled equipment.
- g. Measured airflows for both air handlers and volume control units.
- h. Damper positions for both air handlers and volume control units.
- i. Heating and cooling valve positions.
- j. Occupancy sensor indications used for HVAC control.
- k. Set points including but not limited to occupied and unoccupied space temperature, supply air temperature, hydronic supply temperature, radiant heating and cooling temperature, pumping pressure, fan static pressure, etc.
- l. Supporting information necessary to evaluate setpoint reset sequences.
- m. Operating schedules for controlled equipment.
- n. Loop tuning variables.

2.09 APPLICATION PROGRAMS

- A. General: Provide user-programmable DDC system programs with library of base-level predefined functions with user specified parameters.
- B. Time of Day Scheduling:
 - 1. Six schedules for equipment operation.
 - 2. Seven unique days per schedule.
 - 3. Program individual time cycle capability for each piece of equipment.
- C. Control Priorities:
 - 1. Provide an effective order of control priorities such that each succeeding level of optimization does not interfere with a more critical function. Alarm actions and manual commands from the operator to override lower level functions (such as duty cycling or scheduling).
 - 2. Events, initiated outside the DDC system causing equipment shutdown automatically reset when events causing the shutdown is cleared, such as power failure or fire alarm. (when fire alarm system is cleared and reset, air handlers, etc., sequentially restart).
 - 3. Alarms within the control system (such as freeze protection), mechanical equipment (such as air handlers) restart after the alarm condition is manually reset.
- D. Alarms: Provide the following alarm processing capabilities:
 - 1. Connected status or analog point may be designated as alarm input point.
 - 2. Start/stop points with status feedback as well as associated analog alarms have a user-programmable inhibit time assigned to each point to prevent nuisance alarms from occurring during startup of HVAC equipment.
 - 3. Each alarmable point have change-of-state priority assignment assignable at 3 levels. One each for its level of criticality.
 - a. Low : Maintenance alarms
 - b. High: Critical HVAC equipment alarms
 - c. Emergency: Life safety alarms.

4. User may designate which conditions of alarm cause alarms to be initiated for display. The user may also designate alarm message for alarm condition and for return to normal condition as desired. Each message may be up to 32 characters in length and up to 32 messages are available in each digital management system.
 5. Provide for orderly display of alarms based on criticality (i.e., if two or more alarms occur simultaneously); alarm with highest level of priority displayed first.
 6. User may designate which conditions of alarm cause alarms to be initiated for display. User may also designate alarm message for alarm condition and for return to normal condition as desired. Each message may be up to 80 characters in length.
 7. Provide automatic phone dialing feature with the capability to report a general alarm recorded message.
- E. Security: Support multi-level password access with the following minimum access levels:
1. Read-only level, without capability of changing any part of software.
 2. Adjustment level, allowing operator to adjust setpoints and schedules, force outputs on/off, but not to modify programming.
 3. Full programming access.
 4. Supports additional levels of programming access.
- F. Power Failure: In the event of the loss of normal power, orderly shutdown of controllers to prevent the loss of database or operating system software. Non-volatile memory incorporated for critical controller configuration data, and battery backup provided to support the real-time clock and volatile memory for a minimum of 72 hours.
1. During a loss of normal power, the control sequences go to the normal system shutdown conditions.
 2. Upon restoration of normal power and after a minimum off-time delay, the controller automatically resumes full operation without manual intervention through a normal soft-start sequence.
 3. Should a controller memory be lost for any reason, the operator workstation automatically reloads the program without intervention by the system operators.
- G. Providing load shedding software package.
- H. Preventive maintenance software package.

2.10 INPUT/OUTPUT (I/O) FUNCTIONS

- A. Analog Inputs (AI):
1. Monitor each analog input, perform A-to-D conversion, and hold the digital value in a buffer for interrogation.
 2. Provide signal conditioning for each analog input.
 3. Individually calibrate analog inputs for zero and span, in hardware or in software.

4. Minimum 12 bit A to D resolution.
- B. Analog Outputs (AO):
1. Accept digital data, perform D-to-A conversion, and output a signal compatible with the operator.
 2. Individually calibrate analog outputs for zero and span.
 3. Provide short circuit protection.
 4. Minimum 8 bit D to A resolution.
- C. Digital Inputs (DI):
1. Accept ON/OFF, OPEN/CLOSE or other change of state (two-state data) indications.
 2. Provide isolation and protection against input voltage up to 180 Vac peak.
- D. Digital Outputs (DO):
1. Provide contact closures for momentary and maintained operation of output devices.
 2. Closures have a minimum duration of 0.1 second.

2.11 UNINTERRUPTABLE POWER SUPPLY

- A. General:
1. Provide an uninterruptable power supply (UPS) for each DDC field panel.
 2. UPS fed by 120V AC emergency power circuits.
 3. Floor or wall mountable.
- B. Provide MGE Pulsar UPS or pre-bid approved equal.
- C. UL 1778 listing.
- D. Base sizing on peak current requirements of connected load plus 15 percent factor of safety
- E. Provide manufacturer's standard three-year comprehensive warranty, including batteries.

2.12 ENERGY MANAGEMENT SYSTEM

- A. General
1. Provide a complete system consisting of metering instruments, communications between components; communications network; dataloggers; protocol converters and other appurtenances as required for a complete system.
 2. Meters, network controllers, and Ethernet gateways provided with non-volatile flash memory sufficient to maintain system programming indefinitely.

B. Data Acquisition Network

1. Connect meters to DDC system via TCP/IP communications over ethernet LAN. Communications in BACnet/IP protocol.
2. The system may utilize Modbus for communication with field devices over local RS-485 communications links.
3. Connection to the building Ethernet network made at the nearest wall data outlet in a mechanical or electrical room.
4. Limit cabling lengths between devices in accordance with manufacturers published requirements.

C. Data Access and Display

1. Measured values, both instantaneous readings and historical data, available to any user on any computer with an Internet connection without requiring a specific operating system or proprietary software that is not publically available freeware.
2. Assign metering a unique network address and by entering that address or corresponding URL into a web browser, HTML web pages of data available for that device.
3. Specific browser software permitted to be required to access system features beyond the measured values.

D. Data Format

1. Synchronize to a single time base so that events on the system can be compared at different locations on the system using a common time base. Time base synchronized with DDC system.
2. Store data in DDC system database.

E. Software

1. Seamless BACnet/IP integrated with building Direct Digital Control, DDC system, and have the ability to display individual meter output data.
2. Calculation engine to virtually calculate, display, and store-derived values.
3. Download meter data every 15 minutes.

F. Interface and Display

1. Provide 32-inch LED flat panel display.
2. Scroll through display features in 20 second intervals (adjustable).
3. Display:
 - a. Monthly Utility Total Energy (kbtu) and EUI (kbtu/sf/yr) bar chart overlaid with the prior year by month. Use different colors to indicate the contribution of gas and electricity to each monthly total bar.

- b. Monthly System Total Energy (kbtu) and EUI (kbtu/sf/yr) bar chart overlaid with the prior year by month. Use different colors to indicate the contribution of each end use (Mechanical, plug loads, plumbing, and lighting) to each monthly total bar.
- c. Current Day's end use energy demand (kW) overlaid with the annual weekday and weekend average demand (kW), and temperature in a line chart. Provide separate slides for Lighting and Plug Load end uses.
- d. Current Day's end use energy demand (kbtu/hr) overlaid with the annual weekday and weekend average demand (kbtu/hr), and temperature in a line chart. Provide separate slides for Mechanical and Plumbing Load end uses.
- e. Energy Meter Gauge indicating real-time end use energy demand (kW and W/sf) for Lighting and Plug Loads.
- f. Energy use pie chart indicating percent of annual energy from each enduses (Mechanical, Plumbing, Plug Loads and Lighting).
- g. Monthly water usage (gallons) and WUI (gallons/person/year) bar chart overlaid with the prior year by month.

G. Current Sensors and Transformers

1. Current Transformers, 5A:
 - a. Submetering:
 - 1) Accuracy: 1.0 percent (10 percent-100 percent of Current Transformer rating).
 - 2) Split-core: Flex-core, Hawkeye, Square-D, Veris.
2. Current Sensors; 0-5 VDC, 330 milli-volt:
 - a. Submetering:
 - 1) Accuracy: 1.0 percent (10 percent-100 percent of Current Transformer rating).
 - 2) Manufacturers: Square-D, Magnelab, Veris, Sentron.

H. Electrical Energy Meters

1. Measured values: Real kWh, Reactive kVARh, Apparent kVAh, kW, power factor, RMS power and current per phase.
2. Voltage: monitored circuit voltage indicated in documents.
3. Current Transformers: Provide milli-volt compatible meters where milli-volt Current Transformers are used.
4. Minimum Current Transformer input amperage (5 Amp Current Transformer only): 10A.
5. Sampling rate: minimum 3kHz.
6. Submetering Meter Accuracy: +/-1 percent accuracy (10 percent to 100 percent of Current Transformer rating).
7. Manufacturers: Veris E50, Siemens, Square D.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Operator Workstation: Locate as shown or submit proposed location where not shown.

- B. Mounting Panels: Locate panels where shown on Drawings or near item of equipment to be controlled, but not on equipment itself.
- C. DDC Field Panels:
 - 1. Provide number of panels required to accommodate DI, DO, AI, and AO points and hardware and software to accomplish specified control sequenced.
 - 2. Locate panels in mechanical or electrical rooms
 - 3. Submit proposed locations for approval prior to preparing control drawings.
- D. Pneumatic Signals: The use of pneumatic signals to start and stop motors is not allowed.
- E. Electrical:
 - 1. Provide control wiring for control devices and control panels.
 - 2. Run control wiring in mechanical rooms or locations susceptible to damage in conduit. Plenum rated cable may be used in other locations.
 - 3. Provide power wiring for control devices and control panels. Utilize designated circuits in electrical power panels. Refer to Electrical Drawings. If no circuits are designated for DDC Controls, submit detailed request for use of spare circuits at no additional cost.
 - 4. Install power wiring in conduit.
 - 5. Grounding: Instrumentation and communication grounding installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.
 - 6. Control voltage limited to maximum of 120V.
 - 7. Where relay coil is connected to load side of motor starter to energize with motor operation, external control circuit properly fused with fuse block located in respective starter enclosure.
 - 8. Where relays are used to control single-phase motors directly, provide contacts rated for not less than horsepower rating of largest motor switched by relay.
- F. Identification: Provide engraved nameplates identifying switches, lights and starters, and each control device where control function is not readily apparent.
- G. Room Thermostats and Room Sensors
 - 1. Wall Thermostats and Room Sensors with User Adjustment: Mount at height of 48 inches above finished floor.
 - 2. Wall Thermostats and Room Sensors without User Adjustment: Mount at height of 60 inches above finished floor.
 - 3. Provide insulating back on thermostats mounted on exterior walls.
 - 4. Provide one thermostat for each zone of temperature control.

5. Submit proposed locations for approval prior to preparing control drawings, where not shown or alternate location is proposed.

H. Carbon Dioxide Sensor

1. Mount sensor at 5 feet above finished floor or as indicated on the plans.
2. Provide sensor quantity as indicated on plans or as required by sensor coverage rating (max. 20-foot radius).
3. Alarm above 850 ppm.
4. Refer to sequence of operations for more information on sensor use.

I. Airflow Station (Duct-Mounted):

1. Install grid array in ductwork according to manufacturer's recommendations.
2. Provide gasket between frame and duct.

J. Airflow Station (Fan Inlet): Install in fan inlet bell in accordance with the manufacturer's instructions.

K. Automatic Air Flow Station Measuring Damper: Install in accordance with the manufacturer's recommendations.

L. Leak Detection System: Refer to Drawings for required locations and extent of area to be covered. Install in accordance with the manufacturer's instructions.

M. Window Switch:

1. Installation of window switches in accordance with window manufacturer's requirements and not to void window warranty.
2. Provide necessary components for a complete installation.
3. Coordinate with window manufacturer for factory or field installation of components.
4. Align magnet with proximity switch.
5. Coordinate installation with Architect and other trades.

3.02 ENERGY METERS

A. Configure system wiring so metering instrument can be isolated and removed from the system without the need to de-energize any power or protective circuit. This requirement may be met in one of two ways:

1. Connections to the metering instrument may be made using separable terminal blocks.
2. Terminal Blocks:
 - a. Short the Current Transformer circuit prior to breaking the metering instrument circuit on removal and make the metering instrument circuit prior to unshorting the current transformer circuit on insertion.

- b. Transformer and line voltage terminals finger safe when left disconnected and energized.
 3. Connections to the metering instrument may be made through test blocks with disconnecting switches for line and neutral voltage circuits and shorting switches for current transformer circuits.
- B. System wiring within switchgear of switchboard assembly type SIS, termination of In accordance with manufacturer's published requirements.
- C. Provide overcurrent protection for metering equipment based on manufacturer's guidelines and the available fault current at the measurement point. This requirement may be met in one of three ways:
 1. Meter within 30 feet of Current Transformers:
 - a. Provide meter housing with integral fusing.
 - b. Provide circuit breaker or fused disconnecting means adjacent to equipment monitored.
 - c. Provide PT with integral fusing.
 2. Meter over 30 feet from Current Transformers:
 - a. Provide circuit breaker disconnect at equipment location for meter point and individual conductor fusing at meter equipment location.
- D. Provide Current Transformers sized based on minimum circuit ampacity listed on equipment nameplate or circuit overcurrent protection device rating.
- E. Provide Current Transformer conductors sized per manufacturer's published requirements based on length of run.
- F. NEMA 1 housing unless noted otherwise. Meters located in a rooftop or exterior environment NEMA 3R housing.
- G. Provide additional NEMA enclosures as necessary for Current Transformers in order to provide manufacturer recommended clearances between separate Current Transformers.
- H. Calibrate instrumentation based on National Institute of Standards and Technology, NIST, procedures.

END OF SECTION

SECTION 23 31 01

HVAC DUCTS AND CASING-LOW PRESSURE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Supports, Anchorage And Restraints
 - 2. Sheetmetal Ductwork
 - 3. Single Wall Housing Plenums
 - 4. Flexible Ducts
 - 5. Acoustical Lined Plenums
 - 6. Exposed or Visible Ductwork In Finished Spaces
 - 7. Stainless Steel Ductwork
 - 8. Aluminum Ductwork
- B. Related Sections include:
 - 1. Section 23 05 48, Vibration and Seismic Controls for HVAC Piping Equipment
 - 2. Section 23 07 00, Insulation for HVAC
 - 3. Section 23 33 00, Air Duct Accessories
 - 4. Section 22 30 00, Plumbing Equipment

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Work performed by qualified, experienced mechanics, in accordance with the manual of Duct and Sheet Metal Construction of the Sheet Metal and Air Conditioning Contractors National Association and these Specifications.

B. Regulatory Requirements:

1. Entire ductwork system, including materials and installation, installed in accordance with NFPA 90A.
2. Ductwork and components UL 181 listed, Class I air duct, flame rating not to exceed 25 and smoke rating not to exceed 50.

1.04 SUBMITTALS

A. Submit the following:

1. Provide catalog data on each product specified hereunder.
2. Schedule of duct construction standards.
3. Provide shop drawings showing materials and construction details for single wall housing plenum.
4. Provide shop drawings showing construction details, support, and seismic restraint of ductwork distribution systems.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Supports, Anchorage And Restraints:

1. Mason Industries.

B. Flexible Ducts:

1. Thermaflex M-KE
2. Gen Flex IMP-25S
3. Other Manufacturers: Submit substitution request.

2.02 SUPPORTS, ANCHORAGE AND RESTRAINTS

A. General:

1. When supports, anchorages, and seismic restraints for equipment, and supports and seismic restraints for ductwork are not shown on the Drawings, and response for design.
2. Resist seismic forces as specified in the latest edition of the International Building Code for the seismic zone in which the project is constructed.
3. Seismic restraints follow provisions described in Section 23 05 48, Vibration and Seismic Control for HVAC Piping and Equipment.
4. Seismic restraints not to introduce stresses in the ductwork caused by thermal expansion or contraction.

5. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
- B. Suspended Ductwork: Seismic restraints in accordance with the latest edition of the SMACNA, Seismic Restraint Manual - Guidelines for Mechanical Systems for the seismic hazard level corresponding to the seismic zone in which the project is constructed.
- C. Engineered Support Systems: The following support systems designed, detailed, and bear the seal of a professional engineer registered in the State having jurisdiction:
 1. Supports and seismic restraints for suspended ductwork and equipment.
 2. Support frames for ductwork and equipment which provide support from below.
 3. Equipment and ductwork support frame anchorage to supporting slab or structure.

2.03 SHEETMETAL DUCTWORK

- A. Fabricate from galvanized steel, unless noted otherwise.
- B. Minimum gauge, duct construction, joint reinforcing, fittings, hangers, and supports in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, Latest Edition.
- C. Duct Classification: Ducts considered low pressure when design velocities are 2000 fpm or less and maximum static pressure is 2-inches wg positive or negative.
 1. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 1/2-inch wg positive or negative.
 - a. Supply ductwork downstream from terminal units.
 - b. Supply, return or exhaust ductwork serving fans scheduled to operate at less than 1/2-inch wg
 - c. Supply, return, or exhaust branch ductwork which serves one or two inlets/outlets.
 2. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 1-inch wg positive or negative.
 - a. Supply, return, or exhaust ductwork serving fans scheduled to operate at less than 1-inch wg On supply fans pressure drops for louvers, coils, clean filters, and sound traps may be deleted from scheduled fan static.
 - b. Supply, return, or exhaust ductwork serving multiple duct branches where contractor can demonstrate that pressures will not exceed 1-inch wg positive or negative.
 - c. Boiler direct vent combustion air intake ductwork.
 - d. Water heater direct vent combustion air intake ductwork.
 3. The following ductwork constructed in accordance with minimum reinforcement requirements for static pressure class of 2-inches wg, positive or negative.
 - a. Supply, return, or exhaust ductwork serving fans scheduled to operate at pressures greater than 1-inch wg positive or negative.
- D. Longitudinal seams on rectangular duct, pittsburgh or Button punch snap lock. Snap lock seams for round duct may be used only on ducts classified for 1/2-inch wg Longitudinal seams for round ducts using lap and rivet, spot weld, or fillet weld may be used only on ducts classified for statics 1-inch wg or less.
- E. Joining and reinforcing systems manufactured by Ductmate, Roloc, or TDC are acceptable. Ductmate 35 is equivalent to SMACNA J, and Ductmate 25 is equivalent to SMACNA F.

- F. Use of adjustable round elbows not permitted.

2.04 SINGLE WALL HOUSING PLENUMS

- A. Fabricate from galvanized steel, unless otherwise noted.
- B. Minimum gauge not less than 18 gauge except panels 10-feet-1-inch or longer 16 gauge.
- C. Housing panels constructed in accordance with the latest edition of SMACNA HVAC Duct Construction Standards – Metal and Flexible.
- D. Minimum pressure classification for single wall housing panels is 2-inches wg positive or negative.
- E. Maximum allowable panel width 24-inches with standing interlocking seams.
- F. Openings in panels for air inlets/outlets, or access doors reinforced per SMACNA standards.
- G. Provide intermediate reinforcing and/or bracing when spans are 8-feet or longer.
- H. Line interior surfaces of single wall plenums with minimum of 2-inch thick acoustical lining.
- I. Access Doors:
 - 1. Construct of 20-gauge galvanized steel, double wall construction.
 - 2. Install in opening in plenum panel reinforced with 10-gauge channel.
 - 3. Doors mounted on three hinges and seat against neoprene gaskets.
 - 4. Doors in plenums at humidifiers have 12-inch by 12-inch double glass inserts from observation.
 - 5. Doors 24-inch by 60-inch height unless otherwise indicated.

2.05 FLEXIBLE DUCTS

- A. Flexible air duct with CPE or metal film liner permanently bonded to coated spring steel wire helix with 1-inch thick fiberglass insulation blanket covered with fiberglass reinforced metal film vapor barrier jacket.
- B. Duct rated for 6-inch wg positive and 1-inch wg negative.

2.06 ACOUSTICAL LINED PLENUMS

- A. Panels:
 - 1. Double wall insulated panel consisting of 20-gauge galvanized steel perforated interior panel, 4-inch thick fiberglass insulation, and 18-gauge outer panel.
 - 2. Panels located downstream of final filters have solid inside panel or sheet Mylar liner between inside perforated panel and insulation.

3. Panels of tongue and groove construction with adjacent panels held rigidly in position by self-interlocking joint effective inside or out. As alternate panels may be joined with H-channels.
- B. Housing Construction:
1. Capable of withstanding pressures up to 4-inches WG positive on supply ductwork and 4-inches WG negative on return and exhaust ductwork.
 2. Deflection at design pressure not to exceed 1/200 of span.
- C. For spans 12-feet or greater, provide additional structural reinforcement.

2.07 EXPOSED OR VISIBLE DUCTWORK IN FINISHED SPACES

- A. Round:
1. Material:
 - a. Round or flat oval, machine formed, spiral lock-seam galvanized sheet metal ductwork of thicknesses as listed for sheet metal duct.
 - b. Paintable surface.
 2. Fittings: Machine formed, shop fabricated, with welded seams, designed for easiest air flow, similar to United Sheetmetal numbers listed.
 - a. Mitered Elbow with Turning Vanes: Type EV-90-2.
 - b. Radius Elbows: Type E090-5. Similar for less than 90 degree elbows.
 - c. Tees: Type Con-T-1.
 - d. Reducing Fittings: May be used unless noted otherwise.
- B. Rectangular:
1. Same as for sheet metal ductwork but paintable surface.
 2. Inside reinforcing.
 3. Use special care to prevent imperfections in the metal surface.

2.08 STAINLESS STEEL DUCTWORK

- A. Ductwork listed below and ductwork indicated on drawings constructed of 18 gauge minimum stainless steel with 2D finish concealed and No. 4 finish exposed. Type 304 or 316 as indicated.
- B. Seams: Welded and liquid tight.
- C. Accessories:
1. Stainless steel including dampers
 2. Damper Hardware
 3. Turning Vanes

2.09 ALUMINUM DUCTWORK

- A. Ductwork listed below and ductwork indicated on drawings constructed of 3003-H-14 alloy aluminum. Gauge of metal and construction details to be determined by using minimum equivalent thickness and reinforcing for galvanized steel tables in SMACNA.
- B. Longitudinal seams, Pittsburgh type.
- C. Button punch snap lock seams not allowed.

PART 3 - EXECUTION

3.01 APPLIED LOCATIONS

- A. Supply ductwork on downstream side of terminal box. Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.
- B. Supply Ductwork from Spin-In Fittings to Supply Outlet Collar Connection: Flexible duct, maximum 4-foot length.
- C. Return Air Trunk Ductwork from End Run to Unit Connection: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.
- D. Exhaust Ductwork: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.
- E. Ductwork between Transfer Grilles: Galvanized sheet metal ductwork, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.
- F. Exposed or Visible Ductwork in Finished Spaces: Sheet metal as specified for application, lined where indicated on the Drawings or as specified in Section 23 07 00, Insulation for HVAC.
- G. Acoustical lined plenums on inlet and outlet of rooftop units. Plenum size sufficient for duct connections as shown on plans, minimum plenum size and same as unit opening.
- H. Stainless Steel Ducts: Type 304, 10-feet downstream of showers or duct mounted humidifiers.
- I. Aluminum ducts:
 - 1. Dedicated shower exhaust systems.
 - 2. Shower and moisture laden air exhaust branch ducts up to the point of connection to the main exhaust system.

3.02 INSTALLATION

- A. Ductwork:
 - 1. Seal traverse joints with an approved mastic during joining procedure or tape after joining to provide airtight duct system.

2. Low pressure ductwork hanger and support systems in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible. Wire supports are not allowed.
3. Provide supplementary steel for support of ductwork in shafts and between building structural members.
4. Fabricate changes in direction to permit easy air flow, using full 1.5D radius bends or fixed turning vanes in square elbows. Radius elbows less than 1.5D radius, splitter vanes.
5. Change in duct size or shape necessitated by interference made using rectangular equivalents of equal velocity.
6. Where pipe, structural member, or other obstruction passes through a duct, provide streamlined sheet metal collar around member and increase duct size to maintain net free area. Fit collar and caulk to make air tight.

B. Sound Attenuation (Internal Insulation):

1. Provide sound attenuation duct where shown and as specified under Section 23 07 00, Insulation for HVAC.
2. Duct dimensions shown are net inside attenuating material.

C. Dampers:

1. Install where shown and where necessary to complete final balancing of system.
2. Install regulators as specified in Section 23 33 00, Air Duct Accessories for each specific project condition.
3. Leave dampers locked wide open in preparation for balancing.

D. Extractors: Install behind supply grilles and registers where shown.

E. Flexible Connectors:

1. Make connections to fans and other rotating equipment with flexible connectors with 2-inch minimum clearance between casing and ductwork.
2. Not required on internally spring isolated units.

F. Spin-in Fittings:

1. Install at branch takeoffs to outlets using round or flex duct.
2. Connect to flexible duct with draw band strap and minimum of two wraps of duct tape.
3. Leave dampers locked wide open.

G. Flexible Ducts:

1. Make connections at ends using draw band strap and a minimum of 2 wraps of duct tape.

2. Suspend center spans from structure above using wire as required by code. Connect to manufacturer's eyelet on jacket or use 1-inch wide galvanized steel strap with single loop at top and smooth edges.
 3. Suspending duct by laying it on the ceiling is prohibited.
 4. Avoid crimping flex duct. Changes in direction made using 2D radius. Duct connections to grilles, registers and diffusers using less than 2D radius bends are not acceptable. Where space is constricted, use sheet metal elbows or Thermaflex Flex Boots (or equal).
- H. Ductwork, Grease Hood Exhaust:
1. Slope minimum of 1/4-inch per*foot of run toward the hood. Where horizontal ducts exceed 75-feet in length, slope minimum of 1-inch per*foot of run.
 2. Install access doors at every change in direction and maximum of 10-feet on center.
 3. Provide access doors and allow penetrations for sprinklers as required by Fire Protection section of these specifications.
 4. Install ductwork in a rated shaft as specified under other divisions of work.
- I. Ductwork, Exposed or Visible in Finished Areas:
1. Use extreme care in handling and installing.
 2. Replace dented or damaged sections.
 3. Install ductwork straight and true, parallel to building lines.
 4. Make connections with pop rivets using couplings where applicable. Grind raw edges smooth and apply paintable sealant to cover imperfections.
 5. Remove excess sealant to provide a finished joint.
 6. Provide floor, wall, and ceiling plates as specified in Section 23 05 00, Common Work Results for HVAC.
 7. Finish, clean and prime ductwork and hangers for painting.
- J. Single Wall Housing Plenums:
1. Install housing plenums in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, latest edition.
 2. Joints and seams sealed with high pressure duct sealer or gaskets and fastened with bolts, screws, or pop rivets.
 3. Pipe, duct, conduit, and control penetrations sealed to prevent air leakage using close off sheets and strips.
 4. Securely anchor housing panels to floor or roof curbs.
 5. Block outside air or return air dampers open to prevent damage during construction until automatic control system is operational and adjusted.

6. Provide access doors where indicated on drawings and where required to provide access for cleaning and maintenance. Access doors installed to open against air pressure.
 7. Slope plenum and connected ductwork to drain towards the exterior louver or building exterior opening.
 8. For single wall plenums installed behind exterior louvers or wall openings, slope plenum floor and connected ductwork at 1/4-inch/foot to drain towards the exterior louver or opening.
 9. For single wall plenums installed below roof ventilators or roof openings, slope floor of plenum at 1/4-inch/foot to drain connection. Pipe drain connection to floor drain.
- K. Stainless Steel Duct: Install stainless steel ductwork similar to galvanized ductwork per SMACNA standards.
- L. Aluminum Duct:
1. Slope minimum of 1/4-inch per foot of run toward the grille.
 2. Install similar to galvanized duct work per SMACNA standards.
 3. Provide dielectric protection when joining aluminum duct to steel duct by utilizing neoprene flexible connections or other approved method.
 4. Use aluminum straps and hangers to support aluminum, ductwork.

3.03 FIELD QUALITY CONTROL

- A. Coordination with Balance Agency:
1. Provide services of a sheet metal person familiar with the system ductwork to provide assistance to the balancing agency during the initial phases of air balancing in locating sheet metal dampers.
 2. Install missing dampers required to complete final balancing.

END OF SECTION

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SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Medium Pressure Duct Accessories
 - 2. Low Pressure Duct Accessories
 - 3. Fire and Smoke Dampers
- B. Related Sections include:
 - 1. Section 23 31 01, HVAC Ducts and Casing-Low Pressure
 - 2. Section 23 31 02, HVAC Ducts and Casing-Medium Pressure
 - 3. Section 23 09 00, Instrumentation and Controls for HVAC

1.03 QUALITY ASSURANCE

- A. Work performed by qualified, experienced mechanics in accordance with the manual of Duct and Sheet Metal Construction of the National Association of Sheet Metal and Air Conditioning Contractors and these Specifications.
- B. Install entire ductwork system, including materials and installation, in accordance with NFPA 90A.
- C. Flexible connectors, flexible equipment connections, tapes, and sealants listed as UL 181, Class I air duct. Flame spread rating not to exceed 25 and smoke developed rating not to exceed 50.

1.04 SUBMITTALS

- A. Submit the following: Product data for Duct Accessories.
 - 1. Medium Pressure Duct Accessories:
 - a. Acoustical Turning Vanes
 - b. Access Doors

- c. Bell Mouth Fittings
- d. Duct Sealer

- 2. Low Pressure Duct Accessories:
 - a. Constant Airflow Regulators
 - b. Access Doors
 - c. Backdraft Dampers
 - d. Water Eliminators
 - e. Roof Jack
 - f. Automatic Dampers
 - g. Duct Sealer

- 3. Fire and Smoke Dampers:
 - a. Combination Smoke and Fire Dampers

- B. Operation and Maintenance Data: Automatic dampers, Combination smoke and fire dampers, air flow station.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Medium Pressure Duct Accessories:
 - 1. Duct Sealer:
 - a. McGill Airseal Zero
 - b. Design Polymerics DP 1090.
 - c. Other Manufacturers: Submit substitution request.

 - 2. Flexible Equipment Connector:
 - a. Duro Dyne Corporation
 - b. Ventfabrics

 - 3. Acoustical Turning Vanes:
 - a. AirSan Acoustiturn
 - b. Or approved equal.

 - 4. Access Doors:
 - a. United Sheetmetal APR or ASR
 - b. Metco
 - c. Semco
 - d. Cesco
 - e. Ruskin
 - f. Nailor-Hart
 - g. Or approved equal.

- B. Low Pressure Duct Accessories:
 - 1. Flexible Equipment Connector:
 - a. Duro Dyne Corporation
 - b. Ventfabrics

 - 2. Extrators:
 - a. Carnes
 - b. Anemostat

- c. Barber-Coleman
 - d. Nailor-Hart
 - e. Or approved equal.
3. Access Doors:
- a. Air Balance
 - b. Ruskin
 - c. Metco
 - d. Duro Dyne Corporation
 - e. Cesco
 - f. Nailor-Hart
 - g. Or approved equal.
4. Backdraft Dampers:
- a. Air Balance
 - b. Ruskin
 - c. Cesco
 - d. Advanced Air
 - e. Nailor-Hart
 - f. Or approved equal.
- C. Fire and Smoke Dampers:
- 1. Where Ruskin is the only manufacturer indicated, equivalent products may be furnished.

2.02 MEDIUM PRESSURE DUCT ACCESSORIES

- A. Duct Sealer:
- 1. Description:
 - a. Suitable for indoor/outdoor use, including application in moist conditions, rated to 10-inch wg.
 - b. Maximum Flame Spread/Smoke Developed Rating of 25/50, maximum VOC of 420 g/L less water.
 - c. SCAQMD Rule 1168 compliant.
- B. Flexible Equipment Connector:
- 1. Description: Woven fiberglass fabric with neoprene coating, air-tight, water-tight, fire retardant.
 - 2. Minimum Density: 30 oz. per sq. yd.
 - 3. Temperature Range: -20 degrees F to 200 degrees F
 - 4. Pressure Range: -10-inch wg to +10-inch wg
- C. Turning Vane Assemblies:
- 1. Sheet Metal Vanes: Multiple radius hollow vane air foil type with 4-1/2-inch inside radius, galvanized steel construction.
 - 2. Runners: Embossed type.

D. Acoustical Turning Vanes:

1. Multiple radius air foil type, perforated steel construction with fiberglass fill.

E. Access Doors:

1. Round, oval or rectangular to match duct, single wall to open against positive duct pressure, fastened with spring clips, pressure seal gasket, fastened with chain. Double wall access doors similar except provide insulated frame and insulated door.

F. Bell Mouth Fittings: Round or flat oval, radius of 0.20 D minimum.

2.03 LOW PRESSURE DUCT ACCESSORIES

A. Damper Regulators:

1. Ventlok model numbers used, similar products by Young, Duro Dyne Corporation or approved equal are acceptable.
2. Dial Regulator:
 - a. Concealed or exposed duct in unfinished spaces, blade lengths 18-inch and less, 3/8-inch, Ventlok 635, or 638 for insulated duct.
 - b. For blade lengths, 19-inches and above, similar except 1/2-inch shafts.
3. Dial Regulator: Exposed duct finished space, 3/8-inch, Ventlok 640.
4. Dial Regulator:
 - a. Concealed, not accessible, blade lengths 18-inch and less, 3/8-inch Ventlok 666 regulator with 680 mitered gear assembly where right angle turn is necessary.
 - b. Blade lengths 19-inches and above, similar except 1/2-inch shafts.
5. End Bearings:
 - a. Ducts rated to 1-inch WG, open end, Ventlock 607.
 - b. Ducts rated above 1-inch WG, closed end, Ventlock 609.
 - c. Exposed ductwork, finished spaces, Ventlock 609.
 - d. Spring end bearings not allowed.

B. Constant Airflow Regulator:

1. Constant volume pressure regulator, round or rectangular, as conditions dictate, UL listed for flame and smoke generation.
2. Factory assembled and calibrated assembly, no field adjustment necessary.
3. Regulators maintain constant airflow +/- 10 percent of scheduled airflow rates within operating the pressure range of the system.
4. Units to have flange connection.
5. Provide 5-year warranty.
6. Based on: CAR by American Aldes or approved equal.

C. Volume Damper Fabrication:

1. Single blade dampers reinforced or crimped for rigidity, with pivot rod extending through duct. Dampers over 12-inches high use multiple opposed blade damper. Single blade damper no larger than 12-inches by 48-inches. Multiple blade damper factory fabricated, Ruskin MD-35 or equal.
2. Minimum gauge and duct construction in accordance with SMACNA, HVAC Duct Construction Standards, latest edition.
3. Splitter and butterfly dampers fabricated of 18 gauge galvanized steel.
4. Dampers of length suitable to close branch ducts without damper flutter.
5. Damper blade must be aligned with handle and index pointer.

D. Flexible Equipment Connector:

1. Description: Woven fiberglass fabric with neoprene coating, air-tight, water-tight, fire retardant.
2. Minimum Density: 30 oz. per sq. yd.
3. Temperature Range: -20 degrees F to 200 degrees F
4. Pressure Range: -10-inch wg to +10-inch wg

E. Extractors (EX): Gang operated blades, steel construction, blades at 1-inch centers, slide operator set 15 degrees into main trunk duct, Titus AG-45 with No. 1 operator.

F. Spin-in Fittings:

1. Sheet Metal Duct:
 - a. Straight pattern sheet metal spin-in fitting with scoops designed for connection to sheet metal ductwork, volume damper, and locking quadrant.
 - b. Construction with spot welds or rivets.
 - c. Button-punch fabrication prohibited.
2. Fiberglass Duct:
 - a. Straight pattern sheet metal spin-in fitting with scoops designed for connection to fiberglass ductwork volume damper, and locking quadrant.
 - b. Spot weld or rivet construction.
 - c. Button-punch fabrication prohibited.

G. Duct Sealer:

1. Based On:
 - a. McGill Airseal Zero
 - b. Design Polymerics DP 1090
2. Description:
 - a. Suitable for indoor/outdoor use, including application in moist conditions, rated to 10-inch wg.
 - b. Maximum Flame Spread/Smoke Developed Rating of 25/50, maximum VOC of 420 g/L less water.

c. SCAQMD Rule 1168 compliant.

H. Duct Tape for Sheet Metal:

1. ARNO C520 duct tape similar United
2. Duro Dyne Corporation
3. Nashua

I. Tape and Adhesive/Activator System for Sheet Metal: Hardcast, Polymer Adhesives.

J. Turning Vane Assemblies:

1. Sheet Metal Vanes: Multiple radius hollow vane air foil type 2-inch (small vane) or 4-1/2-inch (large vane) inside radius, galvanized steel construction.
2. Runners: Push-on type.
3. Acoustical Vanes: Multiple radius air foil type, perforated steel construction with fiberglass fill. AirSan Acoustiturn or as approved.

K. Access Doors:

1. Doors complete with steel frame, steel door with backing plate, cam latches (two on units 14-inch by 14-inch and larger), hinge, and gasketing. Insulate doors on insulated or lined ducts.
2. Grease Duct Access Door: Construct of metal thickness equal to metal duct, doors air, and grease tight with hinge and hand operable latches. Ductmate.
3. Size:

Duct Width or Duct Diameter	Net Access Door Opening
Up to 8-inch	6-inch by 6-inch
9-inch to 12-inch	8-inch by 8-inch
13-inch to 20-inch	12-inch by 12-inch
21-inch to 30-inch	16-inch by 14-inch
31-inch to 42-inch	18-inch by 14-inch
Over 42-inch	Two 16-inch by 14-inch

L. Backdraft Dampers:

1. Description: Gravity operated, vinyl edged, metal bladed backdraft dampers.

M. Drip Pans: Provide Type 304 stainless steel drip pans for cooling coils and exhaust heat recovery coils on built-up units as indicated.

N. Louver Blank-off Panels:

1. At air intake or exhaust louvers which are only partially active area, blank off inactive area with sheet metal closure panels caulked airtight secured to louver frame and insulated with 2-inch rigid fiberglass insulation per Section 23 07 00, Insulation for HVAC.

O. Roof Jack: Enamel finish steel with back draft damper and bird screen. Broan 636, or equal.

P. Automatic Dampers:

1. Description:
 - a. Multi-blade air foil type, except where either dimension is less than 10-inches a single blade may be used. Maximum blade length to be 48-inches.
 - b. Provide parallel blades for positive or modulating mixing service and opposed blades for throttling service.
 - c. Blades to be interlocking, minimum 16 gauge galvanized steel.
2. Compression type edge seals and side seating stops.
3. Reinforced blades, have continuous full length axle shafts, axle to axle linkage, and/or operating jackshafts to provide coordinated tracking of blades.
4. Dampers over 25 square-feet in area to be in two or more sections, with interconnected blades. Maximum air leakage of 3 cfm per square foot at 1-inch wg pressure.
5. Provide automatic dampers except those specified to be provided with units. Tested in accordance with AMCA Standard 500. Based on Ruskin CD-60.
6. Damper Operators: Refer to Section 23 09 00, Instrumentation and Controls for HVAC.
7. Manufacturers:
 - a. Ruskin
 - b. Greenheck
 - c. Air Balance
 - d. Cesco
 - e. Or equal.

2.04 FIRE AND SMOKE DAMPERS

A. Dynamic Fire Dampers:

1. Code Compliance: Provide dynamic fire dampers with a UL 555 label for fire rating indicated and in conformance with NFPA 90A.
2. Integrally hinged, folding blade curtain type, for installation in ductwork complete with 160 degrees F fire link and retainer.
3. Suitable for horizontal or vertical installation as required. Furnish stainless steel closure springs and cam lock for complete damper closure on dampers to be installed in vertical air flow positions.
4. Medium pressure, 1-1/2-hour: For use in partitions up to 2-hour rating with damper out of air stream. Ruskin Model DIBD2, Style C for rectangular, Style CR for round, style CO for oval.
5. Medium pressure, 3-hour: for use in partitions over 2-hour rating with damper out of air stream. Ruskin Model DIBD23, Style C for rectangular, Style CR for round, Style CO for oval.
6. Low pressure, 1-1/2-hour: For use in partitions up to 2-hour rating with damper out of air stream for supply.
 - a. Ruskin Model DIBD2 Style B for supply.
 - b. Ruskin Model DIBD2 Style A for return or exhaust.

7. Low pressure, 3-hour: For use in partitions over 2-hour rating with damper out of air stream for supply.
 - a. Ruskin Model DIBD23 Style B for supply.
 - b. Ruskin Model DIBD23 Style A for return or exhaust.
8. Provide factory installed and wired UL listed duct smoke detector for 0-3000 fpm flow, Ruskin Model DSDN as part of assembly. Provide contactor from smoke detector to fire alarm system.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install devices as shown on the Contract Drawings and per manufacturer's recommendations.
- B. Medium Pressure Duct Accessory installation specified under Section 23 31 02, HVAC Ducts and Casing-Medium Pressure.
- C. Low Pressure Duct Accessory installation specified under Section 23 31 01, HVAC Ducts and Casing-Low Pressure.
- D. Smoke Dampers and Combination Fire and Smoke Dampers:
 1. Install dampers in accordance with NFPA 90A and manufacturer's written recommendations.
 2. Size and locate dampers as shown on Drawings.
 3. Where dampers are not accessible for servicing by removing an outlet, provide access doors for servicing. Doors compatible with the duct in which they are installed.
- E. Access Doors: Install where indicated and at duct mounted coils, humidifiers, automatic control dampers, smoke dampers, fire dampers, airflow stations, to provide access for cleaning and maintenance.
- F. Back Draft Dampers: Install where indicated and at the discharge (or inlet) of exhaust fans where automatic dampers are not indicated.
- G. Automatic Dampers: Install where indicated and are not specified with equipment or in Section 23 09 00, Instrumentation and Controls for HVAC. Coordinate damper operators with Section 23 09 00, Instrumentation and Controls for HVAC.
- H. Drip Pans:
 1. Install under each cooling coil and exhaust heat recovery coil as indicated.
 2. Provide drain connection from each drip pan and pipe to nearest floor drain through trap.
 3. Drip pans over 6-feet in length require drain connections from both ends.
 4. Pitch drip pans in direction of air flow and to drain.

- I. Louver Blank-off Panels: Install blank-off panels on unused portions of louvers.

END OF SECTION

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SECTION 23 34 00

HVAC FANS

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.
- B. The provisions of Section 23 05 00, Common Work Results for HVAC apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Centrifugal Fans
 - 2. Roof Exhaust Fans
 - 3. Roof Vents
 - 4. Inline Centrifugal Fans

1.03 SUBMITTALS

- A. Submit the following:
 - 1. Shop Drawings: Showing dimensions, details of construction.
 - 2. Product Data: Showing performance of fans.
 - 3. Operation and Maintenance Data
 - 4. Submit certified sound power ratings for each fan.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Centrifugal Fans:
 - 1. Pace
 - 2. Trane
 - 3. Barry
 - 4. Twin City

5. Peerless
6. Aerovent
7. Acme
8. Greenheck
9. Cook
10. Other Manufacturers: Submit substitution request.

B. Roof Exhaust Fans:

1. Carnes
2. Penn
3. Greenheck
4. Cook
5. Acme
6. Twin City
7. Other Manufacturers: Submit substitution request.

C. Roof Vent:

1. Carnes
2. Penn
3. Greenheck
4. Acme
5. Cook
6. Twin City
7. Other Manufacturers: Submit substitution request.

D. Inline Centrifugal Fans

1. Greenheck
2. Penn
3. Cook
4. Acme
5. Carnes

6. Twin City
7. Other Manufacturers: Submit substitution request.

2.02 CENTRIFUGAL FANS

- A. Description: Centrifugal or utility type centrifugal fans as indicated, standard factory finish, AMCA rated.
- B. Fans:
 1. Single width, single inlet, double width, double inlet, forward curved, backward inclined, or air foil blades as scheduled.
 2. Welded steel housing with sloped cut-off plates, spun steel or die formed inlet cone, welded steel supports.
 3. Statically and dynamically balanced in the factory as an assembly within its own bearings with a maximum full amplitude shaft deflection at bearings not to exceed 0.001-inch at 1200 RPM to meet ANSI S 2.19 G2.5 balance quality grade.
 4. Grease packed pillow block sealed bearings with not less than two pillow blocks per fan assembly. L-10 bearing life of 80,000 hours minimum per AFBMA Standards.
- C. Motor:
 1. Integrally mounted, 1800 rpm maximum, with pre-lubricated sealed ball bearings.
 2. Refer to Section 23 05 00 for energy efficient motor requirements.
- D. Drive:
 1. Sized for 150 percent of motor horsepower, cast iron adjustable sheaves, V-belt type, sheaves statically and dynamically balanced, multiple belt drives on units over 2 HP.
 2. Metal guard over drive, OSHA approved.
 3. Provide fixed sheaves units over 5 HP.
 4. Replace fan sheaves as necessary to obtain desired results.
 5. Include allowance for one sheave change for fans with fixed sheaves.
 6. For fans used as part of a life safety system, provide 1-1/2 times the number of belts required, with a minimum of 2.
- E. Provide vibration isolation as indicated on drawings and in accordance with Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment.
- F. Smoke Control Fans: Provide UL listing as Power Ventilators for Smoke Control Systems where used as a smoke control fan.
- G. Fans exposed to weather have heavy gauge protective covers over bearings and shaft assembly.

- H. Fan outlets with removable angles and bolts for attaching flexible connections or discharge dampers.
- I. Scroll on fans used for kitchen grease exhaust, dishwasher exhaust, and cart wash exhaust, which are subject to moist air streams fully welded and have scroll drains.
- J. Provide automatic motor operated discharge dampers where indicated. Damper as specified in Section 23 09 00, Instrumentation and Controls for HVAC.
- K. Provide fans as indicated with AMCA Type B spark resistant construction.
- L. Provide fans as indicated with protective coating on fan wheel and interior of fan housing. Apply coating before balancing fans and repair breaks in coating which occur during balancing. Coating one 6 mil coat of white plasite 7122 and one 6 mil coat of black plasite 7122.
- M. Sound power level (10W-12W) at fan inlet and discharge when producing CFM at static pressure not to exceed following in octave band:

FAN				Octave Band Center Frequency (HZ)				
ID	63	125	250	500	1000	2000	4000	8000

2.03 ROOF EXHAUST FANS

- A. General Description: Provide curb mounted centrifugal roof exhauster.
- B. Fans:
 - 1. Single width, single inlet, airfoil blades as indicated.
 - 2. Statically and dynamically balanced in the factory as an assembly within its own bearings with a maximum full amplitude shaft deflection at bearings not to exceed 0.003-inch at 1200 RPM to meet ANSI S 2.19 G6.3 balance quality grade.
 - 3. Grease packed pillow block sealed bearings with not less than two pillow blocks per fan assembly.
- C. Smoke Control Fans: Provide UL listing as Power Ventilators for Smoke Control Systems where used as a smoke control fan.
- D. Motor:
 - 1. Integrally mounted, 1800 rpm maximum, with pre-lubricated sealed ball bearings.
 - 2. Provide two speed motors where indicated.
 - 3. Refer to Section 23 05 00, Common Work Results for HVAC for energy efficient motor requirements.
- E. Drive:
 - 1. Sized for 150 percent of motor horsepower, cast iron adjustable sheaves, V-belt type, sheaves statically and dynamically balanced, multiple belt drive on units over 2 HP.
 - 2. For fans used as part of a life safety system, provide 1.5 times the number of belts required, with a minimum of 2.

- F. Drive: Direct drive matched to fan loads.
- G. Fan wheel and motor mounted on integral double deflection neoprene isolators.
- H. Accessories:
 - 1. Bird screen
 - 2. Integral Motor Starter
 - 3. Disconnect Switch under Enclosure
 - 4. Roof Curb
- I. Account for roof slope to provide level mounting service for equipment.
- J. Curb height accounts for roof insulation depth and flashing requirements.
- K. Provide automatic motorized control damper, aluminum blades with felt edges.

2.04 ROOF VENT

- A. General Description:
 - 1. Provide low profile, louvered penthouse, constructed of heavy gauge extruded aluminum blades with mitered corners, welded, suitable for curb mounting, with bird screen and automatic motorized control damper.
 - 2. Sizes as indicated on drawings.
 - 3. Account for roof slope to provide level mounting service for equipment.
- B. General Description:
 - 1. Heavy gauge galvanized steel, low silhouette, roll formed rib sections, exterior baked enamel finish with interior grey prime coat, suitable for curb mounting, with bird screen and automatic motorized control damper.
 - 2. Account for roof slope to provide level mounting service for equipment.

2.05 INLINE CENTRIFUGAL FANS

- 1. General Description: Inline centrifugal, belt driven, cabinet fan, AMCA rated, backward inclined wheel, heavy gauge steel housing adequately braced with edges sealed, externally mounted 1800 rpm motor, hinged access doors.
- 2. Refer to Section 23 05 00, Common Work Results for HVAC for energy efficient motor requirements.
- B. Smoke Control Fans: Provide UL listing as "Power Ventilators for Smoke Control Systems" where used as a smoke control fan.
- C. Drive:
 - 1. Multiple belt with fixed sheave and OSHA approved metal guard.

2. Size drive for 150 percent of motor horsepower.
 3. Fans used as part of a life safety system, provide 1-1/2- times the number of belts required, with a minimum of 2.
- D. Vibration Isolation: Provide vibration isolation as indicated on drawings and in accordance with Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Provide flexible connections on inlet and discharge duct connection. Flexible connection for vane axial fans to be barium loaded vinyl.

3.02 CENTRIFUGAL FANS

- A. Suspend from structure with isolating hanger rods or mount on isolator base.
- B. Extend scroll drain to over floor drain with pipe size the same as outlet size.
- C. Lubricate bearings as recommended by the bearing manufacturer.
- D. Startup: After installation and before starting:
1. Check fan isolation for freedom of motion.
 2. Perform pre-startup tasks as recommended by the manufacturer.
 3. Perform a field vibration test to statically and dynamically balance the fan as an assembly with maximum vibration velocity measured at the fan bearings of 0.15 in/sec over the full range of operational speeds (filter-out reading). Submit vibration test results.

3.03 ROOF EXHAUST FANS

- A. Mount fan on roof curb in accordance with the manufacturer's recommendations. Anchor fan to curb and curb to roof. Coordinate roof opening size and curb location.
- B. Connect ductwork.

3.04 ROOF VENT

- A. Mount roof vent on roof curb in accordance with the manufacturer's recommendations. Anchor roof vent to curb and curb to roof. Coordinate roof opening size and curb location.
- B. Make ductwork connections.

3.05 INLINE CENTRIFUGAL FAN

- A. Mount in ductwork using Vibration Isolation as specified in Section 23 05 48 Vibration and Seismic Controls for HVAC Piping and Equipment, and as indicated on drawings.

- B. Connect ductwork using flexible connections.
- C. Arrange for unobstructed access to access door.

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SECTION 23 81 00

DECENTRALIZED UNITARY HVAC EQUIPMIENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. The provisions of Division 23, Heating, Ventilation and Air Conditioning (HVAC) Section 23 05 00, Common Work Results for HVAC, apply to work specified in this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Variable Refrigerant Flow (VRF) System
- B. Related Sections include:
 - 1. Section 23 05 48, Vibration and Seismic Controls for HVAC Piping and Equipment
 - 2. Section 23 09 00, Instrumentation and Controls for HVAC, Instrumentation and Controls for HVAC
 - 3. Section 23 09 93, Sequence of Operations for HVAC Controls

1.03 SUBMITTALS

- A. Submit the following:
 - 1. Shop drawings showing details of construction, dimensions, arrangement of components, isolation, filters, etc.
 - 2. Product data showing performance data, standard items, and accessories, operating weight.
 - 3. Flow diagrams and pipe sizing for refrigerant systems.
 - 4. Operating and maintenance data.
 - 5. Testing Submittals:
 - a. Provide test plan and test procedures for approval.
 - b. Explain in detail, step-by-step, actions and expected results to demonstrate compliance with the requirements of this specification and methods for simulating necessary conditions of operation to demonstrate performance of the system.
 - c. Test plan and test procedures demonstrate capability of system to monitor and control equipment and to accomplish control and monitoring specified.

1.04 ACCEPTANCE TESTING AND TRAINING

- A. Site Testing:
 - 1. General:
 - a. Provide personnel, equipment, instrumentation, and supplies necessary to perform testing by a representative authorized by the manufacturer.
 - b. Owner or Owner's representative will witness and sign off on acceptance testing.
 - 2. Acceptance Test:
 - a. Demonstrate compliance of completed control system with contract documents.
 - b. Use approved test plan, physical and functional requirements of project
- B. Training:
 - 1. General:
 - a. A representative authorized by the manufacturer conduct training courses for designated personnel in operation and maintenance of system.
 - b. Orient training to specific system being installed under this contract.
 - c. Provide training manuals for each trainee, with two additional copies provided for archival at project site.
 - d. Manuals include detailed description of the subject matter for each lesson.
 - e. Copies of audiovisuals delivered to Owner.
 - f. Training day is defined as 8 hours of classroom instruction, including two 15-minute breaks and excluding lunchtime, Monday through Friday, during normal first shift in effect at training facility.
 - g. Notification of planned training given to the Owner's representative at least 15 days prior to the training.
 - 2. Operator's Training I:
 - a. Teach at a convenient location for a period of one training day.
 - b. Upon completion, each student, using appropriate documentation, should be able to perform elementary operations with guidance and describe general hardware architecture and functionality of system.
 - 3. Operator's Training II:
 - a. Teach at project site for a period of one training day after completion of contractor's field testing.
 - b. Course includes instruction on specific hardware configuration of installed system and specific instructions for operating the installed system.
 - c. Upon completion, each student should be able to start system, operate the system, recover the system after failure, and describe the specific hardware architecture and operation of system.
 - 4. Operator's Training III:
 - a. Teach at project site for period of one training day no later than six months after completion of the acceptance test.
 - b. Course will be structured to address specific topics that students need to discuss and to answer questions concerning operation of system.
 - c. Upon completion, students should be fully proficient in system operation and have no unanswered questions regarding operation of installed system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Variable Refrigerant Flow (VRF) System:
1. Mitsubishi (City Multi)
 2. Daikin (VRV)
 3. LG (Multi-V)
 4. Basis of Design is Mitsubishi (City Multi). Responsible for changes required from basis of design, such as pipe quantity and routing, control coordination, and power requirements if a different manufacturer is selected.

2.02 VARIABLE REFRIGERANT FLOW SYSTEM (VRF)

- A. Indoor Unit – Wall Mounted:
1. Description:
 - a. Wall mount ductless fan-coil unit.
 - b. Furnish complete unit including the following:
 - 1) Cabinet
 - 2) Wall Mounting Kit and Accessories
 - 3) Refrigerant Line Set
 - 4) Electronic Expansion Valve
 - 5) Fan and Motor Assembly
 - 6) Cooling Coil
 - 7) Condensate Drain Pan and Filter.
 - c. Unit as scheduled on drawing, factory-tested and assembled, factory wired, refrigerant-to-air heat exchanger, fan/motor assembly, compressor, controls and safety devices, control circuit transformer, shipped in one piece with ARI certification and UL listing.
 2. Cabinet:
 - a. 18 gauge steel, removable panels for access to components.
 - b. Provide drain connection.
 3. Fan and Motor:
 - a. Evaporator fan assembly with one or two line-flow fan(s) direct driven by a single motor.
 - b. Statically and dynamically balanced and run on a motor with permanently lubricated bearings.
 - c. Fan consists of two speeds:
 - 1) High
 - 2) Low
 4. Coil/Piping:
 - a. Indoor Coil: Direct expansion type for nonferrous construction with smooth plate fins on copper tubing.
 - b. Condensate Pan: Locate under coil.
 - c. Insulate both refrigerant lines
 5. Filter: Filter return using a removable, washable filter.

6. Electrical:
 - a. Furnish starters, contactors and disconnects.
 - b. Arrange for single point electrical connection.
 7. Condensate Pump:
 - a. Where condensate pump is indicated, provide condensate pump with hard-wired electrical connection.
 - b. Pipe drain to floor drain.
- B. Indoor Unit – Ceiling Cassette:
1. Description:
 - a. Ceiling-recessed cassette fan-coil unit.
 - b. Furnish complete unit including cabinet, ceiling mounting kit and accessories, refrigerant line set, electronic expansion valve, fan and motor assembly, cooling coil, condensate drain pan and filter.
 - c. Unit as scheduled on drawing, factory-tested and assembly, compressor, controls and safety devices, control circuit transformer, shipped in one piece with ARI certification and UL listing.
 2. Cabinet:
 - a. Ceiling-recessed cassette constructed of 18 gauge steel, removable panels for access to components.
 - b. Provide drain connection.
 - c. Painted finish.
 - d. Cabinet Panel: Provisions for a field installed filtered outside air intake.
 - e. Branch ducting allowed from cabinet. Fix grille to bottom of cabinet allowing one-way blow.
 3. Fan and Motor:
 - a. Evaporator fan to have an assembly with one or two line-flow fan(s) direct driven by a single motor.
 - b. Statically and dynamically balanced and run on a motor with permanently lubricated bearings.
 - c. Consist of two speeds:
 - 1) High
 - 2) Low
 4. Coil/Piping:
 - a. Indoor Coil: Direct expansion type of nonferrous construction with smooth plate fins on copper tubing.
 - b. Condensate Pan: Locate under coil.
 - c. Insulate both refrigerant lines.
 5. Filter: Return air filtered by means of an easily removable, washable filter.
 6. Electrical:
 - a. Furnish starters, contactors and disconnects.
 - b. Arrange for single point electrical connection.
 7. Condensate Pump:
 - a. Provide external condensate pump with hard-wired electrical connection when required.
 - b. Pipe drain to floor drain.

C. Indoor Unit – Ceiling Concealed Ducted:

1. Description:
 - a. Ceiling-concealed ducted fan coil designed to mount above the ceiling with a 2-position, field adjustable return and a fixed horizontal discharge supply.
 - b. Furnish complete unit including cabinet, mounting kit and accessories, refrigerant line set, electronic expansion valve, fan and motor assembly, cooling coil, condensate drain pan and filter.
 - c. Unit as scheduled on drawing, factory-tested and assembled, factory wired, refrigerant-to-air heat exchanger, fan/motor assembly, compressor, controls and safety devices, control circuit transformer, shipped in one piece with ARI certification and UL listing.
2. Cabinet:
 - a. Space saving, ceiling-concealed, ducted and have provisions for a field installed filtered outside air intake.
 - b. Constructed of 18 gauge steel, removable panels for access to components.
 - c. Provide drain connection.
3. Fan and Motor:
 - a. Evaporator fan an assembly with one or two lines-flow fan(s) direct driven by a single motor.
 - b. Statically and dynamically balanced and run on a motor with permanently lubricated bearings.
 - c. Fan consist of two speeds, High and Low.
4. Coil/Piping:
 - a. Indoor Coil: Direct expansion type of nonferrous construction with smooth plate fins on copper tubing.
 - b. Condensate Pan: Locate under coil.
 - c. Insulate both refrigerant lines.
5. Filter: Filter return air using standard factory installed return air filter.
6. Electrical:
 - a. Furnish starters, contactors and disconnects.
 - b. Arrange for single point electrical connection.
7. Condensate Pump:
 - a. Provide external condensate pump with hard-wired electrical connection when required.
 - b. Pipe drain to floor drain.
8. Condensate Drain Pan Sensor: Provide secondary condensate drain pan sensor interlocked to turn off unit upon detection. Based on Mitsubishi DPLS series.

D. Indoor Unit – Floor Standing Concealed or Exposed:

1. Description:
 - a. Consist of a floor-standing indoor section.
 - b. Furnish complete unit including cabinet, mounting kit and accessories, refrigerant line set, electronic expansion valve, fan and motor assembly, cooling coil, condensate drain pan, and filter.

- c. Unit as scheduled on drawing, factory-tested and assembled, factory wired, refrigerant-to-air heat exchanger, fan/motor assembly, compressor, controls and safety devices, control circuit transformer, shipped in one piece with ARI certification and UL listing.
 2. Cabinet:
 - a. 18 gauge steel, removable panels for access to components.
 - b. Provide drain connection.
 - c. Exposed Units: Painted finish.
 - d. Concealed Units: Sheet metal finish.
 3. Fan and Motor:
 - a. Evaporator fan an assembly with one or two line-flow fan(s) direct driven by a single motor.
 - b. Statically and dynamically balanced and run on a motor with permanently lubricated bearings.
 - c. Consists of two speeds:
 - 1) High
 - 2) Low
 4. Coil/Piping:
 - a. Indoor Coil: Direct expansion type of nonferrous construction with smooth plate fins on copper tubing.
 - b. Condensate Pan: Locate under coil.
 - c. Insulate both refrigerant lines.
 5. Filter: Return air filtered by means of an easily removable, washable filter.
 6. Electrical:
 - a. Furnish starters, contactors and disconnects.
 - b. Arrange for single point electrical connection.
 7. Condensate Pump:
 - a. Provide external condensate pump with hard-wired electrical connection when required.
 - b. Pipe drain to floor drain.
- E. Indoor Unit – Ceiling Exposed:
 1. Description:
 - a. Ceiling-suspended ductless fan-coil unit.
 - b. Furnish complete unit including cabinet, ceiling mounting kit and accessories, refrigerant line set, electronic expansion valve, fan and motor assembly, cooling coil, condensate drain pan, and filter.
 - c. Unit as scheduled on drawing, factory-tested and assembled, factory wired, refrigerant-to-air heat exchanger, fan/motor assembly, compressor, controls and safety devices, control circuit transformer, shipped in one piece with ARI certification and UL listing.
 2. Cabinet: 18 gauge steel, removable panels for access to components. Provide drain connection.
 3. Fan and Motor:
 - a. Evaporator fan an assembly with one or two line-flow fan(s) direct driven by a single motor.

- b. Statically and dynamically balanced and run on a motor with permanently lubricated bearings.
- c. Consists of two speeds:
 - 1) High
 - 2) Low
- 4. Coil/Piping:
 - a. Indoor coil direct expansion type for nonferrous construction with smooth plate fins on copper tubing.
 - b. Condensate pan located under the coil.
 - c. Insulate both refrigerant lines.
- 5. Filter: Return air filtered by a removable, washable filter.
- 6. Electrical:
 - a. Furnish starters, contactors and disconnects.
 - b. Arrange for single point electrical connection.
- 7. Condensate Pump: Where condensate pump is indicated, provide condensate pump with hard-wired electrical connection.

F. Outdoor Unit:

- 1. Description:
 - a. Provide air cooled heat pump (with heat recovery system for simultaneous heating and cooling) designed for outdoor installation with factory supplied supports, properly assembled and tested at the factory.
 - b. Completely weatherproof and include compressor, condenser coils, condensing fans, motor refrigerant reservoir, charging valve, controls and a holding charge of refrigerant.
 - c. Provide guards on condenser fans and coil guard. Power coated finish.
 - d. Completely factory assembled, piped, wired, and tested.
 - e. Both refrigerant lines insulated between the outside and inside units.
 - f. Sound rating no higher than 63 dB(A).
 - g. Modular in design and allow for side-by-side installation with minimum spacing.
 - h. Provide accessories and kits required for a complete installation including field connection of heat pump units.
- 2. Cabinet: The casing(s) fabricated of galvanized steel, bonderized and finished with baked enamel.
- 3. Condenser Fans and Motors:
 - a. Direct driven variable speed propeller type fans with permanently lubricated motors.
 - b. Provide fans with a raised guard to prevent contact with moving parts.
 - c. Outdoor Unit: Vertical discharge airflow.
- 4. Refrigerant Circuits:
 - a. Units hold a charge of R410A refrigerant.
 - b. Include back seating service valve and gauge ports in liquid and suction lines.
 - c. Provided refrigerant filter-dryer.
 - d. Refrigeration circuit of the condensing unit consists of the following:
 - 1) Scroll Compressor
 - 2) Motors
 - 3) Fans
 - 4) Condenser Coil
 - 5) Electric Expansion Valve

- 6) Solenoid Valves
 - 7) 4-Way Valve
 - 8) Distribution Headers
 - 9) Capillaries
 - 10) Filters
 - 11) Shut-Off Valves
 - 12) Oil Separators
 - 13) Service Ports
 - 14) Liquid Receivers
 - 15) Accumulators
5. Outdoor Coil: Nonferrous construction with lanced or corrugated plat fins on copper tubing.
 6. Compressors:
 - a. Furnish inverter driven scroll hermetic sealed compressor isolation and sound muffling.
 - b. Overload and inherent winding thermostat protection to prevent burn out.
 - c. Provide crankcase heater.
 - d. Multiple compressors manifolded for single joint connection on liquid and suction lines.
 - e. Capacity completely variable down to 16 percent of rated capacity.
 7. Controls:
 - a. Provide high and low pressure cutouts, contractors and internal overload protection on motors.
 - b. Provide low ambient operation to 0 degrees F outside to maintain condensing temperature on part load operation.
 - c. Provide short cycle timer.
 8. Warranty: Provide five year warranty on compressors.
- G. Branch Circuit Controller:
1. General:
 - a. Galvanized steel finish.
 - b. Completely factory assembled, piped and wired.
 - c. Each unit run tested at the factory.
 - d. Mount indoors and operate so that different zones served by each controller can be in heating and cooling mode simultaneously.
 2. Cabinet:
 - a. House a liquid-gas separator and multiple refrigeration control valves.
 - b. Contain tube-in-tube heat exchangers.
 - c. Casing: Fabricated of galvanized steel.
 3. Refrigerant Valves:
 - a. Furnish unit with multiple two position refrigerant valves.
 - b. Circuit: Two-position liquid line valve and a two-position suction line valve.
 - c. When connecting a 54,000 BTU-h or larger indoor unit section, two branch circuits joined together at the branch controller to deliver an appropriate amount of refrigerant the two refrigerant valves operate simultaneously.
 - d. Linear electronic expansion valves used to control the variable refrigerant flow.

4. Integral Drain Pan: Provide integral condensate pan and drain.
 - a. Provide external condensate pump with hard-wired electrical connection when required.
 - b. Pipe drain to floor drain.
 5. Electrical:
 - a. Furnish starters and contactors.
 - b. Arrange for single point electrical connection.
- H. VRF Controls:
1. Network together using a high-speed communication bus and wiring as recommended by manufacturer.
 2. Provide control wiring and control power wiring for a complete and operational system.
 3. Room Thermostat:
 - a. Provide locally programmable 7-day thermostats with automatic change over, fan on-auto switch, system off-auto switch, and individual set point for heating and cooling with backlit LCD display.
 - b. Provide minimum of four independent programmable temperature periods per day.
 - c. Provide error codes in the event of system abnormality/error.
 - d. Provide one thermostat per unit unless otherwise indicated.
 - e. Provide 10 percent spare stock to owner.
 - f. Based on: Mitsubishi Deluxe MA Controller.
- I. Controls Interface:
1. Equip with network port and network type data transfer interface with the DDC controller.
 2. The following interface required:
 - a. BACnet protocol compatible with the system specified in Section 23 09 00, Instrumentation and Controls for HVAC.
 - b. Alarms read to DDC controller.
 - c. The following analog signals read to the DDC controller as a minimum: Space temperature.
 - d. The following status signals be read to the DDC controller as a minimum:
 - 1) Occupied Cycle
 - 2) Unoccupied Cycle
 - 3) Warmup
 - 4) Override
 - 5) Supply Fan
 - 6) Compressors
 - 7) Heating/Cooling Operation
- J. Controls Interface:
1. The packaged equipment controls equipped with a network port and network type data transfer interface with the system specified in Section 23 09 00, Instrumentation and Controls for HVAC.
 2. Input and output points, setpoints and functions identified in the Sequences of Operation accessible to the DDC control system.
 3. Provide 4-hour owner training for tenant billing system.

4. Provide billing options including customization of energy bill, remote meter reading, energy bill formatting, generation of energy bill, and delivery of energy bill to owner.
5. Provide current sensing devices installed at electrical panels and circuits including associated wiring routed in conduit required for a complete tenant metering system.

PART 3 - EXECUTION

3.01 VARIABLE REFRIGERANT FLOW SYSTEM

A. Installation:

1. Install in location shown on the Drawings. Level unit and secure to structure. Provide secondary structural base where required to attached to structure. Provide vibration isolators where indicated.
2. Make piping connections and unit installation per manufacturer's recommendations and installation guides.
3. Size and run refrigerant piping between fan coil unit(s), branch circuit controller(s) and condensing unit(s) per manufacturer's recommendations.
4. Insulate refrigerant piping as specified in Section 23 07 00, Insulation for HVAC.
5. Pipe coil drain pan to floor drain per manufacturers installation guide.
6. Provide secondary drain protection via a sensor in the drain pain overflow. Field wire interlock to shut down the unit upon sensing of moisture.
7. Make refrigerant piping connections, install refrigeration accessories and charge system. Provide additional refrigerant as required for proper operation at design capacities.
8. Provide interconnecting power and control wiring.

B. Controls:

1. Install controls.
2. Provide devices, materials, equipment, software, wiring, interconnecting power, labor and engineering necessary to achieve the Sequences of Operation described in Section 23 09 93, Sequence of Operations for HVAC Controls.

C. Start-up:

1. Comply with manufacturer's instructions. Startup checklist to be provided by the manufacturer and completed by the contractor prior to startup.
2. Startup to be witnessed and signed off on by the manufacturer's representative.
3. Install filters before operating unit.
4. Ensure proper refrigerant and air flow before operating unit compressor.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.
- C. Sections of Division 26, Electrical are interrelated. When interpreting direction, material, and method specified in Section of Division 26, Electrical, consider it within the entirety of Work in Division 26, Electrical.

1.02 SUMMARY

- A. This Section includes Design-Build work:
 - 1. The intent of Division 26, Electrical Specifications and Drawings is to provide a complete and workable facility, with complete systems as required by applicable codes, as indicated, and as specified.
 - 2. Include work specified in Division 26, Electrical and as indicated on Drawings. Include appurtenances, connections, fasteners, and accessories required to make a complete working system, whether indicated or not indicated.
 - 3. Refer to Division 01, General Requirements.
- B. Division 26, Electrical and the accompanying Drawings are complementary, and what is called for by one as binding as if called for by both.
 - 1. Items shown on the Drawings are not necessarily included in the Specifications and vice versa.
 - 2. In case of conflict, Specifications supersede Drawings.
- C. Imperative language used in Division 26, Electrical addresses the Contractor, as specified in Division 01, General Requirements.

1.03 REFERENCES

- A. The latest adopted revisions of the publications listed below apply to these Specifications as referenced:
 - 1. IBC International Building Code
 - 2. NEC National Electrical Code

3. NFPA National Fire Protection Association
4. NEMA National Electrical Manufacturers Association
5. NECA National Electrical Contractors Association
6. ANSI American National Standards Institute
7. IEEE Institute of Electrical and Electronic Engineers
8. UL Underwriters Laboratories

1.04 SYSTEM DESCRIPTION

A. Ground Systems:

1. Provide complete ground systems indicated.
2. Include conduit system, transformer housings, switchboard frame, and neutral bus, motors, and miscellaneous grounds required by Contract Documents and by applicable codes.

B. System Identification:

1. Clearly identify elements of the Project electrical system to indicate the loads served, or the function of each item of equipment, connected under this work.
2. Comply with requirements of Division 26, Electrical, and with applicable codes.

C. Drawings:

1. Drawings are diagrammatic. They do not show every offset, bend, tee, or elbow, which may be required to install work in the space, provided and avoid conflicts with other construction.
 - a. Prior to installing work, take field dimensions, and note conditions available for, installation.
 - b. Follow the Drawings as closely as practical to do so, and install additional bends, offsets, and elbows where required by installation conditions.
 - 1) Additional offsets, bends, and other connectors are subject to approval by Project Engineer.
 - 2) Install additional offsets, bends, and other connectors without additional cost to Owner.
 - c. The right to make reasonable changes in outlet location prior to roughing in is reserved to the Owner's Representative.
2. Luminaire Designations:
 - a. Lower case letters adjacent to devices or luminaires indicate switching arrangement or circuit grouping.
 - b. Numbers adjacent to devices indicate circuit connection.
3. Circuits and Switching:
 - a. Do not change branch circuiting and switching indicated; nor combine homeruns, without Engineer's prior approval.
 - b. Do not combine or change feeder runs.

4. Circuit Conductors:
 - a. Cross or hash marks on conduit runs indicate quantity of No. 12 copper branch circuit conductors, unless otherwise noted.
 - b. Where such marks do not appear, provide quantity of circuit conductors to the outlets shown to perform the control or circuiting indicated.
 - c. Include ground, travelers, and switch legs required by the circuiting arrangement indicated.
 - d. Provide a dedicated neutral conductor with each circuit. Do not use a shared neutral conductor between phases unless, requested or directed.

1.05 SUBMITTALS

- A. Comply with Division 01, General Requirements.
- B. Contractor Responsibilities:
 1. Submit submittals one time and in proper order.
 2. Ensure equipment will fit in the space provided.
 3. Deviations from the Drawings and Specifications specifically noted in the submittals. Failure to comply will automatically void implied approval for use of the equipment on this project.
- C. Shop Drawings and Equipment Data:
 1. Combine electrical shop drawings and equipment data in Submittal binders.
 2. Include in Submittal binders:
 - a. Complete index of materials and equipment as required by Specifications to be documented by submittals.
 - b. Fully describe equipment furnish per manufacturer's detailed specifications.
- D. Installation Drawings:
 1. Submit prior to starting installation.
 2. Show outlets, devices, terminal cabinets, conduits, wiring, and connections required for the complete system described.
- E. Record Drawings:
 1. Keep record drawings up to date as the work progresses.
 2. Show changes, deviations, addendum items, change orders, corrections, and other variations from the Contract Drawings.
 3. Keep record drawings at the jobsite and available for the Architect's review.
 4. At the completion of the work, incorporate deviations from the installation drawings to indicate as-built conditions.
- F. Operation and Maintenance Data:
 1. As specified in Division 01, General Requirements.

2. Provide updates to separate manuals or chapters for each system as follows:
 - a. Fire Alarm System
 - b. Lighting System
 - c. Lighting Control System
 - d. Power Metering And Monitoring System
 3. Description of system.
 4. Operating Sequence and Procedures:
 - a. Step-by-step procedure for system start-up, including a pre-start checklist.
 - 1) Refer to controls and indicators by nomenclature consistent with that used on panels and in control diagrams.
 - b. Detailed instruction in proper sequence, for each mode of operation (i.e., day-night, staging of equipment).
 - c. Emergency Operation:
 - 1) If some functions of the equipment can be operated while other functions are disabled, give instructions for operations under those conditions.
 - 2) Include here only those alternate methods of operations (from normal) which the operator can follow when there is a partial failure or malfunctioning of components or other unusual condition.
 - d. Shutdown Procedure:
 - 1) Include instructions for stopping and securing the equipment after operation.
 - 2) If a particular sequence is required, give step-by-step instructions in that order.
 5. Preventive Maintenance:
 - a. Schedule for preventive maintenance.
 - 1) State the recommended frequency of performance of each preventive maintenance task such as cleaning, inspection, and scheduled overhauls.
 - b. Cleaning: Provide instructions and schedules for routine cleaning and inspection with recommended lubricants.
 - c. Inspection: If periodic inspection of equipment is required for operation, cleaning, or other reasons, indicate the items to be inspected and give the inspection criteria.
 - d. Provide instructions for lubrication and adjustments required for preventive maintenance routines. Identify test points and given values for each.
 6. Manufacturers' Brochures:
 - a. Include manufacturers' descriptive literature covering devices and equipment used in the system, together with illustrations, exploded views, and renewal parts lists.
 - b. Clearly define manufacturers' standard brochures so that the information applying to the actual installed equipment.
 7. Results of performance testing, as specified in PART 3 of this Section.
- G. Submittals Procedures:
1. Review and recommendations by the Architect or Engineer are not to be construed as change authorizations.
 2. Either if discrepancies are discovered between the materials or equipment submitted, and the Contract Documents, prior to or after the data is processed, the Contract Documents govern.

1.06 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Provide work and materials conforming to:
 - a. Local and State codes.
 - b. Federal and State laws and regulations.
 - c. Other applicable laws and regulations.
 - 2. Obtain and pay for permits, licenses, and inspection certificates required by authorities having jurisdiction.
 - 3. Pay other fees required by governing authorities for work of this Division.
- B. Install only electrical products listed by a recognized testing laboratory, or approved in writing by the local inspection authority as required by governing codes and ordinances.

1.07 SITE VISITATION

- A. Visit the site prior to bidding and become familiar with existing conditions and other factors which may affect the execution of the work. Complete coordination of installation of equipment with prior bid packages previously issued. Include related costs in the initial bid proposal.

1.08 COORDINATION

- A. Coordinate Work of This Division with other trades to ensure proper installation of electrical equipment.
 - 1. Review Drawings of other trades or crafts to avoid conflicts with cabinets, counters, equipment, structural members, and other possible impediments to electrical work.
 - 2. Report potential conflicts to the Architect prior to rough-in.
 - 3. Proceed with rough-in following Architect's directives to resolve conflicts.
 - 4. Architectural Drawings govern.
- B. Verify the physical dimension of each item of electrical equipment to fit the available space. Contractor's responsibility includes:
 - 1. Coordination of the equipment to fit into the available space.
 - 2. Access routes through the construction.
- C. Layout Drawings:
 - 1. Equipment arrangement shown on Drawings is diagrammatic to indicate general equipment sizing and spatial relationship. Include, as part of distribution equipment submittal, a scaled floor plan, which includes equipment shown with their submitted sizes. Include feeder conduit routing, both aboveground and underground, including termination points at equipment. Submit for Engineer's review prior to commencing work.
 - 2. Provide additional wiring details at switchboards, motor control centers, and other areas where work is of sufficient complexity to warrant additional detailing for coordination.

3. Submit layout drawings for approval prior to commencing field installation.
- D. Where electrical connections are required for equipment provided as Work of other Divisions, coordinate rough in and wiring requirements for that equipment with its supplier and installer prior to commencing work. Notify Architect and Engineer of discrepancies between the actual rough in and wiring requirements, and those identified on Drawings for resolution prior to installation.
- E. Arrange raceways, wiring, and equipment to permit ready access to switches, motors, and control components.
 1. Keep doors and access panels clear.
- F. Coordinate electrical, telephone, and other utility services with the appropriate serving utility.
 1. No additional compensation will be allowed the Contractor for connection fees or additional work or equipment required by the serving utility, but not covered in the Drawings or Specifications.
- G. Coordinate underground work with other contractors working on the site.
 1. Coordinate particularly with contractors installing storm sewer, sanitary sewer, water, and irrigation lines to avoid conflicts.
 2. Common trenches may be used with other trades, providing clearances required by codes and ordinances are maintained.
- H. Coordinated Shop Drawings.
 1. Prepare in two-dimensional format.
 2. Include but are not limited to:
 - a. Superplot plans of above ground work with a colored overlay of trades including, but not limited to, HVAC piping, HVAC equipment, plumbing piping and equipment, sprinklers, lighting, lighting controls, cable tray, fire alarm devices, electrical power conduit, and ceiling system to a minimum of 1/2-inch equals 1-foot scale.
 - b. Superplot plans of below ground work with a colored overlay of trades including, but not limited to, HVAC piping, plumbing piping, and power conduit]to a minimum of 1/2-inch equals 1-foot scale.
 - c. Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.
 - d. Slab penetration drawings of HVAC, plumbing, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1-foot scale.
 - e. Fabrication drawings of radiant ceiling panels, architectural metal ceiling, including panel penetrations for lighting, sprinkler heads, fire alarm devices, and other penetrations.

1.09 CHANGE ORDERS

- A. Supplemental cost proposals by the Contractor accompanied with a complete itemized breakdown of labor and materials. At the Architect's request, make available estimating sheets for the supplemental cost proposals. Separate and allocate labor for each item of work.

1.10 WARRANTY

- A. Provide a written warranty covering the work of this Division as required by the General Conditions.
 - 1. Incandescent Lamps: Excluded from this warranty.
- B. Apparatus:
 - 1. Free of defects of material and workmanship and in accord with the Contract Documents.
 - 2. Built and installed to deliver its full rated capacity at the efficiency for which it was designed.
 - 3. Operate at full capacity without objectionable noise or vibration.
- C. Include in Contractor's warranty for Work of Division 26, Electrical system damage caused by failures of system components.

1.11 ALLOWANCES

- A. Comply with Division 01, General Requirements.

1.12 ALTERNATES

- A. Comply with Division 01, General Requirements.
- B. Refer to Electrical Drawings for detailed information relating to the appropriate alternates.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Where specified materials or methods conflict with applicable codes, the more stringent requirement applies.
- B. Provide apparatus built and installed to deliver its full rated capacity at the efficiency for which it was designed.
- C. Ensure that entire electrical system operates at full capacity without objectionable noise or vibration.
- D. Materials and Equipment:
 - 1. Use materials and equipment that are:
 - a. New
 - b. Quality meeting or exceeding specified standards.
 - c. Free of faults and defects.
 - d. Conforming to Contract Documents.
 - e. Of size, make, type, and quality specified.
 - f. Suitable for the installation indicated.
 - g. Manufactured in accordance with NEMA, ANSI, UL, or other applicable standards.
 - h. Otherwise as specified in Division 01, General Requirements.

2. Equipment not meeting requirements will not be acceptable, even though specified by name.
3. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer.
 - a. Component parts of the entire system need not be products of same manufacturer.
4. Basis of Design:
 - a. Consider the Basis of Design equipment scheduled or specified by performance or model number.
 - b. If other equipment is provided in lieu of the Basis of Design equipment, assume responsibility for changes and costs which may be necessary to accommodate this equipment, including, but not limited to:
 - 1) Different sizes and locations for connections.
 - 2) Different dimensions.
 - 3) Different access requirements.
 - 4) Other differences.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Provide a complete properly operating system for each item of equipment specified.
2. Install materials in a neat and professional manner.
3. Comply with equipment manufacturer's written instructions, the best industry practices, and the Contract Documents.
4. Comply with latest published NECA Standard of Installation, and provide competent supervision.

B. Clarification:

1. Where there is a conflict among manufacturer's instruction, best practice, and the Documents, request clarification from the Architect prior to rough-in.
2. Architect's decision will be final.
3. Remove and correct work installed without clarification at no cost to the Owner.

- C. Existing concrete, block, or brick walls are considered not accessible and may require use of Surface Mounted Raceway (SMR) if existing concealed raceway and device boxes are not available for reuse or do not meet the intent of the design (i.e., proximity to egress path, point of use, etc.). Coordinate route and installation where SMR is required with the Architect/Engineer prior to rough-in. Responsible for reinstalling SMR routed without such prior approval to the Architect's satisfaction.

- D. Existing stud walls (wood or metal) with or without blocking with plaster, plasterboard, or paneling finish are considered accessible with accessible ceiling, attic, tunnel, or crawl space above, below, or adjacent. Remove, patch, and repair finished surface as required to conceal rough in for new device locations. If it is determined that a specific instance will not permit concealment of rough-in due to obstructions such as beams, headers, and other structural elements, prior approval before rough-in from the Architect is required.

3.02 INSTALLATION IN RATED CONSTRUCTION

- A. Install intumescent material around ducts, conduits, and other electrical elements penetrating rated construction.
- B. Comply with firestop materials manufacturer written instructions to prevent spread of smoke or fire through sleeves or block-outs penetrating rated fire barriers.
- C. Provide firestop materials specified in Division 07, and as follows:
 - 1. Capable of passing a 3-hour test per ASTM E-814 (UL 1479).
 - 2. Consisting of material capable of expanding nominally eight times when exposed to temperatures of 250 degrees F-350 degrees FF.
 - 3. An alternate method utilizing intumescent materials in caulk or putty complying with Division 07, Thermal and Moisture Protection Section, "Through-Penetration Firestop Systems" may be used.

3.03 EXCAVATION AND BACKFILL

- A. Perform necessary excavation and backfill for the installation of electrical work in compliance with Division 31, Earthwork.
- B. Direct Burial Cable or Non-Metallic Conduit:
 - 1. Minimum 3-inch cover of sand or clean earth fill placed around the cable or conduit on a leveled trench bottom.
 - 2. Lay steel conduit on a smooth level trench bottom, so that contact is made for its entire length.
 - 3. Where the electrical conduit is being laid, remove water from trench.
- C. Place backfill in layers not exceeding 8-inches deep and compact to 95 percent of maximum density at optimum moisture to preclude settlement.
 - 1. Interior: Bank sand or pea gravel.
 - 2. Exterior: Excavated material with final 8-inches clean soil.
- D. Following backfilling, grade trenches to the level of surrounding soil. Dispose excess soil at the site as directed.
- E. Provide 6-inches wide vinyl tape marked ELECTRICAL in backfill, 12-inches below finished grade, above all high voltage cable or conduit runs.

- F. Coordinate patching of all asphalt or concrete surfaces disturbed by this work with General Contractor.

3.04 NOISE CONTROL

- A. Minimize transmission of noise between occupied spaces.
- B. Outlet Boxes:
 - 1. Do not install outlet boxes on opposite sides of partitions back to back.
 - 2. Do not use straight through outlet boxes, except where indicated.
- C. Conduit:
 - 1. Route conduit along corridors or other “noncritical” space to minimize penetrations through sound rated walls, or through non-sound-rated partitions between occupied spaces.
 - 2. Grout solid and airtight penetrations through sound rated partitions.
 - 3. Use flexible connections or attachments between independent wall structures.
 - a. Do not rigidly connect (i.e., bridge) independent wall structures.
- D. Do not install contactors, transformers, starters, and similar noise-producing devices on walls that are common to occupied spaces, unless otherwise indicated.
 - 1. Where such devices are indicated to be mounted on walls common to occupied spaces, use shock mounts, or otherwise isolate them to prevent the transmission of noise to the occupied spaces.
- E. Ballasts, contactors, starters, transformers, and like equipment which are found to be noticeably noisier than other similar equipment on the project will be deemed defective and replaced.

3.05 EQUIPMENT CONNECTIONS

- A. General:
 - 1. Provide complete electrical connections for items of equipment requiring such connections, including incidental wiring, materials, devices, and labor necessary for a finished working installation.
 - 2. Verify the location and method for connecting to each item of equipment prior to roughing-in.
 - 3. Check the amperage, maximum overcurrent protection, voltage, phase, and similar attributes of each item of equipment before rough in and connection.
- B. Motor Connections:
 - 1. Make motor connections for the proper direction of rotation.
 - 2. Minimum Size Flex for Mechanical Equipment: 1/2-inch; except at small control devices where 3/8-inch flex may be used.

3. Exposed Motor Wiring: Jacketed metallic flex with minimum 6-inches slack loop.
 4. Do not test run pump motors until liquid is in the system.
- C. Control devices and wiring relating to the HVAC systems are furnished and installed under Division 23; except for provisions or items indicated in Division 26, Electrical Drawings and Specifications.

3.06 EQUIPMENT SUPPORT

- A. Minimum Support Capacity: Provide fastening devices and supports for electrical equipment, luminaires, panels, outlets, and cabinets capable of supporting not less than four times the ultimate weight of the object or objects fastened to or suspended from the building structure.
- B. Luminaire Supports:
1. Support luminaires from the building structure.
 2. Use supports that provide proper alignment and leveling of luminaires.
 3. Where permitted at exposed luminaires, install flexible connections neat and straight, without excess slack, and attached to the support device.
- C. Support junction boxes, pull boxes, or other conduit terminating housings located above the suspended ceiling from the floor above, roof, or penthouse floor structure to prevent sagging or swaying.
- D. Conduits:
1. Support suspended conduits 1-inch and larger from the overhead structural system with metal ring or trapeze hangers and threaded steel rod having a safety factor of four.
 2. Conduits smaller than 1-inch installed in ceiling cavities, may be supported on the mechanical system supports when available space and support capacity has been coordinated with the subcontractor installing the supports.
 3. Anchor conduit installed in poured concrete to the steel reinforcing with No. 14 black iron wire.
- E. Powder actuated or similar shot-in fastening devices will not be permitted for electrical work except by special permission from the Architect.

3.07 ACCESS DOORS

- A. Location and size of access doors is Work of Division 26, Electrical.
- B. Furnishing and installation of access doors is work of Division 08.

3.08 ALIGNMENT

- A. Install panels, cabinets, and equipment level and plumb, parallel with structural building lines.
- B. Install distribution equipment and electrical enclosures fitted neatly, without gaps, openings, or distortion.

- C. Properly and neatly, close unused openings with approved devices.
- D. Fit surface panels, devices, and outlets with neat, appropriate, trims, plates, or covers without overhanging edges, protruding corners, or raw edges.

3.09 CUTTING AND PATCHING

- A. General:
 - 1. Comply with Division 01, General Requirements.
 - 2. Restore to original condition new or existing work cut or damaged by installation, testing, and removal of electrical Work.
 - 3. Patch and finish spaces around conduits passing through floors and walls to match the adjacent construction, including painting or other finishes.
 - 4. Clean up and remove dirt and debris.
- B. Make additional required openings by drilling or cutting. Use of jackhammer is prohibited.
- C. Cut oversize fill holes so that a tight fit is obtained around the objects passing through.
 - 1. In rated construction, comply with Division 07, Thermal and Moisture Protection.
- D. Obtain Architect's permission and direction prior to piercing beams or columns.
- E. Where alterations disturb lawns, paving, walks, and other permanent site improvements, repair and refinish surfaces to condition existing prior to commencement of work.

3.10 PROTECTION OF WORK

- A. Protect electrical work and equipment installed under this Division against damage by other trades, weather conditions, or other causes.
 - 1. Equipment found damaged or in other than new condition will be rejected as defective.
- B. Keep switchgear, transformers, panels, luminaires, and electrical equipment covered or closed to exclude dust, dirt, and splashes of plaster, cement, paint, or other construction material spray.
 - 1. Equipment not free of contamination is not acceptable.
- C. Provide enclosures and trims in new condition, free of rust, scratches, and other finish defects.
 - 1. If damaged, properly refinish in a manner acceptable to the Architect.

3.11 UNINTERRUPTED SERVICE

- A. Maintain electrical service to functioning portions of the building throughout construction.
- B. Pre-arrange with Owner outages necessary for new construction.
 - 1. Comply with Division 01, General Requirements.

2. Apply for scheduled shutdowns minimum 4 weeks prior to time needed and reconfirm a minimum of 72 hours prior to time needed.
 3. Contractor is liable for damages resulting from unscheduled outages or for those not confined to the pre-arranged times. Damages include costs incurred by the Owner and by the Owner's tenants.
- C. Maintain signal and communication systems and equipment in operation at all times.
1. Outages of these systems treated the same as electrical power outages.
- D. Maintain telephone services in accordance with Division 01, General Requirements.

3.12 DEMOLITION AND SALVAGE

A. General:

1. Remove or relocate electrical wiring, equipment, luminaires, etc., as may be encountered in removed or remodeled areas in the existing construction affected by this work.
2. Disconnect electrical service to hard-wired equipment scheduled for removal under other Divisions of Work.
3. Wiring which serves usable existing outlets restored and routed clear of the construction or demolition.
4. Safely cut off and terminate wiring abandoned and removed to leave site clean.

B. Reuse of Existing:

1. Existing concealed conduits in good condition may be reused for installation of new wiring where available.
2. Existing undamaged, properly supported surface conduits may be reused where surface conduits are called for, if the installation meets workmanship requirements of the Specifications.
3. Where new wiring is added or existing wiring disturbed in existing branch circuit raceways, existing wires replaced with new.

C. Salvage and Disposal:

1. Removed materials, not containing hazardous waste, not scheduled for reuse become the property of the Contractor for removal from the site, except for those items specifically indicated on the Demolition Drawings for salvage or reuse.
2. Materials containing, or possibly containing, hazardous waste identified for removal and disposal by the Owner's Hazardous Waste Contractor.
3. Neatly store salvaged items at one location at the site where directed by the Owner's Representative.
4. Salvage properly operating circuit breakers from panels scheduled for removal and use to replace faulty or inadequate breakers in existing panels scheduled to remain.

3.13 WIRING IN PRECAST CONSTRUCTION

- A. Coordinate installation of electrical conduit, boxes, fittings, anchors, and miscellaneous items concealed in precast concrete assemblies with the General Contractor.
- B. Where electrical items are required to be installed in concrete assemblies precast off-site, it will be the Electrical Contractor's responsibility to place the electrical items necessary in the concrete at the off-site locations or pay for the General Contractor to make arrangements for the installation of these items in the precast assemblies. Electrical Contractor held responsible for the proper placement and locations of electrical items at the off-site location.

3.14 COMPLETION AND TESTING

- A. General:
 - 1. Comply with Division 01, General Requirements.
- B. Upon completion, test systems to show that installed equipment operates as designed and specified, free of faults and unintentional grounds.
 - 1. Schedule system tests so that several occur on the same day.
 - 2. Coordinate testing schedule with construction phasing.
 - 3. Conduct tests in the presence of the Architect or its representative.
 - 4. Notify Architect of tests 48 hours in advance.
- C. Engage a journeyman electrician with required tools to conduct equipment tests. Arrange to have the equipment factory representative present for those tests where the manufacturer's warranty could be impacted by the absence of a factory representative.
- D. Perform tests per the requirements of each of the following systems:
 - 1. Fire Alarm System
 - 2. Lighting System
 - 3. Lighting Control System
 - 4. Power Metering and Monitoring System
- E. Provide a written record of performance tests and submit with operation and maintenance data.

3.15 COMMISSIONING

- A. Complete phases of work so the system, equipment, and components can be checked out, started, calibrated, operationally tested, adjusted, balanced, functionally tested, and otherwise commissioned. Complete systems, including subsystems, so they are fully functional.

- B. Perform commissioning as specified in Section 01 91 00, General Commissioning Requirements, the technical sections, and Section 26 08 00, Commissioning of Electrical Systems.
 - 1. Unless specified otherwise in the technical sections, provide factory startup services for the following items of equipment:
 - a. Lighting Control Systems
- C. Participation in Commissioning:
 - 1. Provide skilled technicians to checkout, startup, calibrate, and test systems, equipment, and components.
 - 2. The Engineer reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system.
- D. Resolution of Deficiencies:
 - 1. Complete corrective work in a timely fashion to permit timely completion of the commissioning process. Experimentation to render system performance permitted.
- E. Verification and Documentation:
 - 1. One each test is performed, have the commissioning manager observe the physical responses of the system and compare them to the specified requirements to verify the test results.
 - 2. Submit site observation reports for deficiencies in the system.
 - 3. Record the result of individual checks or tests on the pre-approved checklist, test, and report form from the commissioning plan and submit results for review.

END OF SECTION

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SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Conductors - 600V
 - 2. Power Limited Wiring
 - 3. Conductors - Fire Pump Circuits
 - 4. MC Branch Circuit Cable
 - 5. Connectors - 600V and Below
- B. Related Sections include:
 - 1. Section 26 05 26, Grounding and Bonding for Electrical Systems
 - 2. Section 26 05 33, Raceways and Boxes for Electrical Systems
 - 3. Section 26 05 53, Identification for Electrical Systems
 - 4. Section 26 05 80, Electrical Testing

1.03 REFERENCED STANDARDS

- A. ASTM: American Society For Testing and Materials:
 - 1. ASTM B 3 Soft or Annealed Copper Wire
 - 2. ASTM B 8 Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
 - 3. ASTM B 33 Tinned Soft or Annealed Copper Wire for Electrical Purposes
- B. ICEA: Insulated Cable Engineers Association:
 - 1. S-95-658 Non-shielded 0-2 kV Cables

- C. IEEE: Institute of Electrical and Electronic Engineers:
 - 1. IEEE 383 Type Test of Class IE Electric Cables, Field Splices, and Connections
- D. UL: Underwriters Laboratories:
 - 1. UL 44 Rubber-Insulated Wires and Cables
 - 2. UL 83 Thermoplastic-Insulated Wires and Cables
 - 3. UL 1277 Type TC Power and Control Tray Cable

1.04 SUBMITTALS

- A. Submit product data for the following materials:
 - 1. Single conductor 600V power and control conductors.
 - 2. MC Cable
- B. Submittals of the following materials consist only of a listing of the manufacturer's name and the applicable catalog numbers of the items to be utilized.
 - 1. Connectors
 - 2. Branch Circuit Conductor Splices
 - 3. Splices with Compression Fitting and Heat-Shrinkable Insulator
- C. Submit cable test data per testing requirements of PART 3.

1.05 QUALITY ASSURANCE

- A. Copper Conductors. Indicated sizes considered minimum for ampacities and voltage drop requirements.
- B. Conductors for special systems as recommended by the equipment manufacturer except as noted.
- C. Deliver conductors to the job site in cartons, protective covers, or on reels.

PART 2 - PRODUCTS

- A. Conductors - 600V:
 - 1. General
 - 2. Essex
 - 3. Southwire
 - 4. Or equivalent.

- B. MC Branch Circuit Cable:
 - 1. AFC Cable Systems
 - 2. Southwire
 - 3. Okonite
- C. Connectors - 600V and Below:
 - 1. Burndy
 - 2. Anderson
 - 3. Or equivalent.

2.02 CONDUCTORS – 600V

- A. Type:
 - 1. Copper: 12 AWG minimum size unless noted otherwise. 12 AWG and 10 AWG, solid or stranded, 8 AWG or larger, Class B concentric or compressed stranded.
 - 2. Aluminum: 1/0 AWG minimum size unless noted otherwise. Compact stranded conductors, AA-8000 series electrical grade aluminum alloy.
 - 3. Conductors with continuous colored jackets are acceptable; refer to color-coding in PART 3.
 - 4. Conductors with manufacturers no lube continuous jacket coatings are acceptable.
- B. Insulation:
 - 1. THHN/THWN-2 for conductors 6 AWG and smaller.
 - 2. XHHW-2 for conductors 4 AWG and larger.
- C. Thru wiring in fluorescent luminaires rated for 90 degree C minimum.

2.03 POWER LIMITED WIRING

- A. Copper, stranded or solid as recommended by the system manufacturer.
- B. Insulation appropriate for the system and location used.

2.04 MC BRANCH CIRCUIT CABLE

- A. Sheath:
 - 1. Steel or Aluminum, of the interlocking metal type, continuous and close fitting.
 - 2. Sheath not considered a current carrying or grounding conductor.

- B. Conductors:
 - 1. Solid copper, of the same ampacity as the conduit/wire system indicated for the specific location.
 - 2. Provide separate green insulated grounding conductors in circuits where an isolated ground is called for.
- C. Provide HCF rated cable for health care facility construction as code required.
- D. Feeder style MC Cable with steel or aluminum armor for feeders greater than 100A.

2.05 CONNECTORS – 600V AND BELOW

- A. Branch Circuit Conductor Splices:
 - 1. Live spring type, Scotchlok, Ideal Wire Nut, Buchanan B-Cap, or 3M Series 560 self-stripping type.
 - 2. Push in self-locking type connectors, WAGO.
- B. Cable Splices:
 - 1. Compression tool applied sleeves, Kearney, Burndy, or equivalent with 600V heat shrink insulation.
 - 2. Submit proposed splice location to the Engineer for review, except where indicated on the plans
- C. Terminator Lugs for Stranded Wire:
 - 1. 10 AWG Wire and Smaller: Spade flared, tool applied.
 - 2. 8 AWG Wire and Larger: Compression tool applied.
 - 3. Setscrew type terminator lugs furnished as an integral part of switches and circuit breakers will be acceptable.

PART 3 - EXECUTION

3.01 CONDUCTORS

- A. Pulling compounds may be used for pulling conductors. Clean residue from the conductors and raceway entrances after the pull is made.
- B. Pulleys or Blocks:
 - 1. Use for alignment of the conductors when pulling.
 - 2. Pulling in accordance with manufacturer's specifications regarding pulling tensions, bending radii of the cable, and compounds.

- C. Make up and insulate wiring promptly after installation of conductors. Do not pull wire in until bushings are installed and raceways terminations are completed. Do not pull wire into conduit embedded in concrete until after the concrete poured and forms stripped.
- D. Provide a dedicated neutral conductor with each branch circuit, do not use a shared neutral conductor between phases unless specifically requested or directed.
- E. For remodel work or where shared neutrals are used by equipment such as systems furniture, provide a breaker handle tie as required for the phases sharing the neutral conductor.
- F. Aluminum conductors for feeders between switchboards, distribution panels, panelboards, motor control centers, dry type transformers, and busway units.
 - 1. Aluminum Conductors:
 - a. Do not utilized for feeders 100A or smaller.
 - b. Not allowed for branch circuits or equipment connections.
 - c. Refer to the feeder schedule on the drawings for conductor and conduit sizes.

3.02 MC CABLE

- A. MC Cable: Allowed only where concealed within wall or ceiling cavities.
- B. MC Cable:
 - 1. Do not use for branch circuit homeruns to branch panelboards.
 - 2. EMT or RMC conduit utilized for branch circuit homeruns to branch panelboards.
 - 3. Provide enclosures and terminals to transition from MC Cable to building wire as required.

3.03 CONNECTORS

- A. Terminate control and special systems with a tool applied spade flared lug when terminating at a screw connection.
- B. Screw and bolt type connectors made up tight and retightened after an 8 hour period.
- C. Apply tool applied compression connectors per manufacturer’s recommendations and physically checked for tightness.

3.04 COLOR CODING

- A. Color code secondary service, feeders, and branch circuit conductors. Phase color code to be consistent at feeder terminations, A-B-C left-to-right, A-B-C top-to-bottom, or A-B-C front-to-back. Color code is as follows:

120/240V 208Y/120V	Phase	480V 480Y/277V
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray*
Green	Ground**	Green
* or white with colored (other than green) tracer		
**Ground for isolated ground receptacles green with yellow tracer.		

- B. Use solid color compound or solid color coating for 12 AWG and 10 AWG branch circuit conductors and neutral sizes.
- C. Phase conductors 8 AWG and larger color code using one of the following:
 - 1. Solid color compound or solid color coating.
 - 2. Stripes, bands, or hash marks of color specified above.
 - 3. Colored as specified using 3/4-inch wide tape. Apply tape in half overlapping turns for a minimum of three inches for terminal points and in junction boxes, pull boxes, troughs, manholes, and handholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Apply tags to cable stating size and insulation type where cable markings are tape covered.
- D. Switch legs, travelers, etc., consistent with the phases to which, connected or a color distinctive from that listed.
- E. Color-coding of the flexible wiring system conductors and connectors.
- F. For modifications and additions to existing wiring systems, color-coding conform to the existing wiring system.

3.05 FIELD TESTING

- A. 600V Rated Conductors: Test for continuity. Conductors 100A and over in meggered after installation and prior to termination. Provide the megger, rated 1,000V DC, and record and maintain the results, in tabular form, clearly identifying each conductor tested.
 - 1. Replace cables when test value is less than 15 megohms.
 - 2. Cable test submittal include results, equipment used, and date.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Ground Conductors
 - 2. Connectors
- B. Related Sections include:
 - 1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
 - 2. Section 26 05 33, Raceways and Boxes for Electrical Systems
 - 3. Section 26 05 80, Electrical Testing
 - 4. Section 26 24 16, Panelboards
 - 5. Section 26 27 26, Wiring Devices
 - 6. Section 26 29 00, Motor Controllers

1.03 QUALITY ASSURANCE

- A. Provide complete ground systems as indicated. Include conduit system, transformer housings, switchboard frame and neutral bus, motors, and miscellaneous grounds required.
- B. Provide 600V insulated main bonding jumper for utility company connection between ground bus in switchgear lineup and ground termination point or service ground in transformer vault as directed by the utility.
- C. Provide an insulated ground conductor in every conduit or raceway containing power conductors.
- D. Continue existing system as specified herein and shown on the Drawings.

PART 2 - PRODUCTS

2.01 GROUND CONDUCTORS

- A. Green insulated copper for use in conduits, raceways, and enclosures.
- B. Bare copper for ground grids and grounding electrode systems.

2.02 CONNECTORS

- A. Cast, setscrew, or bolted type.
- B. Form poured, exothermic welds.
- C. Grounding lugs where provided as standard manufacturer's items on equipment.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Grounding Conductors: Sized in accordance with Article 250, Tables 250.66 and 250.122 of the National Electrical Code.
- B. Grounding Conductor Connectors: Make up tight, located for future servicing, and ensure low impedance.
- C. Ground the electrical system, the cold-water service, structural steel, and transformers to the building ground grid.
- D. Plug-in Receptacles: Bonded to the boxes, raceways, and grounding conductor.

3.02 EQUIPMENT

- A. Provide separate green insulated equipment ground conductor in non-metallic and flexible electrical raceways.
- B. Ground luminaires, panels, controls, motors, disconnect switches, exterior lighting standards, and noncurrent carrying metallic enclosures. Use bonding jumpers, grounding bushings, lugs, buses, etc., for this purpose.
- C. Provide grounding bushings on feeder conduit entrances to panels and equipment enclosures and bond bushings to enclosures with minimum 10 AWG conductor. Connect the equipment ground to the building system ground. Use the same size equipment ground conductors as phase conductors, up through 10 AWG.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Hangers
 - 2. Pipe Straps
 - 3. Support of Open Cabling
- B. Related Sections include:
 - 1. Section 26 05 33, Raceways and Boxes for Electrical Systems
 - 2. Section 26 24 16, Panelboards
 - 3. Section 26 50 00, Lighting

1.03 REFERENCED STANDARDS

- A. International Building Code (IBC)
- B. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

PART 2 - PRODUCTS

2.01 HANGERS

- A. Kindorf B-905-2A Channel, H-119-D washer, C105 strap, minimum 1/2-inch rod with ceiling flange, or equal.

2.02 PIPE STRAPS

- A. Two-hole galvanized or malleable iron.

2.03 SUPPORT OF OPEN CABLING

- A. Support of Open Cabling: Label NRTL for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 2. Lacing bars, spools, J-hooks, and D-rings.
 - 3. Straps and other devices.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide electrical equipment supports.
- B. Install vertical support members for equipment, straight and parallel to building walls.
- C. Provide independent supports to structural member for electrical fixtures, materials, or equipment installed in or on ceiling, walls, or in void spaces and/or over furred or suspended ceilings.
- D. Do not use other trades' fastening devices to support electrical equipment materials or fixtures.
- E. Do not use supports and/or fastening devices to support other than one particular item.
- F. Support conduits within 18-inches of outlets, boxes, panels, cabinets, and deflections.
- G. Provide complete seismic anchorage and bracing for the vertical and lateral restraint of conduit, cable trays, bus ducts, and electrical equipment as required by IBC Chapter 6 and the most recent version of the SMACNA Seismic Restraint Manual for Seismic Hazard Level (SHL) A. Submit shop drawings of bracing systems to the Architect for review and bear the seal of a professional engineer registered in the State of California.

3.02 LUMINAIRES

- A. Light-Duty Ceiling Systems:
 - 1. Attach 12 gauge hanger wire from each corner of the luminaire to the structure above.
 - 2. Positively and securely, attach luminaire within 6-inches of each corner to the suspended ceiling-framing member by mechanical means.
- B. Intermediate-Duty Ceiling Systems:
 - 1. Positively and securely, attach luminaire within 6-inches of each corner to the suspended ceiling-framing member by mechanical means.
 - 2. Attach 12 gauge hanger wire within 3-inches of each corner of each luminaire.
 - 3. Connect two 12 gauge slack wires from the luminaire housing to the structure above for luminaires weighing less than 56 pounds.

4. Support luminaires weighing 56 pounds or more directly from the structure above with approved hangers attached to each corner of the luminaire.

C. Heavy-Duty Ceiling Systems:

1. Positively and securely, attach luminaire within 6 inches of each corner to the suspended ceiling-framing member by mechanical means.
2. Connect two 12-gauge slack wires from the luminaire housing to the structure above for luminaires weighing less than 56 pounds.
3. Support luminaires weighing 56 pounds or more directly from the structure above with approved hangers attached to each corner of the luminaire.

3.03 PULL AND JUNCTION BOXES

A. Pull and junction boxes installed within the cavity of a suspended ceiling that is not a fire rated assembly may be attached to the suspended ceiling framing members, provided the following criteria are met:

1. Installation complies with the ceiling system manufacturer's instructions.
2. Pull or junction box is not larger than 100 cubic inches.
3. Support to the main runner with two fastening devices designed for framing member application and positively attach or lock to the member.
4. Serves branch circuits and associated equipment in the area.
5. Pull or junction box is within 6-feet of the luminaires supplied.
6. Framing members are not rotated more than 2 degrees after installation.
7. Install within the cavity of a suspended ceiling may be attached to independent support wires, provided the following criteria are met:
 - a. Independent support wires are taut and connected at both ends, one end to the ceiling framing member and the other to the structure above.
 - b. No larger than 100 cubic inches.
 - c. Secure to the independent support wires by two fastening devices designed for the application.
 - d. Independent support wires in a fire-rated ceiling are distinguishable by color, tagging, or other effective means.

3.04 CABLES AND RACEWAY

A. Cables and raceway installed within the cavity of a suspended ceiling may be attached to independent support wires provided the following criteria are met:

1. Independent support wires are taut and connected at both ends, one end to the ceiling framing member and the other to the structure above.
2. Raceways no larger than 1-inch trade size and cables and bundled cables are not larger than 1-inch diameter including insulation.

3. Not more than three raceways or cables supported by independent support wire and supported within the top or bottom 12-inches.
 4. Cables for telecommunications, data processing, Class 2 power-limited signaling systems, fiber optics, and other power limited systems are securely fastened within 2 feet of each termination and at intervals not to exceed 5-feet or per the manufacturer's installation instructions.
 5. Secure raceways at intervals required for the type of raceway installed.
 6. Secure cables and raceway to independent support wires by fastening devices and clips designed for the purpose.
 7. Independent support wires are distinguishable by color, tagging, or other effective means.
- B. Cables and raceway installed within the cavity of a suspended ceiling may be supported with trapezes constructed of steel rods and channels provided the following criteria are met:
1. The size of the rods, channel, and fastening devices are suitable for the anticipated weight.
 2. The spacing of the trapezes meets that required for the type of raceway installed.
 3. Secure to a trapeze by straps designed for the purpose.
 4. Cables and raceway do not support other raceway or cables.
 5. An appropriately sized seismic bracing system is installed.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Metallic Conduits
 - 2. Non-Metallic Conduits
 - 3. Wireways
 - 4. Fittings
 - 5. Metallic Boxes
 - 6. Floor Boxes
 - 7. Non-Metallic Boxes
- B. Related Sections include:
 - 1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
 - 2. Section 26 05 26, Grounding and Bonding for Electrical Systems
 - 3. Section 26 05 29, Hangers and Supports for Electrical Systems
 - 4. Section 26 05 53, Identification for Electrical Systems

PART 2 - PRODUCTS

2.01 GENERAL

- A. Raceways and conduits of specified types for electrical system wiring, except where clearly indicated otherwise.
- B. Fittings, boxes, hangers, and appurtenances required for the conduits and raceways.

- C. Size raceways and conduits as indicated. Where no size indicated, conduit may be the minimum code permitted size for the quantity of conductors installed, based upon NEC tables for conductors with type THW insulation.

2.02 METALLIC CONDUITS

- A. Rigid Metal Conduit (RMC):
 - 1. Smooth surfaced heavy wall mild steel tube of uniform thickness and temper, reamed and threaded at each end and protected inside and out with galvanizing, sherardizing, or equivalent process.
 - 2. Comply with NEC Article 344.
- B. Intermediate Metallic Conduit (IMC):
 - 1. Smooth surface, intermediate wall mild steel tube of uniform thickness and temper, reamed and threaded at each end, and protected inside and out with galvanizing, sherardizing, or equivalent process.
 - 2. Comply with NEC Article 342.
- C. Electrical Metallic Tubing (EMT):
 - 1. Smooth surface, thin wall mild steel tube of uniform thickness and temper, galvanized or sherardized on the outside, and enameled on the interior.
 - 2. Comply with NEC Article 358.
- D. Flexible Conduits (Flex):
 - 1. Flexible Metallic Conduit:
 - a. Interlocking single strip steel construction, galvanized inside and out after fabrication.
 - b. Comply with NEC Article 348.
 - 2. Liquid Tight:
 - a. Similar to flexible metallic conduit, except encased in a liquid tight polyvinylchloride or equivalent outer jacket over the flexible steel core.
 - b. Comply with NEC Article 350.

2.03 NON-METALLIC CONDUITS

- A. Rigid Non-Metallic Conduit:
 - 1. Type II PVC Schedule 40 or 80, suitable for use with 90 degree C rated wire.
 - 2. Conform to UL Standard 651 and carry appropriate UL listing for above and below ground use.

2.04 WIREWAYS

- A. Troughs: Steel, painted, square in cross section, preformed knockouts on standard spacing, screw cover.

- B. Fittings: Tees, elbows, couplings as required for configuration shown on the Drawings.

2.05 FITTINGS

A. RMC and IMC:

1. Threaded Locknuts: Sealing type where used with NEMA 2, 3, 3R, 4, and 12 enclosures.
2. Threaded Bushings: 1-1/4-inch and larger, insulated, grounding type as required under Section 26 05 26, Grounding and Bonding for Electrical Systems.
3. Threaded Couplings: Standard threaded of the same material and as furnished with conduit supplied. Erickson type couplings may be used where required to complete conduit runs larger than 1-inch.

B. EMT:

1. Connectors: Steel compression ring or steel set screw type for conduit termination, with insulated throat, suitable for conditions used. Use lay-in grounding type bushings where terminating grounding conductors.
2. Couplings: Steel compression ring or steel set screw type, concrete tight.

C. Threadless: RMC and IMC couplings and box connectors may be steel threadless, compression ring or set screw type for use with conduits 1-inch and smaller where installed in poured concrete locations or where limited working space makes threaded fittings impractical.

D. Weatherproof Connectors: Threaded

E. Expansion Couplings: Equivalent to O.Z. type EX with jumper.

F. Seal-Offs: With filler fiber, compound, and removable cover.

2.06 METALLIC BOXES

A. Flush and Concealed Outlet Boxes: Galvanized stamped steel with screw ears for device ring mounting, knock-out plugs, mounting holes, fixture studs if required, RACO or equivalent.

B. Surface Outlet Boxes: Galvanized stamped steel same as above for use on ceilings; cast steel or aluminum with threaded hubs or bosses for use on walls.

C. Large Boxes:

1. Boxes exceeding 4-11/16-inches when required welded steel construction with screw cover and painted, steel gauge as required by physical size,
2. Manufacturers:
 - a. Hoffman
 - b. Circle AW
 - c. Equal as approved by the district.

D. Systems:

1. Boxes for systems devices as recommended by the systems manufacturer, suitable for the equipment installed.

2. Equip with grounding lugs, brackets, device rings, etc., as required.

2.07 FLOOR BOXES

- A. Combination concealed power, data and communications services floor box with flush-hinged door and cover assembly. Nominal 12-inch by 6-inch by 3-inch stamped steel concrete tight box with multiple conduit entrances and pre-pour and after-pour adjusting screws.
 1. Heavy gauge steel doorplate suitable for carpet cut-in.
 2. High impact thermoplastic trim and carpet flange, finish by Architect.
 3. Tilted steel service plates for power and signal devices.
 4. Hubbell 3SFB-SS series or equal.
- B. Large capacity combination concealed power, data, and communications services floor box with flush-hinged door and cover assembly. Nominal 12-inch by 10-inch by 3-inch stamped steel concrete tight box with four service compartments, multiple conduit entrances and pre-pour and after-pour adjusting screws. Cover to prevent water, dirt, and debris from entering the power and communication devices. UL listed for use with tile, carpet or wood floor finishes.
 1. Die cast aluminum cover and cable doors suitable for carpet or tile cut-ins.
 2. Cover and carpet flange, finish by Architect.
 3. Four steel service plates for power, signal and future devices.
 4. Wiremold RFB4-SS series or equal.
- C. Flush fire-rated poke-through power and data floor device with slide open device covers. Nominal 7-inch diameter trim flange, 4-inch diameter core, 3/4-inch service conduits, and power junction box. 2 hour UL listed assembly suitable for use with tile or carpet floor finishes,
 1. High impact thermoplastic faceplate, carper flange and slide device covers, finish by Architect.
 2. Carpet flange and faceplate and slide device covers, finish by Architect.
 3. One pre-wired 20A duplex receptacle.
 4. Two Cat 6 modular inserts.
 5. Wiremold RC3 Series or equal.
- D. Flush in floor junction boxes and those serving pedestal fittings concrete tight square stamped steel, fully adjustable with multiple conduit entrances and a round cover assembly.
 1. Cover assembly and plate, finish by Architect.
 2. Brushed aluminum power pedestal with single 20A duplex receptacle.
 3. Brushed aluminum data communications pedestal.

4. Wiremold R880 Series boxes and 500 Series pedestals or equal.

2.08 NON-METALLIC BOXES

- A. PVC, molded enclosures, threaded hubs.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Conceal conduits in finished spaces. Concealed conduits run in a direct line with long sweep bends and offsets. Where RMC and IMC embedded is in concrete below grade or in damp locations make watertight by painting the entire male thread with Rustoleum metal primer or equivalent before assembly.
- B. Route exposed conduit parallel or at right angles to structural building lines and neatly offset into boxes. Conduits attached directly to building surfaces closely follow the surfaces. Conduit fittings used to saddle under beams. Drilling or notching of existing beams, trusses on structural members coordinated with Architect prior to commencing.
- C. Rigidly secure RMC and IMC terminations at boxes, cabinets, and general wiring enclosures with double locknuts and bushings or approved fittings. Screw in conduit and engage at least five threads in hub where conduit boxes with threaded hubs or bosses are used. Use insulating bushings for conduits 1-1/4-inches or larger.
- D. Keep conduit and raceways closed with suitable plugs or caps during construction to prevent entrance of dirt, moisture, concrete, or foreign objects. Clean and dry raceways before installation of wire and at the time of acceptance.
- E. Pack spaces around conduits with polyethylene backing rods and seal with polyurethane caulking to prevent entrance of moisture where conduits are installed in sleeves or block-outs penetrating moisture barriers.

3.02 CONDUIT

- A. RMC:
 1. Use in areas for wiring systems.
 2. Install for exposed runs of medium voltage circuits outside of the electrical rooms.
 3. Install where subject to mechanical injury.
 4. Install with threaded fittings made up tight.
- B. IMC:
 1. Use for medium voltage circuits where concealed or where exposed in the electrical rooms.
 2. Use for circuits rated 600V and less where not in contact with earth or fill.
 3. Install with threaded fittings made up tight.

C. EMT:

1. Use in other dry protected locations for circuits rated 600V and less.
2. Securely support and fasten whether exposed or concealed at intervals of nominally every 8-feet and within 24-inches of each outlet, ell, fitting, panel, etc.

D. Flex:

1. Use for connections to vibration producing equipment and where installation flexibility is required with a minimum 12-inches slack connection.
2. Limit flex length to 36-inches for exposed equipment connections and 72-inches in concealed ceiling and wall cavities.
3. Use PVC jacketed flex in wet locations, areas subject to washdown, and exterior locations.

E. PVC:

1. Type II Schedule 40 and 80 PVC may be used underground and in and under interior slabs, poured concrete walls, and where scheduled or noted on the Drawings.
2. Make connections with waterproof solvent cement.
3. Provide RMC at 60 degree and larger bends and where penetrating slabs.

3.03 RACEWAYS

- A. Surface metal wireways may be installed at locations to serve motor starters or other control devices where required by a multitude of wiring interconnections or physical layout.

3.04 FITTINGS

- A. Assemble continuous and secured metallic raceways and conduits to boxes, panels, etc., with appropriate fittings to maintain electrical continuity. Cut square and reamed smooth conduit joints with fittings drawn up tight.
- B. Do not use Crimp-on, tap-on, indenter type, malleable iron, or cast set screw fittings.

3.05 BOXES

A. General:

1. Outlet Boxes: Code required size to accommodate wires, fittings, and devices.
2. Provide multi-gang boxes as required to accept devices installed with no more than one device per gang.
3. Equip metallic boxes with grounding provisions.

B. Size and Type:

1. Flush wall switch and receptacle outlets used with conduit systems 4-inches square, 1-1/2-inches or deeper, with one or two-gang plaster ring, mounted vertically. Where three or more devices are at one location, use one piece multiple gang tile box or gang box with suitable device ring.
2. Wall bracket and ceiling surface mounted luminaire outlets 4-inch octagon 1-1/2 inches deep with 3/8-inch fixture stud where required. Wall bracket outlets have single gang opening where required to accommodate luminaire canopy. Provide larger boxes or extension rings where quantity of wires installed requires more cubic capacity.
3. Junction boxes installed in accessible ceiling or wall cavities or exposed in utility areas minimum of 4-inches square, 1-1/2 inches deep with appropriately marked blank cover.
4. Boxes for the special systems suitable for the equipment installed. Coordinate size and type with the system supplier.

C. Pull Boxes

1. Provide pull boxes where shown for installation of cable supports or where required to limit the number of bends in any conduit to not more than three 90-degree bends.
2. Use galvanized boxes of code-required size with removable covers installed so that covers will be accessible after work is completed.

D. Installation:

1. Mount boxes and outlets at nominal centerline heights shown on the drawings.
2. Adjust heights in concrete masonry unit (CMU) walls to prevent devices or finish plates from spanning masonry joints.
3. Recessed Boxes
 - a. Flush with finished surfaces or not more than 1/8-inch back, level and plumb.
 - b. Long screws with spacers or shims for mounting devices will not be acceptable.
 - c. No combustible material exposed to wiring at outlets.
4. Covers for flush mounted boxes in finished spaces extend a minimum of 1/4-inch beyond the box edge to provide a finished appearance. Finish edge of cover to match cover face.
5. Boxes installed attached to a stud in sheet rock walls equipped with opposite side box supports equivalent to Caddy 760. Install drywall screw prior to finish taping. Methods used to attach boxes to studs not to cause projections on the face of the stud to prevent full-length contact of sheet rock to the stud face.

3.06 PULL WIRES

- A. Install nylon pull lines in empty conduits larger than 1-inch where routing includes 25-feet or more in length or includes 180 degrees or more in bends.

- B. Where conduits requiring pull lines are stubbed out and capped, coil a minimum of 36-inches of pull line and tape at termination of conduit for easy future access. Label pull lines as to conduit starting or terminations point and intended future use.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Labels
- B. Related Sections include:
 - 1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
 - 2. Section 26 05 33, Raceways and Boxes for Electrical Systems
 - 3. Section 26 09 43, Network Lighting Controls
 - 4. Section 26 24 16, Panelboards
 - 5. Section 26 27 26, Wiring Devices
 - 6. Section 26 29 00, Motor Controllers
 - 7. Section 26 50 00, Lighting
 - 8. Section 28 30 00, Fire Detection and Alarm

PART 2 - PRODUCTS

2.01 LABELS

- A. Pre-printed: Permanent material pre-printed with black on white, with adhesive backing, Brady, 3M or equivalent.
- B. Engraved Laminated Plastic:
 - 1. 3-ply laminated plastic, colors indicated herein, with beveled edges, engraved letters, and stainless steel screw attachment.
 - 2. Nameplate length to suit engraving.

3. Adhesive attachment is not acceptable.
- C. Clear Plastic Tape:
1. Black (normal) or red (emergency or standby) 12 point Helvetica medium text, clear adhesive backing, field printed with proper equipment for device labeling.
 2. Manufacturers:
 - a. Brother P-Touch
 - b. Dyno-tape
 - c. Kroy
 - d. Equal as approved the District.
- D. Wire Markers: White with black numbers, adhesive-backed tape on dispenser roll, Brady, 3M or equivalent.
- E. Feeder Conduit Marking:
1. Provide one-piece snap-around vinyl feeder conduit markers for feeder conduits.
 2. Provide custom label, black letters on orange background indicating destination equipment, 1-1/4-inch high letters (minimum) – Seton Setmark Pipe Marker Series.
 3. Provide additional one-piece snap-around vinyl label, black letters on orange background for voltage designation (i.e., 277/480V, 120/208V).
 4. Secure labels to conduits using plastic tie wrap, two per label.
- F. Marker Pen: Black permanent marker suitable for writing on metallic surfaces.

PART 3 - EXECUTION

3.01 GENERAL

- A. Nameplate and text coloring:
1. Normal Black nameplate with white lettering.
 2. Standby Yellow nameplate with black lettering.

3.02 BRANCH CIRCUIT PANELBOARDS

- A. Provide engraved laminated plastic nameplate on the face of each panelboard centered above the door as follows:
1. Line 1: Equipment identification (e.g., PANEL 4HA). Text height: 1/2-inch.
 2. Line 2: Equipment voltage, phase and wire quantity (e.g., 480Y/277V, 3PH, 4W). Text height: 3/8-inch.
- B. Indicate feeder source, feeder wire size, and feeder breaker or fuse size with plastic tape labels on the inside of the panel door.

- C. Provide typewritten panel directories, with protective, clear transparent covers, accurately accounting for every breaker installed including spares.
 - 1. Schedules use the actual room designations assigned by name or number near completion of the work and not the space designation on the Drawings. Confirm final room designations with Architect and Owner prior to completion of work.
 - 2. Each load description includes a room or area designation whether indicated on the Drawings or not.

3.03 EQUIPMENT

- A. Provide engraved laminated plastic nameplate on the face of disconnect switches, motor starters, relays, contactors, and etc., indicating equipment served (e.g., AHU-1) and equipment load (e.g., 20 hp). Provide additional engraved laminated plastic nameplate indicating serving panel designation and circuit number.
- B. Provide clear plastic tape label for relays, contactors, time switches and miscellaneous equipment provided under this Division of work indicating equipment served.

3.04 FEEDER CONDUIT

- A. Provide feeder conduit marker for electrical feeders.
- B. Provide markers when exiting source equipment and located along the entire conduit length 20-feet on centers in exposed areas, above ceilings, and upon entering or leaving an area or room.

3.05 DEVICES

- A. Label each receptacle plate with preprinted clear plastic tape indicating serving panel and circuit number (e.g., PANEL 2PA-5). Clean oils, dirt, and foreign materials from plate prior to label application. Label receptacles connected to a GFCI protected circuit downstream from the protecting device.

3.06 RACEWAYS AND BOXES

- A. Label pull boxes and junction boxes for systems with paint or marker pen on box cover identifying system. Where box covers are exposed in finished areas, label inside of cover.
- B. Color label covers as follows:
 - 1. 480Y/277V wiring Orange
 - 2. 208Y/120V wiring Black
 - 3. Fire Alarm Red
 - 4. Communications Green
 - 5. Security Blue
- C. Label each end of pull wires left in empty conduits with tags or tape indicating location of other end of wire.

3.07 SYSTEMS

- A. Complex control circuits may utilize combination of colors with each conductor identified throughout using wraparound numbers or letters. Use the number or letters shown where the Drawings or operation and maintenance data indicate wiring identification.
- B. Label the fire alarm and communication equipment zones, controls, indicators, etc., with machine-printed labels or indicators appropriate for the equipment installed as supplied or recommended by the equipment manufacturer.

3.08 EXISTING EQUIPMENT

- A. Provide new nameplates and labels for existing distribution equipment in accordance with panel descriptions shown on the Drawings. Provide new labels for feeder devices where labels are non-existent, incorrect, or confusing on existing distribution panels affected by this work.
- B. Equip existing branch circuit panelboards scheduled to remain with new, accurate, typed, circuit directories where circuiting changes are made.

END OF SECTION

SECTION 26 05 73

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Studies and Analysis
- B. Related Sections include:
 - 1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
 - 2. Section 26 29 00, Motor Controllers

1.03 REFERENCES

- 1. IEEE 141 Recommended practice for electrical power distribution and coordination of industrial and commercial power systems
- 2. IEEE 242 Recommended practice for protection and coordination of industrial and commercial power systems
- 3. IEEE 399 Recommended practice for industrial and commercial power system analysis
- 4. IEEE 1584 Guide for performing arc-flash hazard calculations
- 5. NFPA 70 National Electrical Code, latest addition
- 6. NFPA 70E Standard for Electrical Safety in the Workplace, latest addition

1.04 SUBMITTALS

- A. Overcurrent Device Coordination Study
- B. Device Setting Recommendations
- C. Arc Flash Hazard Analysis and report
- D. Arc Flash Equipment Labeling Recommendations

- E. Arc Flash Label Example

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Emerson
- B. Equal as approved by the District.

2.02 STUDIES AND ANALYSIS

- A. Overcurrent Device Coordination Study:
 - 1. Provide a coordination study for the electrical overcurrent devices to assure proper equipment and personnel protection.
 - 2. Present an organized time-current analysis of each protective device in series from the individual device back to the source. Reflect the operation of each device during normal and abnormal current conditions.
 - 3. Complete and submit prior to procurement of electrical distribution equipment including: switchgear, switchboards, panelboards, disconnects and overcurrent protection devices.
 - 4. Demonstrate selective coordination of the emergency system in conformance with National Electrical Code Section 700. Standby and optional standby systems on the load side of automatic transfer switches are required to coordinate with overcurrent protection devices on the line side of automatic transfer switches.
 - 5. Bring to the attention of the Engineer devices that fail to selectively coordinate as required to meet code.
 - 6. Provide alternative options and/or scenarios for devices that fail to coordinate and demonstrate methods/devices needed to selectively coordinate for the engineers review and acceptance.
 - 7. Provide pertinent information required by the preparers to complete the study.
 - 8. Include a system one-line diagram and protective coordination curves.
 - a. Determine the required settings of protective devices to assure selective coordination.
 - b. Graphically illustrate on log paper that adequate time separation exists between series devices.
 - c. Plot the specific time-current characteristics of each protective device so that upstream devices are clearly depicted on one sheet.
 - d. Time Current Curves: Develop for both phase and ground protective devices.
 - e. Provide the following specific information shown on the coordination curves:
 - 1) Device identification.
 - 2) Voltage and current ratio for curves.
 - 3) 3-phase and 1-phase ANSI damage points for each transformer.
 - 4) No-damage, melting, and clearing curves for fuses.
 - 5) Cable damage curve.
 - 6) Transformer inrush points.
 - 7) Maximum short circuit cut-off point.

- 8) Motor starting locked rotor curves.
 - 9) Clearly marked short circuit current levels through each protective device and branch.
 - f. Develop a table that summarizes the settings selected for the protective devices. Included the following:
 - 1) Device identification.
 - 2) Circuit breaker sensor rating, long-time, short-time, instantaneous settings, and time bands.
 - 3) Fuse rating and type.
 - 4) Ground fault pickup and time delay.
 - 5) Provide characteristic time-current curves for each adjustable overcurrent protective device showing pickup settings, time delay bands and device operating times. Include trip adjustment time dials and available settings corresponding to each characteristic time-current curve.
- B. Arc Flash Hazard Analysis:
1. Provide an Arc Flash Hazard Study per the requirements set forth in NFPA 70E. The arc flash hazard analysis performed according to the IEEE 1584 equations that are presented in NFPA70E.
 2. Use study to determine:
 - a. Arc flash incident energies.
 - b. Arc flash boundaries.
 - c. Shock hazard boundaries.
 - d. Personal protective equipment (PPE) for energized electrical equipment.
 3. Provide the following information for each system mode of operation and documented. The study includes:
 - a. Equipment name and voltage.
 - b. Equipment device name and ANSI function (i.e., 51/50).
 - c. Equipment type (i.e., switchgear, MCC, panel, VFD, etc.).
 - d. Equipment arc gap.
 - e. Bolted and estimated arcing fault current at the fault point (equipment) in symmetrical amperes. The estimated arcing current should be based on the arcing current equations used.
 - f. Trip time, opening time, and total clearing time (total Arc time) of the protective device.
 - g. Worst-case arc flash boundary for each bus/equipment in the model.
 - h. Worst-case arc flash hazard incident energy in cal/cm² for each bus/equipment in the model.
 - i. Worst-case personal protective equipment (PPE) for each bus/equipment in the model.
 - j. Show five different working distances for each distance.
 - k. Indicate Danger/Hazardous areas where incident energy is greater than 40 cal/cm² and provide recommendations to reduced arc flash energy levels for these areas.
 - l. Flag results where 85 percent arcing current provided worst-case results.
 4. Arc flash study report format:
 - a. Introduction
 - b. Methodology
 - c. Backup Information
 - d. Key Assumptions
 - e. IEEE 1584-2002 Considerations
 - f. Arc flash reduction options: Overcurrent protective device changes.
 - g. Explanation of data in arc flash hazard report tables.

- h. NFPA 70E Information.
 - 1) Shock hazards with covers removed.
 - 2) Shock hazard approach boundaries.
 - a) Limited Approach Boundary
 - b) Restricted Approach Boundary
 - c) Prohibited Approach Boundary
 - 3) Arc Flash Hazard Boundaries
 - i. Results of arc flash hazard analysis for high voltage, medium voltage, and low voltage systems, including:
 - 1) Working Distances
 - 2) Energy Levels
 - 3) PPE Requirements
 - 4) Recommendations to reduce arc flash hazard energy and exposure.
 - j. Arc Flash Hazard Report
 - k. Electronic File
5. Provide labels for the project.

PART 3 - EXECUTION

3.01 SETTINGS AND ADJUSTMENT

- A. Set and adjust breakers in the distribution system per the recommendations of the coordination study and settings table.
- B. Provide protective covers and locking devices on breakers to secure settings from accidental changes.

3.02 ARC FLASH WARNING LABELS

- A. Provide a 3-1/2-inch by 5-inch thermal transfer type label of high adhesion polyester for each work location analyzed.
- B. Labels will be based on recommended overcurrent device settings and will be provided after the results of the analysis have been presented to the Owner and after any system changes, upgrades, or modifications have been incorporated in the system.
- C. The label includes the following information, at a minimum:
 - 1. Location Designation
 - 2. Nominal Voltage
 - 3. Flash Protection Boundary
 - 4. Hazard Risk Category
 - 5. Incident Energy
 - 6. Working Distance
 - 7. Engineering Report Number, Revision Number, and Issue Date
- D. Machine printed labels with no field markings.

- E. One arc flash label provided for each, unit substation primary and secondary side, switchboard, switchgear section, motor control center, panelboard, and busway.

3.03 ARC FLASH TRAINING

- A. Train the Owner's qualified electrical personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Training certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET) of equivalent.

END OF SECTION

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SECTION 26 05 80
ELECTRICAL TESTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Testing Equipment
- B. Related Sections include:
 - 1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
 - 2. Section 26 05 26, Grounding and Bonding for Electrical Systems
 - 3. Section 26 09 13, Electrical Power Monitoring and Control
 - 4. Section 26 09 43, Network Lighting Controls
 - 5. Section 26 24 16, Panelboards
 - 6. Section 26 29 00, Motor Controllers
 - 7. Section 28 30 00, Fire Detection and Alarm

1.03 TESTING CRITERIA

- A. General:
 - 1. Perform field tests and operational checks to assure that electrical equipment, both contractor and Owner supplied, is operational within industry and manufacturer's tolerances and is installed in accordance with design specifications.
 - 2. The tests and operational check determine the suitability for energization.
 - 3. Schedule tests and give a minimum of one week's advance notice of time and date to the Architect and Owner for major systems tests specified in this Section.
 - 4. Testing company provides the equipment and technical personnel to perform tests and inspections. At Contractors expense, furnish personnel necessary to assist in the testing and inspection.

5. When tests and inspections are complete, attach a label to the devices tested. Provide on the label, the name of the testing company, date of tests, and initials of the Engineer who performed the tests.

B. Responsibilities:

1. Clean the equipment, torque down accessible bolts according to the equipment manufacturer's instructions, perform routine insulation resistance tests on branch and feeder circuits, continuity checks on branch and control wiring, and rotation tests for distribution and utilization equipment.
2. Furnish a complete set of current plans and specifications to the testing company prior to commencement of testing. At each test site, provide test control power necessary to perform the tests specified. Consult the test organization as to the specific power requirements. Notify the testing organization when the equipment and systems are ready for their inspections and testing. After review by the testing engineer, correct deficiencies noted by the testing company.
3. Responsible for having the manufacturer of each equipment and/or system provide factory trained representatives(s) that will perform required functional testing, checkout, and repairs in order to pronounce the equipment and/or systems meet the requirements of these specifications and Drawings and it is ready for startup testing and commissioning by the testing organization as specified hereafter.
4. Furnish settings of protective devices by the Engineer, in conjunction with Utility.
5. Testing organization to notify Engineer prior to the commencement of testing. The testing organization, set, and adjust the protective devices and associated auxiliary timing devices in accordance with the values furnished by the Engineer. The testing organization maintains a written record of tests and, upon completion of the test, include them in a final report. Detail deficiencies in the system material, workmanship, or design.

C. Implementation:

1. Safety practices comply with applicable state and local safety orders, as well as with the Occupational Safety and Health Act (OSHA). Compliance with the National Fire Protection Association (NFPA) standard NFPA 70E, and the Accident Prevention Manual for Industrial Operations of the National Safety Council.
2. Tests, other than phase rotation and operational tests, only performed on apparatus that is deenergized. The testing company's lead test engineer for the project designated safety representative and supervise testing observations and safety requirements. Do not proceed with Work until determined that it is safe to do so.
3. Power Circuits: Conductors shorted to ground by a hotline grounding device approved for the purpose. Provide warning signs and protective barriers as necessary to conduct the tests safely.

D. Reports:

1. General: Provide full documentation of tests in the form of a report.
2. Test report includes the following sections:
 - a. Scope of Testing
 - b. Equipment Tested
 - c. Description of Test

- d. Test Results
 - e. Conclusions and Recommendations
 - f. Appendix, including Test Forms
3. Record each piece of equipment on a data sheet listing the condition of the equipment as found and as left. Include recommendations for necessary repair and/or replacement parts. Indicate on data sheets the name of the engineer who tested the equipment and the date of the test completion.
 4. Submit record copies of the completed test report no more than 30 days after completion of the testing and inspection.

1.04 REFERENCES

- A. The testing and inspection comply with applicable sections of the applicable codes and standards listed in Section 26 05 00, Common Work Results of Electrical of the project specifications.
- B. The inspection and testing comply with the project plans and specifications, as well as with the manufacturer's drawings, instruction manuals, and other applicable data that may be provided by the Engineer, for the apparatus tested.

1.05 QUALIFICATIONS

- A. Testing Organization:
 1. Independent division of the manufacturer of the assembled products being tested. If an outside testing organization is utilized, a representative of the manufacturer under contract by the testing company. Be present during testing to ensure the testing is performed properly and that any deficiencies discovered are promptly corrected.
 2. Full service company that employs factory trained test engineers capable of troubleshooting, as well as identifying power equipment problems.
 3. Perform Work outlined under the full time, onsite supervision of a graduate engineer with a minimum of 5 years of field testing experience.
 4. Upon request, submit proof of its qualifications.

PART 2 - PRODUCTS

2.01 TESTING EQUIPMENT

- A. Testing agency to have calibration program which maintains applicable test instrumentation within rated accuracy. Traceable accuracy to the National Bureau of Standards in an unbroken chain. Calibrate instruments calibrated in accordance with the following frequency schedule:
 1. Field Instruments: 6 months maximum.
 2. Laboratory Instruments: 12 months.
 3. Leased Specialty Equipment: 12 months (where accuracy is guaranteed by lessor). Dated calibration labels visible on test equipment.

PART 3 - EXECUTION

3.01 EQUIPMENT TO BE TESTED

- A. Section 26 09 13, Electrical Power Monitoring and Control:
 - 1. Instrument Transformers: Perform tests listed in the NETA 2007 Acceptance Testing Specifications for Instrument Transformers, Section 7.10.
 - 2. Metering Functions: Perform tests listed in the NETA 2007 Acceptance Testing Specifications for Metering, Section 7.11.
- B. Section 26 24 16, Panelboards:
 - 1. Panelboards: Perform tests listed in the NETA 2007 Acceptance Testing Specifications for Switchgear and Switchboard Assemblies, Section 7.1. Only those tests applicable to panelboards need be performed, no electrical tests of the circuit breakers need to be performed.
- C. Section 26 29 00, Motor Controllers
- D. Section 28 30 00, Fire Alarm and Detection:
 - 1. Fire Alarm System: Perform tests listed in Section 28 30 00, Fire Alarm and Detection.

END OF SECTION

SECTION 26 08 00

COMMISSIONING FOR ELECTRICAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.
- C. The Work of this Section is supplemental to and does not supersede any other requirements of the Contract Documents.

1.02 SUMMARY

- A. The commissioning process is described in Section 01 91 00, Commissioning.
- B. Provide all labor and materials required to complete the commissioning of those Division 26, Electrical, systems and equipment identified as Commissioned Systems and Equipment in Section 01 91 00, Commissioning.
- C. Related Sections include:
 - 1. Section 01 91 00, Commissioning
 - 2. All Sections of Division 26, Electrical.

1.03 SUBMITTALS

- A. Refer to Section 01 91 00, Commissioning.

1.04 COMMISSIONING SCOPE OF WORK - COMMISSIONING AGENT

- A. Refer to Section 01 91 00, Commissioning.

1.05 COMMISSIONING SCOPE OF WORK - CONTRACTOR

- A. Refer to Section 01 91 00, Commissioning.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

- A. Refer to Section 01 91 00, Commissioning.

PART 3 - EXECUTION

3.01 MEETINGS

- A. Refer to Section 01 91 00, Commissioning.

3.02 INSTALLATION, CHECK-OUT, START-UP AND PREFUNCTIONAL CHECKS

- A. Refer to Section 01 91 00, Commissioning.

3.03 FUNCTIONAL TESTING

- A. Refer to Section 01 91 00, Commissioning.

3.04 TRAINING OF FACILITY OPERATING STAFF AND BUILDING OCCUPANTS

- A. Refer to Section 01 91 00, Commissioning.

END OF SECTION

SECTION 26 09 13

ELECTRICAL POWER MONITORING AND CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Microprocessor-Based Metering Equipment
 - 2. System Architecture
 - 3. Metering and Monitoring Functions
- B. Related Sections include:
 - 1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
 - 2. Section 26 05 26, Grounding and Bonding for Electrical Systems
 - 3. Section 26 05 33, Raceways and Boxes for Electrical Systems
 - 4. Section 26 05 53, Identification for Electrical Systems
 - 5. Section 26 05 80, Electrical Testing
 - 6. Section 26 24 16, Panelboards

1.03 REFERENCES

- A. Microprocessor metering equipment UL listed, CSA certified and meet IEEE Standard C37.90.1 for surge protection.

1.04 SUBMITTALS

- A. Product data:
 - 1. Microprocessor metering equipment product literature with description of operational capability to perform specified metering functions and software analysis features, and communication protocol.
 - 2. Published operators' manuals for the microprocessor metering equipment.

- B. Operation and Maintenance Manuals:
 - 1. Final set up and operators' manuals.
 - 2. Instruction books and/or leaflets.
 - 3. Recommended renewal parts list.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Cutler-Hammer
- B. General Electric
- C. Square D Company
- D. Siemens
- E. Equal as approved by the District.

2.02 MICROPROCESSOR-BASED METERING EQUIPMENT

- A. General:
 - 1. Provide a complete system consisting of instrument transformers, metering instruments, trip units with metering functions; communications between components; communications with the building computer network; computers; operator interfaces at the switchgear; operator interfaces via networked computers; and other appurtenances as required for a complete system.
 - a. Overall system communications TCP/IP over a dedicated Ethernet LAN. The system support a LAN comprised of either Category 5 cable at 10baseT or fiber optics at 100baseFX or a mix thereof.
 - b. The system may also utilize Modbus/TCP for communication with field devices over an RS-485 communications link at speeds up to 38.4k baud.
 - c. Connection to the building Ethernet network made at a single Ethernet gateway.
 - 2. Configure system wiring so metering instrument can be isolated and removed from the system without the need to deenergize power or protective circuit. This requirement may be met in one of two ways:
 - a. Connections to the metering instrument may be made using separable terminal blocks. The terminal blocks for CT circuits short the CT circuit prior to breaking the metering instrument circuit on removal and make the metering instrument circuit prior to unshorting the CT circuit on insertion. CT and PT or line voltage terminals finger safe when left disconnected and energized.
 - b. Connections to the metering instrument may be made though test blocks with disconnecting switches for line and neutral voltage circuits and shorting switches for CT circuits.
 - 3. Terminate system wiring on spade or ring terminals, except that only ring terminals utilized on CT circuits. System wiring within switchgear of switchboard assembly type SIS.

4. Alarm and waveform capture set points may be created by the system operator based on the parameters defined below being greater than or less than value selected by the system operator.
5. Display, whether at the local display of a metering instrument or through software, auto range between units, kilo units or Mega units such that the absolute values less than 1,000 read as units, absolute values less than 1,000,000 but not less than 1,000 read as kilo units, and values of 1,000,000 or greater read as Mega units, except that voltage readings in units of Volts and kilovolts not be utilized.
6. Measured values, both instantaneous readings and historical data, available to users on a computer on the Ethernet network in the building without the use of proprietary software, or requiring particular operating system. To facilitate this, each metering device assigned a unique network address and by entering that address or corresponding URL into a web browser, HTML web pages of data available for that device. Specific browser software permitted to be required to access system features beyond the measured values.
7. System settings and operational parameters only accessible through a maximum of five specific user computers, require the use of proprietary software, and fully password protected.
8. Synchronize complete system to a single time base so that events on the system can be compared at different locations on the system using a common time base.
9. Capable of monitoring Modbus devices for which register values are defined.
10. System requirements indicated are minimum requirements, additional features and increased accuracy is permitted.
11. Historical data resides on the system, independent of external personal computers. Industrial computers included as integral components of the system and mounted within a switchgear enclosure may be used to supplement the storage capacity of the various metering devices in the system. Sufficient data storage space included so that each instantaneous value listed can be logged on one minute increments and maintained for 36 hours. After 36 hours, data retained at 15 minute intervals for 35 days. After 35 days, data retained at 1 hour intervals for a minimum of one year.

B. Shared Components:

1. Permitted to share components with the protective systems specified in Section 26 13 13, Medium-Voltage Circuit Breaker Switchgear and Section 26 11 16, Secondary Unit Substations provided that such sharing does not compromise the protective functions and that such sharing does not compromise the equipment of this section.
2. It is anticipated that the PTs specified in Section 26 13 13, Medium-Voltage Circuit Breaker Switchgear will be shared and that there will not be separate PTs for the metering of the medium voltage systems.
3. Where the accuracy of the protective relay metering functions or circuit breaker trip unit metering functions are sufficient to meet the requirements listed below, those metering functions may be used in lieu of separate metering instruments.

PART 3 - EXECUTION

3.01 FIELD TESTING

- A. Verify complete system operation including hardware, software and communication devices.
- B. Test components per the requirements of Section 26 05 80, Electrical Testing.

3.02 SYSTEM OPERATOR TRAINING

- A. Provide onsite training for the Owner's system operations personnel. The training course minimum of 16 hours of classroom instruction and cover system operation and troubleshooting, alarm and waveform capture set points, system programming, web page customization for the user interface, and recommended periodic maintenance.
- B. Provide a local or toll-free phone number to provide assistance to the Owner's operations personnel in the operation of the system for a minimum of five years. Costs associated with this assistance included in the original system cost.

3.03 MANUFACTURER'S CERTIFICATION

- A. A qualified factory-trained manufacturer's representative certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.
- B. Provide 4 copies of the manufacturer's representative's certification.

END OF SECTION

SECTION 26 09 43

NETWORK LIGHTING CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Lighting Controls
 - 2. Wireless Sensors
 - 3. Load Control Modules
 - 4. Wired Wall Dimmers and Switches with Wireless Communication Inputs
 - 5. Wireless Control Stations
 - 6. LED Drivers
 - 7. Power Interfaces
 - 8. Digital Dimming Ballast Models
 - 9. Wireless Hubs
 - 10. Source Quality Controls
- B. Related Sections Include:
 - 1. Section 26 05 00 Common Work Results for Electrical
 - 2. Section 26 05 53, Identification for Electrical Systems
 - 3. Section 26 05 26 Grounding and Bonding for Electrical Systems

1.03 REFERENCE STANDARDS

- A. ANSI C82.11 American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; 2011

- B. ANSI/ESD S20.20 Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices); 2014
- C. ASTM D4674 Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2002a (Reapproved 2010)
- D. CAL TITLE 24 P6 California Code of Regulations, Title 24, Part 6 (California Energy Code); 2013
- E. CSA C22.2 No. 223 Power Supplies with Extra-low-voltage Class 2 Outputs; 2015
- F. IEC 60929 AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements; 2015
- G. IEC 61000-4-2 Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test; 2008
- H. IEC 61347-2-3 Lamp Control Gear - Part 2-3: Particular Requirements for A.C. and/or D.C. Supplied Electronic Control Gear for Fluorescent Lamps; 2011
- I. IEEE 1789 Recommended Practice for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers; 2015
- J. IEEE C62.41.2 Recommended Practice on Characterization of Surges in Low-Voltage (1000V and less) AC Power Circuits; 2002 (Cor 1, 2012)
- K. ISO 9001 Quality Management Systems-Requirements; 2008
- L. NECA 1 Standard for Good Workmanship in Electrical Construction; 2010
- M. NECA 130 Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010
- N. NEMA 410 Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; National Electrical Manufacturers Association; 2011
- O. NEMA WD 1 General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2010)
- P. NFPA 70 National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, including Applicable Amendments and Supplements
- Q. UL 20 General-Use Snap Switches; Current Edition, including Revisions
- R. UL 508 Industrial Control Equipment; Underwriters Laboratories Inc.; Current Edition, including Revisions
- S. UL 924 Emergency Lighting and Power Equipment; Current Edition, including Revisions
- T. UL 935 Fluorescent-Lamp Ballasts; Current Edition, including Revisions
- U. UL 1310 Class 2 Power Units; Current Edition, including Revisions

- V. UL 1472 Solid-State Dimming Controls; Current Edition, including Revisions
- W. UL 1598C Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits; Current Edition, including Revisions
- X. UL 2043 Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, including Revisions
- Y. UL 8750 Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, including Revisions

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of sensors and wall controls with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate the placement of wall controls with actual installed door swings.
 - 3. Coordinate the placement of daylight sensors with windows, skylights, and luminaires to achieve optimum operation.
 - 4. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
 - 5. Coordinate the work to provide luminaires and lamps compatible with the lighting controls to be installed.
 - 6. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Pre-Wire Meeting; Lutron LSC-PREWIRE: Include as part of the base bid additional costs for Lighting Control Manufacturer to conduct on-site meeting prior to commencing work. Manufacturer to review with installer:
 - 1. Low voltage wiring requirements.
 - 2. Separation of power and low voltage/data wiring.
 - 3. Wire labeling.
 - 4. Wireless hub locations and installation.
 - 5. Provide sensor locations to be reviewed in accordance with layout. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.
 - 6. Control locations.
 - 7. Computer jack locations.
 - 8. Load circuit wiring.

9. Network wiring requirements.
 10. Connections to other equipment.
 11. Installer responsibilities.
- C. Sequencing: Do not install sensors and wall controls until final surface finishes are complete.

1.05 SUBMITTALS

- A. See Division 01, General Requirements for submittal procedures.
- B. Design Documents: Lighting Control Manufacturer to provide plans indicating occupancy/vacancy and/or daylight sensor locations.
- C. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 1. Occupancy/Vacancy Sensors: Include detailed basic motion detection coverage range diagrams.
 2. Wall Dimmers: Include derating information for ganged multiple devices.
 3. Samples: Wall Controls: Show available color and finish selections.
- D. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. System Performance-Verification Documentation; Lutron LSC-SPV-DOC: Include as part of the base bid additional costs for manufacturer's enhanced documentation detailing start-up performance-verification procedures and functional tests performed along with test results.
- F. Title 24 Acceptance Testing Documentation: Submit Certification of Acceptance and associated documentation for lighting control acceptance testing performed in accordance with CAL TITLE 24 P6, as specified in PART 3.
- G. Project Record Documents: Record actual installed locations and settings for lighting control system components.
- H. Operation and Maintenance Data: Include detailed information on lighting control system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
- I. Warranty: Submit sample of manufacturer's Warranty or Enhanced Warranty as specified in PART 1. Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications:

1. Company with not less than ten years of experience manufacturing lighting control products using wireless communication between devices.
2. Registered to ISO 9001, including in-house engineering for product design activities.
3. Provides factory direct technical support hotline available 24 hours per day, 7 days per week.
4. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.
1. Basis of Design System Requirements - Lutron, Unless Otherwise Indicated:
 2. Ambient Temperature:
 - a. Lighting Control System Components, Except Fluorescent Electronic Dimming Ballasts: Between 32 and 104 degrees F.
 - b. Fluorescent Electronic Dimming Ballasts: Between 50 and 140 degrees F.
 - c. Relative Humidity: Less than 90 percent, non-condensing.
 - d. Protect lighting controls from dust.

1.09 WARRANTY

- A. See Division 01, General Requirements, for additional warranty requirements.
- B. Manufacturer's Standard Warranty, With Manufacturer Full-Scope Start-Up; Lutron Standard 2-Year Warranty; Lutron LSC-B2:
1. Manufacturer Lighting Control System Components, Except Lighting Management System Computer, Ballasts/Drivers and Ballast Modules:
 - a. First Two Years:
 - 1) 100 percent replacement parts coverage, 100 percent manufacturer labor coverage to troubleshoot and diagnose a lighting issue.
 - 2) First-available on-site or remote response time.
 - 3) Remote diagnostics for applicable systems.
 - b. Telephone Technical Support: Available 24 hours per day, 7 days per week, excluding manufacturer holidays.
 2. Lighting Management System Computer: One year 100 percent parts coverage, one year 100 percent manufacturer labor coverage.
 3. Ballasts/Drivers and Ballast Modules:
 - a. With Remote Full-Scope Start-Up: Three years 100 percent parts coverage, no manufacturer labor coverage.

- b. With On-Site Full-Scope Start-Up: Five years 100 percent parts coverage, no manufacturer labor coverage.
- C. Include as part of the base bid additional costs for manufacturer's enhanced warranty; Gold Enhanced Warranty; Lutron LSC-E8G:
 - 1. Manufacturer Lighting Control System Components, Except Lighting Management System Computer, Ballasts/Drivers and Ballast Modules:
 - a. First Two Years:
 - 1) 100 percent replacement parts coverage, 100 percent manufacturer labor coverage to troubleshoot and diagnose a lighting issue.
 - 2) Remote diagnostics for applicable systems.
 - 3) Upgrade from as-available Field Service to 72-hour on-site or remote response time.
 - 4) Plus annual scheduled Preventive Maintenance Visit.
 - b. Telephone Technical Support: Available 24 hours per day, 7 days per week, excluding manufacturer holidays.
 - c. Additional Coverage for Years 3-5: 50 percent replacement parts coverage, no manufacturer labor coverage.
 - d. Additional Coverage for Years 6-8: 25 percent replacement parts coverage, no manufacturer labor coverage.
 - 2. Lighting Management System Computer: One year 100 percent parts coverage, one year 100 percent manufacturer labor coverage.
 - 3. Ballasts/Drivers and Ballast Modules:
 - a. With Remote Full-Scope Start-Up or no Full-Scope Start-Up: Three years 100 percent parts coverage, no manufacturer labor coverage.
 - b. With On-Site Full-Scope Start-Up: Five years 100 percent parts coverage, no manufacturer labor coverage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Manufacturer: Lutron Electronics Company, Inc; Vive; www.lutron.com.
- B. Equal as approved by the District.
- C. Substitutions: See Division 01, General Requirements.
 - 1. Proposed substitutions (clearly delineated as such) must be submitted in writing for approval by Architect a minimum of 10 working days prior to the bid date and must be made available to bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
 - 2. By using pre-approved substitutions, Contractor accepts responsibility and associated costs for required modifications to related equipment and wiring. Provide complete engineered shop drawings (including power wiring) with deviations from the original design highlighted in an alternate color for review and approval by Architect prior to rough-in.
- D. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 LIGHTING CONTROLS - GENERAL REQUIREMENTS

- A. Sensor Layout and Tuning: Include as part of the base bid additional costs for Lighting Control Manufacturer's Sensor Layout and Tuning service; Lutron LSC-SENS-LT:
1. Lighting Control Manufacturer to take full responsibility for wired or wireless occupancy/vacancy and daylight sensor layout and performance for sensors provided by Lighting Control Manufacturer.
 2. Lighting Control Manufacturer to analyze the reflected ceiling plans, via supplied electronic AutoCAD format, and design a detailed sensor layout that provides adequate occupancy sensor coverage and ensures occupancy and daylight sensor performance per agreed upon sequence of operations. Contractor to utilize the layouts for sensor placement.
 3. During startup, Lighting Control Manufacturer to direct Contractor regarding sensor relocation, as required, should conditions require a deviation from locations specified in the drawings.
 4. Lighting Control Manufacturer to provide up to two additional post-startup on-site service visits, within one calendar year from Date of Substantial Completion to fine-tune sensor calibration per the agreed upon sequence of operations.
- B. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.
- C. Unless specifically indicated to be excluded, provide required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, programming, etc. as necessary for a complete operating system that provides the control intent indicated.
- D. Design lighting control equipment for 10 year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C) and 90 percent non-condensing relative humidity.
- E. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.
- F. Wireless Devices:
1. Wireless device family includes area or fixture level sensors, area or fixture level load controls for dimming or switching, and load controls that can be mounted in a wallbox, on a junction box, or at the fixture.
 2. Wireless devices including sensors, load controls, and wireless remotes or wall stations, can be set up using simple button press programming without needing any other equipment (e.g. central hub, processor, computer, or other smart device).
 3. Wireless hub adds the ability to set up the system using any smart device with a web browser (e.g. smartphone, tablet, PC, or laptop).
 4. System does not require a factory technician to set up or program the system.
 5. Capable of diagnosing system communications.
 6. Capable of having addresses automatically assigned to them.

7. Receives signals from other wireless devices and provides feedback to user.
8. Capable of determining which devices have been addressed.
9. RF Range: 60-feet line-of-sight or 30-feet through typical construction materials between RF transmitting devices and compatible RF receiving devices.
10. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 15, for Class B application.

G. Wireless Network:

1. RF Frequency: 434 MHz; operate in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.
 - a. Wireless sensors, wireless wall stations and wireless load control devices do not operate in the noisy 2.4 GHz frequency band where high potential for RF interference exists.
 - b. Wireless devices operate in an uncongested frequency band providing reliable operation.
 - c. Fixed network architecture ensures associated lights and load controls respond in a simultaneous and coordinated fashion from a button press, sensor signal, or command from the wireless hub.
2. Distributed Architecture: Local room devices communicate directly with each other. If the wireless hub is removed or damaged, local control, sensing, and operation continues to function without interruption.
3. Local room devices communicate directly with each other (and not through a central hub or processor) to ensure:
 - a. Reliability of system performance.
 - b. Fast response time to events in the space (e.g. button presses or sensor signals).
 - c. Independent operation in the event of the wireless hub being removed or damaged.

H. Device Finishes:

1. Wall Controls: Match finishes for Wiring Devices in Section 26 27 26, Wiring Devices, unless otherwise indicated.
2. Wall Controls: To be selected by Architect.
3. Standard Colors: Comply with NEMA WD1 where applicable.
4. Color Variation in Same Product Family: Maximum delta E of 1, CIE L*a*b color units.
5. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.

I. Interface with building automation system as specified in Division 25, Integrated Automation and Network Integration Consultation; LSC-INT-VISIT.

2.03 WIRELESS SENSORS

A. General Requirements:

1. Operational life of 10 years without the need to replace batteries when installed per manufacturer's instructions.
2. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
3. Does not require external power packs, power wiring, or communication wiring.
4. Capable of being placed in test mode to verify correct operation from the face of the unit.

B. Wireless Occupancy/Vacancy Sensors:

1. General Requirements:

- a. Provides a clearly visible method of indication to verify that motion is being detected during testing and that the unit is communicating to compatible RF receiving devices.
- b. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
- c. Sensing Mechanism: Passive infrared coupled with technology for sensing fine motions; Lutron XCT Technology. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
- d. Provide optional, readily accessible, user-adjustable controls for timeout, automatic/manual-on, and sensitivity.
- e. Turns off lighting after reasonable and adjustable time delay once the last person to occupy the space vacates a room or area. Provide adjustable timeout settings of 1, 5, 15, and 30 minutes.
- f. Capable of turning dimmer's lighting load on to an optional locked preset level selectable by the user. Locked preset range to be selectable on the dimmer from 1 percent to 100 percent.
- g. Color: White.
- h. Provide necessary mounting hardware and instructions for both temporary and permanent mounting.
- i. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.
- j. Sensor lens to illuminate during test mode when motion is detected to allow installer to place sensor in ideal location and to verify coverage prior to permanent mounting.
- k. Ceiling-Mounted Sensors:
 - 1) Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
 - 2) Provide recessed mounting bracket compatible with drywall and compressed fiber ceilings.
- l. Wall-Mounted Sensors: Provide wall or corner mounting brackets compatible with drywall and plaster walls.

2. Wireless Combination Occupancy/Vacancy Sensors:

- a. Ceiling-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), an occupancy sensor with low light feature (automatic-on when less than one footcandle of ambient light available and automatic-off), or a vacancy sensor (manual-on and automatic-off).

- b. Wall-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), or a vacancy sensor (manual-on and automatic-off).
 - c. Product(s):
 - 1) Ceiling-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OCR2B-P-WH: Coverage from 324 SF to 676 SF depending on ceiling height from 8 to 12-feet; 360 degree field of view.
 - 2) Wall-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OWLB-P-WH: Minor motion coverage of 1500 SF and major motion coverage of 3000 SF with mounting height of 6 to 8-feet; 180 degree field of view.
 - 3) Corner-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OKLB-P-WH: Minor motion coverage of 1225 SF and major motion coverage of 2500 SF with mounting height of 6 to 8-feet; 90 degree field of view.
 - 4) Hallway Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OHLB-P-WH: Major motion coverage of up to 150-feet with mounting height of 6 to 8-feet; narrow field of view.
3. Wireless Vacancy-Only Sensors:
- a. Operates only as a vacancy sensor (manual-on and automatic-off) in accordance with CAL TITLE 24 P6 requirements.
 - b. Product(s):
 - 1) Ceiling-Mounted Vacancy-Only Sensor; Lutron Radio Powr Savr Series, Model LFR2-VCR2B-P-WH: Coverage from 324 SF to 676 SF depending on ceiling height from 8 to 12-feet; 360 degree field of view.
 - 2) Wall-Mounted Vacancy-Only Sensor; Lutron Radio Powr Savr Series, Model LFR2-VWLB-P-WH: Minor motion coverage of 1500 SF and major motion coverage of 3000 SF with mounting height of 6 to 8-feet; 180 degree field of view.
 - 3) Corner-Mounted Vacancy-Only Sensor; Lutron Radio Powr Savr Series, Model LFR2-VKLB-P-WH: Minor motion coverage of 1225 SF and major motion coverage of 2500 SF with mounting height of 6 to 8-feet; 90 degree field of view.
 - 4) Hallway Vacancy-Only Sensor; Lutron Radio Powr Savr Series, Model LFR2-VHLB-P-WH: Major motion coverage of up to 150-feet with mounting height of 6 to 8-feet; narrow field of view.
- C. Wireless Daylight Sensors:
- 1. Product: Lutron Radio Powr Savr Series, Model LFR2-DCRB-WH.
 - 2. Open-loop basis for daylight sensor control scheme.
 - 3. Stable output over temperature from 32 degrees F to 104 degrees F.
 - 4. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
 - 5. Provide linear response from 2 to 150 footcandles.
 - 6. Color: White.
 - 7. Mounting:
 - a. Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.

- b. Provide necessary mounting hardware and instructions for both temporary and permanent mounting.
 - c. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.
8. Meets CAL TITLE 24 P6 requirements.

2.04 LOAD CONTROL MODULES

- A. Provide wireless load control modules as indicated or as required to control the loads as indicated.
- B. Junction Box-Mounted Modules:
 - 1. Plenum rated.
 - 2. Dimming Modules:
 - a. Product(s): 8A dimming module with 0-10V control; Lutron PowPak Dimming Module Model RMJS-8T-DV-B.
 - b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
 - c. Single low voltage dimming module with Class 1 or Class 2 isolated 0-10V output signal conforming to IEC 60929 Annex E.2; source or sink automatically configures.
 - d. Selectable minimum light level.
 - e. Configurable high- and low-end trim.
 - f. Relay: Rated for 0-10V ballasts, LED drivers, or fixtures that conform with NEMA 410.
 - 3. Relay Modules:
 - a. Product(s):
 - 1) 16A relay module, without contact closure output; Lutron PowPak Relay Module Model RMJS-16R-DV-B.
 - 2) 16A relay module, with contact closure output; Lutron PowPak Relay Module Model RMJS-16RCCO1-DV-B.
 - 3) 5A relay module, without contact closure output; Lutron PowPak Relay Module Model RMJS-5R-DV-B.
 - 4) 5A relay module, with contact closure output; Lutron PowPak Relay Module Model RMJS-5RCCO1-DV-B.
 - b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
 - c. Relay:
 - 1) Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16A for lighting loads.
 - 2) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
 - 3) Fully rated output continuous duty for inductive, capacitive, and resistive loads.
 - d. Contact Closure Output:
 - 1) Single contact closure output with normally open and normally closed dry maintained contacts suitable for connection to third party equipment (e.g. building management system, HVAC system, etc.).
 - 2) Contact Ratings: Resistive load; 1 A at 0-24 VDC, 0.5 A at 0-24 VAC.
 - 3) Controlled by associated occupancy/vacancy sensors and wall controls.

4. 20A Receptacle Modules:
 - a. Product(s):
 - 1) 20A receptacle module, without contact closure output; Lutron PowPak 20A Relay Module Model RMJS-20R-DV-B.
 - 2) 20A receptacle module, with contact closure output; Lutron PowPak 20A Relay Module Model RMJS-20RCCO1-DV-B.
 - b. Communicates via radio frequency with up to 10 compatible occupancy/vacancy sensors, and ten wireless control stations.
 - c. Relay:
 - 1) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
 - 2) Motor rating of 1 HP at 120V, 2 HP at 277V.
 - d. Contact Closure Output:
 - 1) Single contact closure output with normally open and normally closed dry maintained contacts suitable for connection to third party equipment (e.g. building management system, HVAC system, etc.).
 - 2) Contact Ratings: Resistive load; 1A at 0-24 VDC, 0.5 A at 0-24 VAC.
 - 3) Controlled by associated occupancy/vacancy sensors and wall controls.
 5. Contact Closure Output Modules:
 - a. Product: Lutron PowPak CCO Module Model RMJS-CCO1-24-B.
 - b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
 - c. Contact Closure Output:
 - 1) Single contact closure output with normally open and normally closed dry maintained contacts suitable for connection to third party equipment (e.g. building management system, HVAC system, etc.).
 - 2) Contact Ratings: Resistive load; 1A at 0-24 VDC, 0.5A at 0-24 VAC.
 - 3) Operation affected by associated occupancy/vacancy sensors and wall controls.
- C. Fixture Control Modules/Sensors:
1. Fixture Control Modules:
 - a. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
 - b. Communicates via wired input with one combination occupancy/daylight or vacancy/daylight fixture sensor.
 - c. Coordination between Wired and Wireless Sensors:
 - 1) Occupancy/Vacancy Sensing: Wired and wireless sensors work in conjunction (occupancy detected by either sensor turns lights on and vacancy detected by both sensors turns lights off).
 - 2) Daylight Sensing: Wireless sensor takes precedence over wired sensor.
 - d. Selectable minimum light level.
 - e. Configurable high- and low-end trim.
 - f. Plenum rated.
 - g. Mounts to fixture or junction box through 1/2-inch trade size knockout.
 - h. Digital Ballast/LED Driver Fixture Control Modules:
 - 1) Product: Lutron PowPak Wireless Fixture Control for EcoSystem ballasts/drivers; Model FCJS-ECO.
 - 2) Supports reporting of energy measurement to wireless hub at accuracy of plus/minus 2 percent or 0.5W (whichever is higher).
 - 3) Single integral controller with Class 1 or Class 2 isolated digital output signal conforming to IEC 60929; capable of direct control without interface.

- 4) Provides direct low-voltage control of up to three compatible digital ballasts/LED drivers.
 - a) Electronically links a digital ballast/LED driver to a zone for both dimming and turning on/off.
 - b) Electronically assigns occupancy/vacancy sensors for manual on/auto off and auto on/auto off control.
 - c) Electronically assigns wireless control stations for manual local control.
 - d) Electronically assigns daylight sensor for automatic daylight dimming.
- i. 0-10V Dimming Fixture Control Modules:
 - 1) Product: Lutron PowPak Wireless Fixture Control for 0-10V ballasts/drivers; Model FCJS-010.
 - 2) Supports reporting of energy measurement to wireless hub at accuracy of plus/minus 2 percent or 0.5W (whichever is higher).
 - 3) Single low voltage dimming module with Class 1 or Class 2 isolated 0-10V output signal conforming to IEC 60929 Annex E.2; source or sink automatically configures.
 - 4) Provides 0-10V control for up to three ballasts/LED drivers (1A load at 120-277V, 6 mA max control current).
 - 5) Rated for switching 0-10V ballasts, LED drivers, or fixtures that conform with NEMA 410.
2. Wired Fixture Sensors:
 - a. Product(s):
 - 1) Wired occupancy/daylight fixture sensor; Lutron PowPak Fixture Sensor; Model FC-SENSOR.
 - 2) Wired vacancy/daylight fixture sensor; Lutron PowPak Fixture Sensor; Model FC-VSENSOR.
 - b. Occupancy/Vacancy Sensing:
 - 1) Passive infrared coupled with technology for sensing fine motions; Lutron XCT Technology. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
 - 2) Coverage: 300 SF with mounting height of 8 to 12-feet; 360 degree field of view.
 - 3) Sensor Timeout: 15 minutes.
 - a) Sensor timeout adjustable via Lutron Vive wireless hub when connected to compatible fixture control module.
 - c. Daylight Sensing:
 - 1) Automatic calibration.
 - 2) Provide linear response to changes in perceived light level.
 - a) Response adjustable via Lutron Vive wireless hub when connected to compatible fixture control module.
 - 3) Closed loop proportional control scheme.
 - 4) Sensor Range: 0 to 150 footcandles (0 to 1600 lux).
 - d. Mounts to fixture or ceiling.

2.05 WIRED WALL DIMMERS AND SWITCHES WITH WIRELESS COMMUNICATION INPUTS

A. General Requirements:

1. Provide air gap service switch to disconnect power to load for safe lamp replacement, accessible without removing faceplate.
2. Operates at the rated capacity across the full ambient temperature range including modified capacities for ganged configurations which require removal of fins.
3. Provide radio frequency interference suppression.

4. Surge Tolerance: Designed and tested to withstand surges of 6,000V, 200A according to IEEE C62.41.2 without impairment to performance.
 5. Dimmers: Provide full range, continuously variable control of light intensity.
 6. Dimmers for Electronic Low Voltage (ELV) Transformers:
 - a. Provide circuitry designed to control the input of electronic (solid-state) low voltage (ELV) transformers. Do not use dimmers that utilize standard phase control.
 - b. Provide resettable overload protection that provides automatic shut-off when dimmer capacity is exceeded. Do not use protection methods that are non-resettable or require device to be removed from outlet box.
 - c. Designed to withstand a short, per UL 1472, between load hot and either neutral or ground without damage to dimmer.
 7. Dimmers for Magnetic Low Voltage (MLV) Transformers:
 - a. Provide circuitry designed to control and provide a symmetrical AC waveform to input of magnetic low voltage transformers per UL 1472.
 - b. Magnetic low voltage transformers to operate below rated current or temperature.
 8. Electronic Switches: Listed as complying with UL 20, UL 508, and UL 1472.
- B. Preset Smart Wall Dimmers and Switches with Wireless Communication Inputs; Lutron Maestro Wireless Series:
1. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
 2. Dimmer Control: Multi-function tap switch with small, raised rocker for dimmer adjustment.
 - a. Rocker raises/lowers light level, with new level becoming the current preset level.
 - b. Switch single tap raises lights to preset level or fades lights to off.
 - c. Switch double tap raises light to full on level.
 - d. Switch tap and hold slowly fades lights to off over period of 10 seconds.
 - e. LEDs adjacent to tap switch indicate light level when dimmer is on, and function as locator light when dimmer is off.
 3. Switch Control: Switch single tap turns lights on/off.
 4. Dimmer High End Trim:
 - a. Incandescent Dimmers: Minimum of 92 percent of line voltage.
 - b. Dimmers for Electronic Low Voltage (ELV) Transformers: Minimum of 95 percent of line voltage.
 - c. Dimmers for Magnetic Low Voltage Transformers: Minimum of 92 percent of line voltage.
 5. Product(s) - Preset Smart Dimmers with Wireless Communication Inputs:
 - a. Preset Smart Dimmer; Lutron Maestro Wireless Series: Incandescent/halogen (600W, 120V), magnetic low voltage (600 VA/450 W, 120V), dimmable CFL/LED (150W, 120V); multi-location capability using companion dimmers (up to nine companion dimmers may be connected); minimum load requirement.
 - 1) Lutron Model MRF2S-6CL; single pole/multi-location; 120V.
 - b. Preset Smart Dimmer: Lutron Maestro Wireless Series: Electronic low voltage (600W, 120V); neutral required; multi-location capability using companion dimmers (up to nine companion dimmers may be connected); minimum load requirement.
 - 1) Lutron Model MRF2S-6ELV-120; single-pole/multi-location; 120V.

- c. Companion Dimmer: Provides multi-location capability for compatible Lutron Maestro Wireless Series dimmers.
 - 1) Lutron Model MA-R; gloss finish; 120V.
 - 2) Lutron Model MSC-AD; satin finish; 120V.
 - 3) Lutron Model MA-R-277V; gloss finish; 277V.
 - 4) Lutron Model MSC-AD-277V; satin finish; 277V.
- 6. Product(s) - Electronic Switches with Wireless Communication Inputs:
 - a. Electronic Switch; Lutron Maestro Wireless Series: 6A lighting/3A fan (120V); neutral required; multi-location capability using companion switches (up to nine companion switches may be connected); minimum load requirement.
 - 1) Lutron Model MRF2S-6ANS; single-pole/multi-location; 120V.
 - b. Electronic Switch; Lutron Maestro Wireless Series: 8A lighting/5.8A fan (120V); neutral required; multi-location capability using companion switches (up to nine companion switches may be connected); minimum load requirement.
 - 1) Lutron Model MRF2S-8ANS-120; single-pole/multi-location; 120V.
 - c. Electronic Switch; Lutron Maestro Wireless Series: 8A lighting/3A fan (120V); 8A lighting (277V); multi-location capability using companion switches (up to nine companion switches may be connected); minimum load requirement.
 - 1) Lutron Model MRF2S-8S-DV; single-pole/multi-location; 120-277V.
 - d. Companion Switch: Provides multi-location capability for compatible Lutron Maestro Wireless Series electronic switches.
 - 1) Lutron Model MA-AS; gloss finish; 120V.
 - 2) Lutron Model MSC-AS; satin finish; 120V.
 - 3) Lutron Model MA-AS-277V; gloss finish; 277V.
 - 4) Lutron Model MSC-AS-277V; satin finish; 277V.

2.06 WIRELESS CONTROL STATIONS

- A. Product(s):
 - 1. 2-Button Control; Lutron Pico Wireless Control Model PJ2-2B. Button Marking: Light (icons).
 - 2. 2-Button Control with Night Light; Lutron Pico Wireless Control Model PJN-2B.
 - 3. 2-Button with Raise/Lower Control; Lutron Pico Wireless Control Model PJ2-2BRL. Button Marking: Light (icons).
 - 4. 3-Button Control; Lutron Pico Wireless Control Model PJ2-3B. Button Marking: Light (icons).
 - 5. 3-Button with Raise/Lower Control; Lutron Pico Wireless Control Model PJ2-3BRL. Button Marking: Light (icons).
 - 6. 3-Button with Raise/Lower Control and Night Light; Lutron Pico Wireless Control Model PJN-3BRL.
 - 7. 4-Button; Lutron Pico Wireless Control Model PJ2-4B. Button Marking: Zone controls (light).
 - 8. Single Pedestal; Lutron Pico Pedestal Model L-PED1.
 - 9. Double Pedestal; Lutron Pico Pedestal Model L-PED2.
 - 10. Triple Pedestal; Lutron Pico Pedestal Model L-PED3.

11. Quadruple Pedestal; Lutron Pico Pedestal Model L-PED4.
 12. Screw Mounting Kit; Lutron Model PICO-SM-KIT.
 13. Wallbox Adapter; Lutron Model PICO-WBX-ADAPT.
- B. Quantity: As indicated on the drawings.
- C. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
- D. Does not require external power packs, power or communication wiring.
- E. Allows for easy reprogramming without replacing unit.
- F. Button Programming:
1. Single action
 2. Toggle action
- G. Includes LED to indicate button press or programming mode status.
- H. Mounting:
1. Capable of being mounted with a table stand or directly to a wall under a faceplate.
 2. Faceplates: Provide concealed mounting hardware.
- I. Power: Battery-operated with minimum ten-year battery life (3-year battery life for night light models).
- J. Finish: To be selected by Architect.

2.07 LED DRIVERS

- A. General Requirements:
1. Operate for at least 50,000 hours at maximum case temperature and 90 percent non-condensing relative humidity.
 2. Provide thermal fold-back protection by automatically reducing power output (dimming) to protect LED driver and LED light engine/fixture from damage due to over-temperature conditions that approach or exceed the LED driver's maximum operating temperature at calibration point.
 3. Provide integral recording of operating hours and maximum operating temperature to aid in troubleshooting and warranty claims.
 4. Designed and tested to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.
 5. Manufactured in a facility that employs ESD reduction practices in compliance with ANSI/ESD S20.20.

6. UL 8750 recognized or listed as applicable.
 7. UL Type TL rated where possible to allow for easier fixture evaluation and listing of different driver series.
 8. UL 1598C listed for field replacement as applicable.
 9. Designed and tested to withstand Category A surges of 4,000V according to IEEE C62.41.2 without impairment of performance.
 10. Class A sound rating; Inaudible in a 27 dBA ambient.
 11. Demonstrate no visible change in light output with a variation of plus or minus 10 percent change in line-voltage input.
 12. LED drivers of the same family/series to track evenly across multiple fixtures at light levels.
 13. Offer programmable output currents in 10 mA increments within designed driver operating ranges for custom fixture length and lumen output configurations, while meeting a low-end dimming range of 100 to 1 percent or 100 to 5 percent as applicable.
 14. Meet NEMA 410 inrush requirements for mitigating inrush currents with solid state lighting sources.
 15. Employ integral fault protection up to 277V to prevent LED driver damage or failure in the event of incorrect application of line-voltage to communication link inputs.
 16. LED driver may be remote located up to 100-feet from LED light engine depending on power outputs required and wire gauge utilized by installer.
- B. 3-Wire Control:
1. Provide integral fault protection to prevent driver failure in the event of a mis-wire.
 2. Operate from input voltage of 12 V through 277V at 50/60 Hz.
- C. Digital Control (when used with compatible Lutron lighting control systems):
1. Employ power failure memory; LED driver to automatically return to the previous state/light level upon restoration of utility power.
 2. Operate from input voltage of 120V through 277V at 50/60 Hz.
 3. Automatically go to 100 percent light output upon loss of control link voltage and lock out system commands until digital control link voltage is restored. Manufacturer to offer UL 924 compliance achievable through use of external Lutron Model LUT-ELI-3PSH interface upon request.
 4. When normal power is lost, drivers fed with emergency power go to emergency mode.
 5. Replacement of single driver during maintenance does not require reprogramming.
 6. Digital low-voltage control wiring capable of being wired as either Class 1 or Class 2.

D. Product(s):

1. Digital Control, 0.1 Percent Dimming with Soft-On and Fade-to-Black Low End Performance; Lutron Hi-lume Premier 0.1 percent Constant Voltage (L3D0-Series):
 - a. Dimming Range: 100 to 0.1 percent measured output current.
 - b. Features smooth fade-to-on and fade-to-black (Lutron Soft-On, Fade-to-Black™) low end dimming performance for an incandescent-like dimming experience.
 - c. Typically dissipates 0.25sW standby power at 120V and 0.40sW standby power at 277V.
 - d. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial applications at 120-277V and residential applications at 120V.
 - e. Total Harmonic Distortion (THD): Less than 20 percent at maximum power; complies with ANSI C82.11.
 - f. Class 2 output designed to withstand hot swap of LED loads; meets UL 1310 and CSA C22.2 No. 223.
 - g. Driver outputs to be short circuit protected, open circuit protected, and overload protected.
 - h. Constant Voltage Drivers:
 - 1) Support for cove and under-cabinet fixtures at 24V.
 - a) Support LED arrays from 2W to 96W.
 - b) Pulse Width Modulation (PWM) dimming frequency meets IEEE 1789.
 - c) Meets solid state requirements for power factor, transient protection, standby power consumption, start time, and operating frequency in Energy Star for Luminaires Version 2.0.
 - d) UL listed.
2. 3-Wire Control, 0.1 Percent Dimming; Lutron Hi-lume Premier 0.1 percent Constant Voltage (L3D0-Series):
 - a. Dimming Range: 100 to 0.1 percent measured output current.
 - b. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial applications at 120-277V and residential applications at 120V.
 - c. Total Harmonic Distortion (THD): Less than 20 percent at maximum power; complies with ANSI C82.11.
 - d. UL Class 2 output designed to withstand hot swap of LED loads.
 - e. Driver outputs to be short circuit protected, open circuit protected, and overload protected.
 - f. Constant Voltage Drivers:
 - 1) Support for cove and under-cabinet fixtures at 24V.
 - a) Support LED arrays from 2 W to 96 W.
 - b) Pulse Width Modulation (PWM) dimming frequency meets IEEE 1789.
 - c) Meets solid state requirements for power factor, transient protection, standby power consumption, start time, and operating frequency in Energy Star for Luminaires Version 2.0.
 - d) UL listed.
3. Forward Phase (Neutral Wire Required), One Percent Dimming; Lutron Hi-lume 1 percent (LTE-Series):
 - a. Dimming Range: 100 to one percent relative light output.
 - b. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial and residential applications at 120V.
 - c. Total Harmonic Distortion (THD): Less than 20 percent at full output for 40W loads; complies with ANSI C82.11.
 - d. Constant Current Drivers:
 - 1) Support for downlights and pendant fixtures from 200 mA to 2.1A to ensure a compatible driver exists.
 - a) Support LED arrays up to 53W.

- b) Pulse Width Modulation (PWM) or Constant Current Reduction (CCR) dimming methods available.
- 2) Support for troffers, linear pendants, and linear recessed fixtures from 200 mA to 2.1A to ensure a compatible driver exists.
 - a) Support LED arrays up to 40W.
 - b) Pulse Width Modulation (PWM) or Constant Current Reduction (CCR) dimming methods available.
- 3) Support for cove and under-cabinet fixtures from 200 mA to 2.1A to ensure a compatible driver exists.
 - a) Support LED arrays up to 40W.
 - b) Pulse Width Modulation (PWM) or Constant Current Reduction (CCR) dimming methods available.
 - c) UL listed.
- e. Constant Voltage Drivers:
 - 1) Support for downlights and pendant fixtures from 10V to 60V (in 0.5V steps) to ensure a compatible driver exists.
 - a) Support LED arrays up to 40W.
 - b) Pulse Width Modulation (PWM) dimming method.
 - 2) Support for troffers, linear pendants, and linear recessed fixtures from 10V to 60V (in 0.5V steps) to ensure a compatible driver exists.
 - a) Support LED arrays up to 40W.
 - b) Pulse Width Modulation (PWM) dimming method.
 - 3) Support for cove and under-cabinet fixtures from 10V to 60V (in 0.5V steps) to ensure a compatible driver exists.
 - a) Support LED arrays up to 40W.
 - b) Pulse Width Modulation (PWM) dimming method.
 - c) UL listed.
- 4. 3-Wire and Digital Control, One Percent Dimming; Lutron Hi-lume 1 percent (L3D-Series):
 - a. Dimming Range: 100 to one percent relative light output.
 - b. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial applications at 120V or 277V.
 - c. Total Harmonic Distortion (THD): Less than 20 percent at full output for loads greater than 25W typical (higher for select models); complies with ANSI C82.11.
 - d. Constant Current Drivers:
 - 1) Support for downlights and pendant fixtures from 200 mA to 2.1 A to ensure a compatible driver exists.
 - a) Support LED arrays up to 53W.
 - b) Pulse Width Modulation (PWM) or Constant Current Reduction (CCR) dimming methods available.
 - 2) Support for troffers, linear pendants, and linear recessed fixtures from 200 mA to 2.1 A to ensure a compatible driver exists.
 - a) Support LED arrays up to 40W.
 - b) Pulse Width Modulation (PWM) or Constant Current Reduction (CCR) dimming methods available.
 - 3) Support for cove and under-cabinet fixtures from 200 mA to 2.1 A to ensure a compatible driver exists.
 - a) Support LED arrays up to 40W.
 - b) Pulse Width Modulation (PWM) or Constant Current Reduction (CCR) dimming methods available.
 - c) UL listed.
 - e. Constant Voltage Drivers:
 - 1) Support for downlights and pendant fixtures from 10V to 60V (in 0.5 V steps) to ensure a compatible driver exists.
 - a) Support LED arrays up to 40W.

- b) Pulse Width Modulation (PWM) dimming method.
 - 2) Support for troffers, linear pendants, and linear recessed fixtures from 10V to 60V (in 0.5 V steps) to ensure a compatible driver exists.
 - a) Support LED arrays up to 40W.
 - b) Pulse Width Modulation (PWM) dimming method.
 - 3) Support for cove and under-cabinet fixtures from 10V to 60V (in 0.5 V steps) to ensure a compatible driver exists.
 - a) Support LED arrays up to 40W.
 - b) Pulse Width Modulation (PWM) dimming method.
 - c) UL listed.
5. Digital Control, Five Percent Dimming; Lutron 5-Series (LDE5-Series):
- a. Dimming Range: 100 to five percent measured output current.
 - b. Typically dissipates 0.2 W standby power at 120V and 0.3W standby power at 277V.
 - c. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial applications at 120-277V.
 - d. Constant Current Reduction (CCR) dimming method.
 - e. Total Harmonic Distortion (THD): Less than 21 percent at full load; complies with ANSI C82.11.
 - f. Constant Current Drivers:
 - 1) Lutron K-Case Form Factor: Support for downlights and pendant fixtures in currents from 220 mA to 1.4A to ensure a compatible driver exists.
 - a) Support LED arrays up to 40W.
 - 2) Lutron M-Case Form Factor: Support for troffers, linear pendants, and linear recessed fixtures from 150 mA to 2.1 A to ensure a compatible driver exists.
 - a) Support LED arrays up to 75 W.
 - b) Meets solid state requirements for power factor, transient protection, standby power consumption, start time, and operating frequency in ENERGY STAR for Luminaires Version 2.0.
 - c) Models available to meet the DesignLights Consortium (DLC) power line quality requirements.
6. Digital Control, One Percent Dimming with Soft-On and Fade-to-Black Low End Performance; Lutron Hi-lume 1 percent Soft-on Fade-to-Black (LDE1-Series):
- a. Dimming Range: 100 to one percent measured output current.
 - b. Features smooth fade-to-on and fade-to-black (Lutron Soft-On, Fade-to-Black™) low end dimming performance for an incandescent-like dimming experience.
 - c. Typically dissipates 0.2 W standby power at 120V and 0.3W standby power at 277V.
 - d. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial applications at 120-277V.
 - e. Employs true Constant Current Reduction (CCR) dimming method from 100 to five percent light level and Pulse Width Modulation (PWM) dimming method from five percent to off.
 - f. Pulse Width Modulation (PWM) frequency of 240 Hz.
 - g. Total Harmonic Distortion (THD): Less than 20 percent at full output for drivers greater than 25W; complies with ANSI C82.11.
 - h. UL Class 2 output.
 - i. Driver outputs to be short circuit protected, open circuit protected, and overload protected.
 - j. Constant Current Drivers:
 - 1) Lutron K-Case Form Factor: Support for fixtures from 220 mA to 1.4A over multiple operating ranges.
 - a) Support LED arrays up to 40W.
 - b) Meets solid state requirements for power factor, transient protection, standby power consumption, start time, and operating frequency in ENERGY STAR for Luminaires Version 2.0.

- 2) Lutron M-Case Form Factor: Support for fixtures from 150 mA to 2.1 A over multiple operating ranges.
 - a) Support LED arrays up to 75 W.
 - b) Meets solid state requirements for power factor, transient protection, standby power consumption, start time, and operating frequency in ENERGY STAR for Luminaires Version 2.0.
 - c) Models available to meet the DesignLights Consortium (DLC) power line quality requirements.

2.08 POWER INTERFACES

- A. Provide power interfaces as indicated or as required to control the loads as indicated.
- B. General Requirements:
 1. Phase independent of control input.
 2. Dimmer to meet limited short circuit test as defined in UL 508.
 3. Utilize air gap off to disconnect the load from line supply.
 4. Diagnostics and Service: Replacing power interface does not require re-programming of system or processor.
- C. Product(s):
 1. Phase-Adaptive Power Module; Lutron PHPM-PA: Provides interface for phase control input to provide full 16 A circuit output of forward/reverse phase control for compatible loads.
 2. 3-Wire Fluorescent Power Module; Lutron PHPM-3F: Provides interface for phase control input to provide full 16 A circuit output for compatible line-voltage control fluorescent electronic dimming ballasts or LED drivers.
 3. Switching Power Module; Lutron PHPM-SW: Provides interface for phase control or switched input to provide full 16 A circuit output of switching for compatible non-dim loads.
 4. Ten Volt Interface; Lutron GRX-TVI: Provides interface for phase control input to provide full 16 A circuit output of switching and 0-10V low voltage control for compatible fluorescent electronic dimming ballasts or LED drivers.

2.09 DIGITAL DIMMING BALLAST MODULES

- A. Provide digital dimming ballast modules as indicated or as required to control the loads as indicated.
- B. General Requirements:
 1. Provide continuous 3-wire signal dimming to compatible 3-wire electronic dimming ballasts.
 2. Utilize air gap off to disconnect the load from line supply.

3. If power is interrupted and subsequently restored, lights automatically return to the setting prior to power interruption.
 4. Unique internal reference number visible displayed on module cover.
 5. Dimmer to meet limited short circuit test as defined in UL 20.
 6. Provide integral fault protection to prevent ballast module failure in the event of a mis-wire.
- C. 3-Wire Ballast Module, 16 Amp; Lutron EcoSystem Model C5-BMJ-16A:
1. Integrates up to 16 amps of 3-wire electronic dimming ballasts into EcoSystem digital control system as a single zone.
 2. Integrates up to 16 amps of switched high intensity discharge (HID) lighting load into EcoSystem digital control system as a single zone.

2.10 WIRELESS HUBS

- A. Wireless hub with BACnet; Lutron Vive Premium Hub.
1. Flush-mount wireless hub; Model HJS-2-FM.
 2. Surface-mount wireless hub; Model HJS-2-SM.
- B. Integrated multicolor LED provides feedback on what mode the hub is in for simple identification and diagnosis.
- C. Integrated processor and web server allows hub to set up and operate the system without any external connections to outside processors, servers, or the internet.
- D. Utilizes Ethernet connection for:
1. Networking up to 64 hubs together to create a larger system.
 2. Integration with Building Management System (BMS) via native BACnet; does not require interface (Lutron Vive Premium wireless hub with BACnet only).
 3. Remote connectivity capabilities, including maintaining system date/time and receiving periodic firmware updates (requires internet connection).
- E. A single hub or network of hubs can operate on either a dedicated lighting control only network or can be integrated with an existing building network as a VLAN.
- F. Communicates directly to compatible Lutron Vive RF devices through use Lutron Clear Connect radio frequency communications link; does not require communication wiring; RF range of 71-feet through walls to cover an area of 15836 SF (device and hub must be on the same floor).
- G. Communicates directly to mobile device (smartphone or tablet) or computer using built-in Wi-Fi, 2.4 GHz 802.11b/g; wireless range of 71-feet through walls (device and hub must be on the same floor).
- H. Does not require external Wi-Fi router for connecting to the hub.

- I. Allows for system setup, control, and monitoring from mobile device or computer using Vive Vue web-based software:
 1. Supports up to 700 total paired devices including compatible wireless sensors, wireless control stations, and wireless load devices.
 2. Allows for timeclock scheduling of events, both time of day and astronomic (sunrise and sunset).
 - a. Timeclock is integrated into the unit and does not require a constant internet connection.
 - b. Retains time and programming information after a power loss.
 3. Allows for control, monitoring, and adjustment from anywhere in the world (Lutron Vive wireless hub internet connection required).
 4. Uses RF signal strength detection to find nearby devices for quick association and programming without having to climb ladders.
 - a. Association and setup does not require a factory technician to perform.
 5. System using Lutron Vive wireless hub(s) can operate with or without connection to the internet.
 6. Supports energy reporting.
 - a. Reports measured energy data for PowPak fixture control modules at accuracy of plus/minus 2 percent or 0.5 W (whichever is higher).
 - b. Reports calculated energy data for PowPak junction box mounted modules at accuracy of 10 percent.
 7. Supports automatic demand response for load shedding via:
 - a. Local contact closure without need for separate interface.
 - b. BACnet (Lutron Vive Premium wireless hub with BACnet only).
 8. Wireless hub can be firmware upgraded to provide new software features and system updates.
 - a. Firmware update can be done either locally using a wired Ethernet connection or Wi-Fi connection, or remotely if the wireless hub is connected to the internet.
- J. Lutron Vive Vue Web-Based Application:
 1. Accessibility and Platform Support:
 - a. Web-based; runs on most HTML5 compatible browsers (including Safari and Chrome).
 - b. Supports multiple platforms and devices; runs from a tablet, desktop, laptop, or smartphone.
 - c. User interface supports multi-touch gestures such as pinch to zoom, drag to pan, etc.
 - d. Utilizes HTTPS (industry-standard certificate-based encryption and authentication for security).
 - e. Multi-level Password Protected Access: Individual password protection on both the integrated Wi-Fi network and web-based software.
 - f. WPA2 security for Wi-Fi communication with wireless hub.
 2. System Navigation and Status Reporting:
 - a. Area Tree View: Easy navigation by area name to view status and make programming adjustments through the software.
 - b. Area and device names can be changed in real time.

- K. BACnet Integration (Lutron Vive Premium wireless hub with BACnet only):
1. Provide ability to communicate by means of native BACnet IP communication (does not require interface) to lighting control system from a user-supplied 10BASE-T or 100BASE-T Ethernet network.
 2. Requires only one network connection per hub.
 3. BACnet Integrator Capabilities:
 - a. The BACnet integrator can command:
 - 1) Area light output.
 - 2) Area load shed level.
 - 3) Area load shed enable/disable.
 - 4) Enable/Disable:
 - a) Area occupancy sensors.
 - b) Area daylighting.
 - 5) Daylighting level.
 - 6) Area occupied and unoccupied level
 - 7) Occupancy sensor timeouts (for fixture sensors).
 - b. The BACnet integrator can monitor:
 - 1) Area on/off status.
 - 2) Area occupancy status.
 - 3) Area load shed status.
 - 4) Area instantaneous energy usage and maximum potential power usage.
 - 5) Enable/Disable:
 - a) Area occupancy sensors.
 - b) Daylighting.
 - c) Timeclocks.
 - 6) Daylighting level.
 - 7) Light levels from photo sensors.
 - 8) Area occupied and unoccupied level.
 - 9) Occupancy sensor timeouts.
- L. Contact Closure Interface: Provide two contact closure inputs; accepts both momentary and maintained contact closures that can be used for automatic demand response.
- M. Rated for use in air-handling spaces as defined in UL 2043.
- N. Meets CAL TITLE 24 P6 requirements.
- O. Provide Ethernet switch(es) as required for inter-hub network wiring per manufacturer's instructions; do not exceed manufacturer's required maximum wiring segment lengths.
1. Lutron Model ETH-SWITCH-16; 16 port.
 2. Lutron Model ETH-SWITCH-24; 24 port.
 3. Lutron Model ETH-SWITCH-24-1M; 24 port, 1 multi-mode fiber.
 4. Lutron Model ETH-SWITCH-24-2M; 24 port, 2 multi-mode fiber.
 5. Lutron Model ETH-SWITCH-24-1S; 24 port, 1 single-mode fiber.
 6. Lutron Model ETH-SWITCH-24-2S; 24 port, 2 single-mode fiber.

2.11 SOURCE QUALITY CONTROL

- A. See Division 01, General Requirements, for additional requirements.
- B. Factory Testing; Lutron Standard Factory Testing:
 - 1. Perform full-function factory testing on completed assemblies. Statistical sampling is not acceptable.
 - 2. Perform full-function factory testing on 100 percent of ballasts and LED drivers.
 - 3. Perform factory burn-in of 100 percent of ballasts at 104 degrees F.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that ratings and configurations of system components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive system components.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. System and Network Integration Consultation; Lutron LSC-INT-VISIT: Include as part of the base bid additional costs for Lighting Control Manufacturer to conduct meeting with facility representative and other related equipment manufacturers to discuss equipment and integration procedures.
 - 1. Coordinate scheduling of visit with Lighting Control Manufacturer. Manufacturer recommends that this visit be scheduled early in construction phase, after system purchase but prior to system installation.

3.03 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, except for mounting heights specified in those standards;, including mounting heights specified in those standards unless otherwise indicated.
- B. Install products in accordance with manufacturer's instructions.
- C. Sensor Locations:
 - 1. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in PART 2, locate sensors in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated. Where Lighting Control Manufacturer Sensor Layout and Tuning service is not specified, locate sensors in accordance with Drawings.

2. Sensor locations indicated are diagrammatic. Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage, in accordance with manufacturer's recommendations.
- D. Ensure that daylight sensor placement minimizes sensor view of electric light sources. Locate ceiling-mounted and luminaire-mounted daylight sensors to avoid direct view of luminaires.
- E. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- F. Lamp Lead Lengths: Do not exceed 3-feet for T4 4-pin compact and T5 BIAx lamps and 7-feet for T5, T5-HO, T8 U-bend, and T8 linear fluorescent lamps.
- G. LED Light Engine/Array Lead Length: Do not exceed 100-feet.
- H. Identify system components in accordance with Section 26 05 53, Identification for Electrical Systems.

3.04 FIELD QUALITY CONTROL

- A. See Division 01, General Requirements, for additional requirements.
- B. Manufacturer's Full-Scope Start-Up Service is not required.
- C. Manufacturer's Programming Service:
 1. Product(s):
 - a. On-site programming, 8-hour block; Lutron LSC-OS-PROG8-SP.
 - b. On-site programming, 4-hour block; Lutron LSC-OS-PROG4-SP.
 - c. Remote programming, 4-hour block; Lutron LSC-RMT-PROG4-SP.
 2. Furnish unit prices for each available programming time interval.
- D. Manufacturer's Full-Scope Start-Up Service: Provide On-Site Full-Scope Start-Up Service where required by manufacturer.
 1. Remote Full-Scope Start-Up Service; Lutron LSC-RMT-SU-VIVE: When available in accordance with manufacturer's guidelines, provide access to manufacturer's certified remote startup technician to provide instruction and guidance for complete system functional test.
 2. On-Site Full-Scope Start-Up Service; Lutron LSC-OS-SU-VIVE: Manufacturer's authorized Service Representative to conduct site visit upon completion of lighting control system installation to perform system startup and verify proper operation:
 - a. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified authorized Service Representative to verify sensor locations, in accordance with layout provided by Lighting Control Manufacturer; Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.
 - b. Verify connection of power wiring and load circuits.
 - c. Verify connection and location of controls.
 - d. Energize wireless hubs.
 - e. Associate occupancy/vacancy sensors, daylight sensors, wireless remotes, and wall stations to load control devices.

- f. Provide initial rough calibration of sensors; fine-tuning of sensors is responsibility of Contractor unless provided by Lighting Control Manufacturer as part of Sensor Layout and Tuning service.
 - g. Program timeclock schedules per approved sequence of operations.
 - h. Configure load shed parameters per approved sequence of operations.
 - i. Verify system operation control by control.
 - j. Obtain sign-off on system functions.
 - k. Train Owner's representative on system capabilities, operation, and maintenance, as specified in PART 3.
- E. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.05 ADJUSTING

- A. On-Site Scene and Level Tuning; Lutron LSC-AF-VISIT: Include as part of the base bid additional costs for Lighting Control Manufacturer to visit site to conduct meeting with Facility to make required lighting adjustments to the system for conformance with original design intent.
- B. Sensor Fine-Tuning:
 - 1. Provide up to two additional post-startup on-site service visits for fine-tuning of sensor calibration.
 - 2. Where not specified, provide fine-tuning of sensor calibration.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 COMMISSIONING

- A. See Division 01, General Requirements.
- B. Title 24 Acceptance Testing Service; Lutron LSC-SPV-DOC-T24: Include as part of the base bid additional costs for to perform lighting control acceptance testing in accordance with CAL TITLE 24 P6. Submit required documentation.

3.08 CLOSEOUT ACTIVITIES

- A. See Division 01, General Requirements.
- B. Demonstration:
 - 1. Demonstrate proper operation of lighting control devices to Facility, and correct deficiencies or make adjustments as directed.
 - 2. On-Site Performance-Verification Walkthrough; Lutron LSC-WALK: Include as part of the base bid additional costs for lighting control manufacturer to provide on-site demonstration of system functionality to facility.

- C. Training: Include services of manufacturer's certified service representative to perform on-site training of Owner's personnel on operation, adjustment, and maintenance of lighting control system as part of on-site system start-up services.
- D. On-Site Warranty Audit Visit; Lutron LSC-WNTY-AUD: Include services of manufacturer to perform on-site verification that system meets manufacturer's requirements as necessary for validation of specified enhanced warranty.

3.09 MAINTENANCE

- A. See Division 01, General Requirements for additional requirements relating to maintenance service.

3.10 PROTECTION

- A. Protect installed products from subsequent construction operations.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Branch Panelboards
 - 2. Identification
- B. Related Sections include:
 - 1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
 - 2. Section 26 05 26, Grounding and Bonding for Electrical Systems
 - 3. Section 26 05 33, Raceways and Boxes for Electrical Systems
 - 4. Section 26 05 53, Identification for Electrical Systems
 - 5. Section 26 05 73, Overcurrent Protective Device Coordination Study
 - 6. Section 26 05 80, Electrical Testing

1.03 SUBMITTALS

- A. Shop Drawings
- B. Product Data
 - 1. Detailed component material list.
 - 2. Voltage rating, amperage rating, bussing material, fault rating, wiring lugs capacity, mounting method, physical size, exterior finish and options.
 - 3. Individual circuit breaker product data sheets.
 - 4. Panel schedules indicate circuit breakers in the same orientation as the construction documents.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Panelboards use the same manufacturer as existing panelboards as part of this project.

2.02 BRANCH PANELBOARDS

A. Branch Circuit Panels:

1. Bolt-on circuit breaker type fitted with metallic flush lift latches and locks keyed alike.
2. Deliver panel keys to the Owner at completion of the project.

B. Short Circuit Current Rating (SCCR):

1. Fully rated at a value greater than the maximum available short circuit current that can be expected at the panelboard location in the electrical system.
2. Series rating is not permitted.

C. Cabinets:

1. Cabinet rough-in boxes code gauge steel, with dead front covers.
2. Flush panels have flush doors with concealed hinges and mounting clamps.
3. Surface panels have metal face trims with no sharp edges or corners.
4. Surface panel cabinets fabricated without knockouts and finished to match face trim.
5. Panels have door in door hinged trim fronts that provides full access to wiring compartment.

D. Wiring Gutters:

1. Minimum of 4-inches wide except where feeder conductors enter where a minimum of 6-inches clear.
2. Feeder conductors to enter directly in line with lug terminals wherever practicable.
3. Provide separate feeder studs for each feeder conductor compression lug.

E. Bussing:

1. Provide one continuous bus bar per phase.
2. Provide copper or electrical grade aluminum alloy sized as indicated on the drawings and in accordance with UL standards to limit temperature rise on current carrying part to a maximum of 149 degrees F above an ambient temperature of 104 degrees F maximum.
3. Full size insulated neutral bars included for panels indicated to have a neutral.
4. Bus bar taps for panels with single pole branches arranged for sequence phasing of the branch circuit devices.

- F. Ground Bus: Provide in each panelboard and include the following:
 - 1. Have the same rating as the neutral bus.
 - 2. Contain a ground conductor terminal for each available circuit in the panelboard.
 - 3. Size terminals for branch circuit equipment grounding conductors.
- G. Isolated Ground Bus: Provide in each panelboard as indicated and included the following:
 - 1. Insulate from the panelboard enclosure.
 - 2. Same rating as the neutral bus.
 - 3. Contain a ground conductor terminal for each available circuit in the panelboard.
 - 4. Have terminals sized for the branch circuit equipment grounding conductors.
- H. Interiors:
 - 1. Main lug only unless otherwise indicated, with dead front shield covering the bus, and bus connectors, with mounting hardware and bussing for spaces indicated for future installation of devices.
 - 2. Dead front construction for interior trim.
 - 3. Cover unused mounting spaces with preformed knockouts.
- I. Main Circuit Breaker:
 - 1. Where indicated, equip panels indicated with main circuit breakers sized as scheduled and mounted behind door at top of panel for top entrance feeders, and bottom of panel for bottom entrance feeders.
 - 2. Where main circuit breaker size is not indicated, ampere rating match feeder ampacity or panelboard rating, whichever is less.
 - a. Molded case, thermal magnetic bolt-on type and sized as indicated on the Drawings. Circuit breaker have an overcenter, trip-free, toggle mechanism that provide quick-make, quick-break contact action. Indicate open, closed, or tripped by handle position, with common internal trip crossbar to provide simultaneous tripping for poles.
 - b. Circuit breakers have a permanent trip action with thermal and magnetic trip elements in each pole. Each thermal element factory calibrated to operate in a 104 degrees F ambient environment. Thermal elements ambient compensating above 104 degrees F.
 - c. Provide the main circuit breaker with a padlock-able lock-off device to provide capability to be locked in the open position.
- J. Branch Circuit Breakers:
 - 1. Provide with amperage rating, and number of poles as indicated in the Panelboard Schedules.
 - 2. Bolt-on type circuit breakers.

3. Overcenter toggle mechanism that provide quick-make, quick-break contact action. Circuit breakers have thermal and magnetic trip elements in each pole. Two and three pole circuit breakers have an internal common trip crossbar to provide simultaneous tripping.
 4. Exposed faceplates of circuit breakers flush with one another.
 5. Short circuit capacity rating to withstand the maximum short circuit duty that can be expected at the breaker location in the electrical system. Minimum short circuit rating for circuit breakers: 10,000 AIC for 120V and 208V breakers, 14,000 AIC for 277V and 480V breakers.
 6. Circuit breakers used for switching duty UL listed for that purpose and marked SWD.
 7. Provide each branch circuit breaker with a factory padlock-able lock-off provisions.
- K. Provide shunt trips, alarms, and auxiliary switches as shown on the Drawings.
- L. Provide Arc Fault Circuit Interrupter (AFCI) breakers as shown on the Drawings or as required by Code.
- M. Provide Ground Fault Interrupter (GFI) Circuit breakers as shown on the drawings or as required by Code. GFI breakers serving heat trace circuits 30 ma ground fault trip rating.
- N. Surge Protective Device (SPD): Provide an integral or separate SPD with panelboards that are part of an emergency NEC 700 required system. Refer to Section 26 43 13, Surge Protective Devices for requirements.

2.03 IDENTIFICATION

- A. Identify branch circuit breakers with individual circuit numbers adjacent to each breaker with a typewritten card to identify the load controlled by that breaker.
- B. Provided with complete schedules of panelboards as designed prior to start of construction. Schedules will include circuit breaker arrangement, load schedules, and ratings for use in identification of circuits and coordination.
- C. Refer to Section 26 05 53, Identification of Electrical Systems for additional requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install panelboards in accordance with manufacturer's recommendations.
- B. Install panelboards plumb and level, located as shown on the Drawings up 6-feet – 6-inches to top unless noted otherwise.
- C. Keep area above panelboard clear of equipment foreign to the electrical installation. Coordinate installation with other trades.
- D. Provide identification and panel schedules as specified in Section 26 05 53, Identification of Electrical Systems.

- E. Provide the required SPD and associated overcurrent device for emergency NEC 700 systems, install per manufacturers recommendations.

3.02 SALVAGE

- A. Utilize circuit breakers in existing panels that are to remain. Where faulty or inadequate breakers are found in these panels, replace with suitable breakers from panels removed during demolition.

3.03 SPARE CONDUITS

- A. Install a spare 3/4-inch conduit from flush panels for each three single pole breakers or spaces provided. Terminate conduits above accessible ceiling or as directed.

END OF SECTION

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SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Line Voltage Wall Switches
 - 2. Receptacles
 - 3. Plates
- B. Related Sections include:
 - 1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
 - 2. Section 26 05 26, Grounding and Bonding for Electrical Systems
 - 3. Section 26 05 53, Identification for Electrical Systems
 - 4. Section 26 05 80, Electrical Testing

1.03 SUBMITTALS

- A. Product Data

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Line Voltage Wall Switches:
 - 1. Hubbell
 - 2. Leviton
 - 3. Arrow-Hart
 - 4. Pass & Seymour

5. Equal as approved by the District.

B. Receptacles:

1. Use same manufacture as the Line Voltage Wall Switches.
2. Hubbell
3. Leviton
4. Arrow-Hart
5. Pass & Seymour
6. Equal as approved by the District.

C. Plates:

1. Hubbell
2. Leviton
3. Arrow-Hart
4. Pass & Seymour
5. Equal as approved by the District.

2.02 MATERIALS

- A. Extra heavy duty grade wiring devices, with special devices as noted on the Drawings. Should the Drawings indicate a device other than those listed. Device of same grade and manufacture as specified below. Furnish a matching plug connector for special purpose devices that do not have the common 120V NEMA 5-20R configuration.
- B. Lighting switches and duplex receptacles installed have similar appearance characteristics unless noted otherwise.

2.03 LINE VOLTAGE WALL SWITCHES

A. Line Voltage Switches:

1. 20A rated, 277V, quiet type, extra heavy duty, heavy duty nylon toggle handle, back and side wired with screw terminal connections.
2. As noted on the drawings provide:
 - a. Pilot light switch: lighted clear toggle.
 - b. Momentary Contact Switches: 15A, SPDT, center off.
 - c. Key Switches: 20A, 277V, back and side wired with screw terminal connections.

B. EPO Pushbutton Switch:

1. Red mushroom head push-off, pull-on with concentric guard, 2-1/4 inch diameter, non-illuminated, heavy duty operator.

2. Provide clear hinged louver to prevent accidental operation.
 3. Provide laminated engraved nameplate attached with stainless steel screws indicating Emergency Power Off and load served.
- C. Except as noted herein, device exposed finish color as follows:
1. Normal Power: per Architect
 - 2.

2.04 RECEPTACLES

- A. Standard Straight Blade Duplex Receptacle:
1. 3-wire, 2-pole with grounding, extra heavy duty, 20A rated, NEMA 5-20R configuration, back and side wired with screw terminal connections.
 - a. Provide hospital grade in patient care areas as required by NEC.
 - b. Provide tamper-resistant as noted on the drawings or NEC required.
 - c. Provide isolated ground as noted on the drawings or NEC required.
 - d. Provide surge suppression receptacles as noted on the drawings.
 2. Ground Fault Interrupting straight blade duplex receptacle:
 - a. Heavy duty, 3-wire, 2 pole with grounding, self-testing, green "ON" LED to indicate power, red "ON" LED to indicate ground fault condition, 20A rated, NEMA 5-20R configuration, back and side wired with screw terminal connections.
 - 1) Provide hospital grade in patient care areas as required by NEC.
 - 2) Provide tamper-resistant as noted on the drawings or where NEC required.
 - 3) Provide weather-resistant rating at exterior locations as required by NEC.
- B. Clock Outlets: As noted on the drawings and compatible with the specified clock system.
- C. Special Purpose Receptacles: As noted on Drawings with NEMA configurations.
- D. Exposed Device Color, unless otherwise noted, is as follows:
1. Normal power: Gray or as selected by Architect.
 2. Isolated Ground: Orange
 3. Surge Suppression: Blue

2.05 PLATES

- A. Flush Finish Plates per Architect.
- B. Surface Covers: Galvanized or cadmium plated steel, 1/2-inch raised industrial type with openings appropriate for device installed.
- C. Weatherproof: Extra-Duty while in use covers, UL 514D listed, commercial quality diecast aluminum construction, NEMA 3R rated, gasketed, built-in padlock provisions, built-in cord strain relief provisions, gray powder-coated finish, vertical mounting as required for application or other covers of similar construction for other receptacle configurations.

- D. Identification: Identify receptacle plates with a pre-printed label indicating serving panel and branch circuit number. Refer to Section 26 05 53, Identification for Electrical Systems.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Devices and finish plates installed plumb with building lines. Install wall mounted receptacles vertically at centerline height shown on the Drawings.
- B. Finish plates and devices are not installed until final painting is complete. Scratched or splattered finish plates and devices will not be accepted.
- C. Switches, receptacles and/or other devices ganged into a common enclosure provided with a separation barrier between devices where the combined circuit voltages within the enclosure exceeds 300V.
- D. Provide GFCI receptacles as shown on the drawings or as NEC required. Provide a GFCI type duplex receptacle in each required location, do not sub-feed normal receptacles downstream of the GFCI receptacle to obtain the GFCI rating.
- E. Provide receptacles with GFCI, tamperproof, weather-resistant or hospital grade ratings as shown on the drawings, appropriate for the installation or required by NEC.

3.02 CORD CAPS

- A. Special plugs provided with the receptacles given to the Owner in their cartons with a letter stating the date and the Owner's representative that received the materials.

3.03 COORDINATION

- A. Electrical Drawings indicate the approximate location of devices. Refer to Architectural elevations, sections, and details for exact locations.
- B. Coordinate with equipment installer the locations and methods of connection to devices mounted in cabinets, counters, work benches, service pedestals and similar equipment.

3.04 TESTING

- A. Test receptacles for line to neutral, line to ground and neutral to ground faults. Correct defective wiring.

END OF SECTION

SECTION 26 29 00

MOTOR CONTROLLERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Motor Starters
 - 2. Disconnects
 - 3. Fuses
 - 4.
- B. Related Sections include:
 - 1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cable
 - 2. Section 26 05 26, Grounding and Bonding for Electrical Systems
 - 3. Section 26 05 53, Identification for Electrical Systems
 - 4. Section 26 05 73, Overcurrent Protective Device Coordination Study
 - 5. Section 26 05 80, Electrical Testing

1.03 SUBMITTALS

- A. Shop drawings, including the following information.
 - 1. Field Dimensions
 - 2. Description of Materials and Finishes
 - 3. Component Connections
 - 4. Anchorage Methods.
 - 5. Installation Procedures

- B. Product Data
- C. Operating and Maintenance Data
- D. Overload (heater) Sizing: A final listing of motors and the heater size installed for that motor.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Motor Starters and Visible Blade Disconnects:
 - 1. Same manufacture as the distribution equipment specified in Section 26 24 13, Switchboards, Allen Bradley or approved equivalent.
- B. Horsepower Rated Toggle Switches:
 - 1. Arrow Hart
 - 2. General Electric
 - 3. Hubbell
 - 4. Pass & Seymour

2.02 GENERAL

- A. Provide manual or magnetic motor starters of the proper characteristics for equipment as indicated.
- B. Provide switches of proper characteristics as disconnecting means.

2.03 MOTOR STARTERS

- A. Manual Starters:
 - 1. NEMA ICS 2, AC general purpose Class A manually operated toggle type full voltage controller for fractional horsepower induction motors, quick-make, quick-break, with thermal overload protection and suitable enclosures.
- B. Magnetic Starters, Non-reversing:
 - 1. NEMA ICS 2, AC general purpose, full voltage across the line non-reversing type, 120V coils, overload relays in each leg, running pilot lights, one normally closed and one normally open auxiliary contacts, 120V control transformers and suitable enclosures.
 - 2. Overload relays ambient compensated bimetallic type with interchangeable heater packs.
 - 3. Overload adjustable, have single-phase sensitivity, and manual or automatic reset.
 - 4. Suitable for the addition of at least four auxiliary contacts of arrangement normally open or normally closed.
 - 5. Provide with a NO and a NC auxiliary contacts.

6. Minimum fault interrupting rating of 10,000A.
- C. Magnetic Starters, Reversing:
1. NEMA ICS 2, AC general purpose.
 2. Reversing starters consist of two contactors and a single overload relays assembly.
 3. Include electrical interlock and integral adjustable time delay transition between FORWARD and REVERSE rotation.
 4. Starters electrically and mechanically interlocked to prohibit line shorts and both starters being energized simultaneously.
- D. Magnetic Starters, Two Speed:
1. NEMA ICS 2, AC general purpose.
 2. Include electrical interlock and integral adjustable time delay transition between SLOW and FAST speeds.
 3. Electrically and mechanically interlocked to prohibit both starters being energized simultaneously.
- E. Combination Starter/Disconnect, (Circuit Breaker):
1. Combine magnetic motor starter as described above and motor circuit protector or thermal magnetic circuit breaker disconnect in a common enclosure.
- F. Motor Circuit Protector:
1. NEMA AB 1, circuit breaker with integral instantaneous magnetic trip in each pole.
 2. Externally operated handle, giving positive visual indication of its ON-OFF position.
- G. Thermal Magnetic Circuit Breaker:
1. NEMA AB 1, with integral thermal and instantaneous magnetic trip in each pole.
 2. Circuit protector externally operated handle, giving positive visual indication of its ON-OFF position.
- H. Combination Starter/Disconnect, Disconnect Switch Type:
1. Combine magnetic motor starter as described above and non-fused or fused disconnect switch in a common enclosure. Switch type as indicated on the drawings. Switch has an externally operated handle that gives positive visual indication of its ON-OFF position.
 2. Non-fused Switch Assemblies:
 - a. NEMA KS 1, enclosed knife switch with enclosed, but visible blades. Switch rated as indicated on the drawings.
 3. Fused Switch Assemblies:
 - a. NEMA KS 1, enclosed knife switch. Fuse clips accept Class R fuses. Switch and fuse sizes as indicated on the drawings.

- I. Starter Contacts:
 - 1. Totally enclosed, double break, silver-cadmium-oxide power contacts.
 - 2. Contact inspection or replacement possible without disturbing line or load wiring.
- J. Overload Relay:
 - 1. NEMA ICS with one-piece thermal unit construction.
 - 2. Interchangeable thermal units.
 - 3. Replaceable overload relay control circuit contact.
 - 4. Thermal units required for starter to operate.
- K. Enclosure:
 - 1. NSI/NEMA ICS 6, Type 1 as indicated, or as required to meet the conditions of installation.
- L. Equip starters with H-O-A selector switches, start-stop stations, or other auxiliary control device listed. Where no auxiliary devices are listed, equip each starter with an H-O-A switch.
- M. Provide a control circuit transformer in each starter. Size transformer to accommodate the contactor(s) and control circuit loads. Include primary and secondary fuses in ungrounded conductors.
 - 1. Provide one normally open and one normally closed auxiliary contacts in each starter, unless additional auxiliary contacts are required. NEMA ICS 2.
- N. Provide starter units with control terminal blocks. Terminal blocks rated at 20-Amperes and accessible from inside the unit with the unit door is opened.
- O. Push Buttons: Unguarded, recessed type
- P. Indicating Lights, LED type:
 - 1. Green for run.
 - 2. Red for stopped unless otherwise indicated.

2.04 DISCONNECTS

- A. Safety and disconnect switches NEMA type HD (heavy duty), quick-make, quick-break, dual rated with electrical characteristics as required by the system voltage and the load served. Equip switches with defeatable cover interlock.
- B. Enclosures NEMA I for indoor use, unless specifically noted otherwise and NEMA 3R where installed exposed to the weather or designated by the subscript WP.
- C. Fusible or non-fusible as designated on Drawings.

2.05 FUSES

- A. UL Class RK-5 dual element, time delay, current limiting type. The overload thermal time delay element spring actuated soldered copper assembly in a separate sand free compartment. The short circuit current limiting section copper alloy links encased in quartz sand.
- B. Capable of holding 500 percent of rated current for a minimum of 10 seconds, and carry a UL listed minimum interrupting rating of 200,000A rms symmetrical.

PART 3 - EXECUTION

3.01 MOTOR STARTERS

- A. Provide the motor starting equipment as shown on the Drawings and coordinate motor overload starter relays.
- B. Install the starters at the respective equipment unless shown otherwise.
- C. Install freestanding starters on metal channel support structure.
- D. Starters that are installed on exterior walls installed with minimum 1/2-inch channel on wall to allow air space between starter and wall.
- E. Where fusible units are provided, install fuses as indicated on the drawings.
- F. Install thermal overloads (heaters) in each starter in accordance with the manufacturer's recommendations for that motor and the type of associated load. Coordinate proper size when individual power factor capacitors are utilized at the motor.

3.02 DISCONNECT SWITCHES

- A. Provide code required disconnect switches under this work.
- B. Non-fusible disconnect switches required when equipment is not in sight of the branch circuit panel or starter may be horsepower rated, toggle type in suitable enclosure, mounted at or on the equipment.

3.03 FUSES

- A. Install fuses for motor protection to best protect the motor without nuisance tripping. Should fuse sizes require changing from what is shown due to variance between the original design information and actual equipment installed, fuses sized in accordance with NEC. Do not size fuses smaller than the starter heaters on motor circuits.
- B. Provide one complete set of spare fuses of each amperage used on this project. Store spare fuses in the spare fuse cabinet.

3.04 COORDINATION

- A. Verify the characteristics and the motor full load current for each motor installed, using the actual motor nameplate data. Select and install the proper running overload devices in the starter as per the manufacturer's instructions. Provide the proper overload protection is a part of this Division of the work.

- B. Prepare table of motor full load currents and installed overload devices and submit to the Architect.

END OF SECTION

SECTION 26 50 00

LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements, apply to this Section.
- B. Provisions of Division 26, Electrical Section 26 05 00, Common Work Results for Electrical, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Lenses
 - 2. Reflector Cones
 - 3. Lamps
 - 4. Lamp Sockets
 - 5. Ballasts
 - 6. Fluorescent Emergency Ballasts
 - 7. Fluorescent Luminaires
 - 8. Linear Fluorescent Luminaires
 - 9. Compact Fluorescent Luminaires
 - 10. High Intensity Discharge Luminaires
 - 11. Incandescent Luminaires
 - 12. Low Voltage Luminaires
 - 13. LED Luminaires
 - 14. Track Lighting Systems
 - 15. Custom Luminaires
 - 16. Cold Cathode Systems
 - 17. Neon Systems

- B. Related Sections include:
1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
 2. Section 26 05 26, Grounding and Bonding for Electrical Systems
 3. Section 26 09 43, Network Lighting Controls
 4. Section 26 27 26, Wiring Devices

1.03 QUALITY ASSURANCE

- A. The lighting design for this project was based on luminaire types and manufacturers as specified.
- B. Specified manufacturers are pre-qualified to bid on products where specified. Inclusion of manufacturer and product series does not relieve specified manufacturer from providing product as described in luminaire schedule; modifications to standard product, if required, include with initial bid.
- C. Items noted or equivalent do not require prior approval but included with the shop drawing submittal.
- D. Other or approved manufacturers and products:
1. Submit substitution request prior to bid, complying with requirements of Division 01, General Requirements.
 2. Determine approval by review of the following luminaire characteristics where applicable.
 3. Lack of pertinent data on characteristics constitutes justification for rejection of the submittal.
 - a. Performance:
 - 1) Distribution
 - 2) Utilization
 - 3) Average brightness/maximum brightness.
 - 4) Spacing to mounting height ratio.
 - 5) Visual comfort probability.
 - b. Construction:
 - 1) Engineering
 - 2) Workmanship
 - 3) Rigidity
 - 4) Permanence of materials and finishes.
 - c. Installation Ease:
 - 1) Captive parts and captive hardware.
 - 2) Provision for leveling.
 - 3) Through-wiring ease.
 - d. Maintenance:
 - 1) Relamping ease.
 - 2) Ease of replacement of ballast and lamp sockets.
 - e. Appearance:
 - 1) Architectural integration.
 - 2) Light tightness.
 - 3) Neat, trim styling.
 - 4) Conformance with design intent.

1.04 GENERAL REQUIREMENTS:

- A. Provide lighting outlets indicated on the Drawings with a luminaire of the type designated and appropriate for the location.
- B. Where a luminaire type designation has been omitted and cannot be determined by the Contractor, request a clarification from the Architect in writing and provide a suitable luminaire type as directed.
- C. Coordinate installation of luminaires with the ceiling installation and other trades to provide a total system that is neat and orderly in appearance.
- D. Luminaires located in fire rated assemblies rated for use in such assemblies or have assembly maintained by the installer through the use of appropriate construction techniques to maintain the assembly rating. It is the responsibility of the contractor to maintain the assembly rating and provide required components during construction. Coordinate luminaires impacted with Division 01, General Requirements and life safety documents.
- E. Install remote ballasts in enclosures as required by luminaire specified. Locate remote ballasts as shown on drawings; where no location is shown, provide recommendation for approval prior to commencing field installation. Remote mounted ballasts located within the distance limitations specified by the ballast manufacturer.
- F. Coordinate voltage requirements to each luminaire as indicated on drawings.
- G. Verify luminaires carry a valid UL or ELT listing.
- H. Procure luminaires through a distributor located within 200 miles of the project site with a valid business license in the state the project is located.
- I. Upon request of the Architect, Engineer, or Owner, provide back-up pricing in a unit cost breakdown per luminaire. Back-up pricing includes distributor net pricing, contractor net pricing, final owner pricing and mark-ups and discounts (lot price or all-or-none) associated with the luminaires.
- J. Lighting related change orders include back-up pricing noted above for review by the engineer and lighting designer.

1.05 SUBMITTALS

- A. Submit the following in accordance with Section 26 05 00, Common Work Results for Electrical:
 - 1. Shop Drawings, to include:
 - a. Product Data. Provide manufacturer's published product data information.
 - b. Luminaire dimensions on a fully dimensioned line drawing.
 - c. Lamp information.
 - d. Lamp socket information.
 - e. Ballast information using ballast manufacturers published product data information. Submit multiple ballasts for single luminaire if compatible with ballast specification included in contract documents. Include certification of lamp and ballast compatibility for submitted ballasts.
 - f. Mounting details including clips, canopies, supports, and methods for attachment to structure.
 - g. UL Labeling information.

- h. Photometric Reports consisting of:
 - 1) Candlepower distribution curves: Provide five plane candlepower distribution data at no more than 5 degree vertical angle increments.
 - 2) Coefficient of utilization table.
 - 3) Zonal lumen summary including overall luminaire efficiency.
 - 4) Luminaire luminance: Provide measured maximum brightness data for luminaires with reflectors and average brightness data for luminaires with refractors.
 - 5) Spacing to mounting height ratio. If parallel and perpendicular ratios differ, provide data on each plane.
 - 6) VCP calculations (where applicable): For general office lighting luminaires, provide typical VCP calculations for ceiling heights between 9-feet and 12-feet at 1-foot increments, for room sizes 20-feet by 20-feet and 30-feet by 30-feet.
 - i. Special requirements of the specification.
2. Operation and maintenance data. Prepare two copies of a Lighting Systems Maintenance Manual consisting of the following in a hard-cover binder for review. After review, Architect will deliver one copy to Owner.
 - a. One complete set of final submittals of actual product installed, including product data and shop drawings. Include product data for actual ballast installed where applicable.
 - b. List of lamps used in Project, cross-referenced to fixture types, with specific manufacturer's names and ordering codes.
 - c. Relamping instructions for lamps that require special precautions (tungsten halogen, metal halide, etc.).
 - d. Lighting fixture cleaning instruction, including chemicals to be used or avoided.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Luminaires new and complete with mounting accessories, junction boxes, trims, and lamps.
- B. Luminaire assemblies UL listed.
- C. Luminaires UL listed appropriate to mounting conditions and application.
- D. Each luminaire family type (downlights, parabolics, etc.) supplied by only one manufacturer.
- E. Recessed luminaires installed in fire rated ceilings and using a fire rated protective cover thermally protected for this application and carry a fire rated listing.
- F. Luminaires installed under canopies, roofs or open areas and similar damp or wet locations UL listed and labeled as suitable for damp or wet locations.

2.02 LENSES

- A. Prismatic Acrylic:
 1. 12-inch by 24-inches and Larger: Extruded of clear virgin acrylic plastic, 0.125-inch minimum overall thickness, 0.1-inch nominal unpenetrated thickness, Pattern 12 with flat sided female prisms running at 45 degrees off panel axis unless otherwise specified in the luminaire schedule. Concave prisms are not acceptable.
 2. As specified in the Luminaire Schedule.

- B. Opal Acrylic:
 - 1. Extruded or injection molded of virgin acrylic plastic, 0.08-inch minimum overall thickness.
 - 2. As specified in the Luminaire Schedule.
- C. Opal Acrylic Overlay: High transmittance type, extruded of virgin acrylic plastic, 0.04-inch overall thickness, with minimum 80 percent light transmittance.

2.03 REFLECTOR CONES

- A. Spun of uniform gauge aluminum, free of spinning marks or other defects.
- B. Integral trim flange.
- C. Color and finish as specified in Luminaire Schedule.
- D. Alzak® process, low iridescent type.
- E. Supply luminaires using Alzak® reflector cones by the same manufacturer unless directed otherwise in Luminaire Schedule.

2.04 LAMPS

- A. Special types as indicated in Luminaire Schedule.
- B. Lens:
 - 1. Mechanically secured from within the housing.
 - 2. Interior linear prisms with smooth exterior.
- C. Louvers and Reflectors:
 - 1. White Reflectors: Steel or aluminum, minimum 22 gauge, with hard baked white enamel finish with minimum 85 percent reflectance.
 - 2. Alzak Reflectors: Low iridescent semi-specular or as indicated in the Luminaire Schedule, Alzak® or Coilzak® with minimum reflectance of 90 percent.
- D. Suspension:
 - 1. Suspension Devices, type as specified in the Luminaire Schedule:
 - a. Aircraft Cable: Stainless steel type - 3/32-inch nominal diameter, stranded, with positive pressure, field adjustable clamp at fixture connection.
 - b. Rigid Pendant: 1/2-inch nominal diameter or as specifically shown on drawings. Supplied by fixture manufacturer when available as standard product. At fixture end of stems, provide earthquake type swivel fitting to permit 45 degree swing away from vertical. Flat canopy to permit splice inspection after installation.
 - c. Chain hangers: Length to suit fixture mounting height if shown or as field conditions dictate. Use two heavy duty chains with S hooks at each suspension point. Length to suit mounting height as shown on Drawings.
 - d. Suspension system must permit ±1/2-inch minimum vertical adjustment after installation.

2. Supports:
 - a. Provide internal safety cable from fixture body to stud in outlet box.
 - b. Carry fixture weight to structure and provide horizontal bracing from suspension points to ceiling framing to prevent sideways shifting. Provide diagonal seismic restraint wires per code.
3. Feed Point:
 - a. Flat-plate canopy to cover outlet box, with holes for support cable and power cord, concealed fasteners to permit splice inspection after installation.
 - b. At the electrified connection provide straight cord feed. Provide a separate feed point where emergency feed is required.
 - c. Power cord: white multi-conductor cord, parallel to support cable (aircraft cable); within pendant (rigid pendant); or flexible conduit (chain hanger).
 - d. Provide a separate fee point where emergency feed is required.
4. Non-feed Points:
 - a. 1/2-inch OD polished chrome end sleeve, inside threaded 1/4-inch-20, with 2 - inchdiameter. Flat white plate to cover hole in ceiling. Top of cable with ball swaged on end, to fit inside sleeve.
 - b. Contractor to provide support above ceiling as required.
5. Suspension method allows adjustment to be made in hanging length to allow for variance in ceiling height.
6. Exposed paintable suspension components have the same finish and color as the luminaire housing.

2.05 LOW VOLTAGE LUMINAIRES

- A. Dimensions: Proper for the various wattage noted on the plans and as recommended by the luminaire manufacturer or as specified.
- B. Recessed luminaires: Equip with protective thermal cutout and a through-wiring junction box accessible from the ceiling opening of the luminaire.
- C. Adjustable Lamp Mechanisms: To have aiming stops which can be permanently set to position lamp vertically and rotationally.
- D. Transformers: Provide proper lamp voltage to low voltage lamps.
 1. Integral:
 - a. Magnetic: Encapsulated for silent operation, securely mounted to the luminaire and removable through the aperture for hard ceiling installations or remote where shown on drawings.
 - b. Electronic: Do not provide electronic transformers unless directed in the Luminaire Schedule.
 2. Remote:
 - a. Magnetic: Encapsulated for silent operation, securely mounted accessible in location shown on drawings. Provide code-sized primary and secondary circuit protection via [fuses] [thermal magnetic circuit breakers], quantity of secondary circuits as required to serve specified load.
 - b. Electronic: Do not provide electronic transformers unless directed in the Luminaire Schedule.

E. Finish:

1. Visible surfaces to be of color and texture as directed in Luminaire Schedule.
2. Concealed interior and exterior luminaire surfaces to be matte black.

2.06 LED LUMINAIRES

- A. Dimensions: Proper for the various wattage noted on the plans and as recommended by the luminaire manufacturer or as specified.
- B. Recessed luminaires: Must be rated for use in recessed applications. If required by the owner or design team, the manufacturer must produce test data proving the product is rated for use in recessed applications.
- C. CRI: Minimum Color Rendering Index (CRI) of 80 or higher.
- D. Color Temperature:
1. Refer to luminaire schedule.
 2. Do not exceed a +/- tolerance of greater than 2 McAdam Ellipses. Over the life of the luminaire.
- E. Adjustable Lamp Mechanisms: To have aiming stops which can be permanently set to position lamp vertically and rotationally.
- F. Power Supply
1. Integral:
 - a. Rated for use with the LED array specified. Warranty array and driver as an assembly. 5 year full replacement, non-pro rated warranty is required on electronic components.
 2. Remote:
 - a. Rated for use with the LED array specified. Warranty array and driver as an assembly. 5 year full replacement, non-pro rated warranty is required on electronic components.
- G. Finish: Visible surfaces to be of color and texture as directed in Luminaire Schedule. Matt black concealed interior and exterior luminaire surfaces or as recommended by the luminaire manufacturer.
- H. Testing: LED luminaires must meet the IES LM-79-08 and LM 80-08 testing requirements. Manufacturer to provide verification of testing compliance upon request of the design team, contractor or owner.
- I. Disposal and replacement: LED manufacturer is responsible for the disposal of expired LED arrays and heat sinks. Clearly label fixture with return information, disposal procedures and manufacturer disposal contact information. Owner will pay for shipping.
1. Manufacturer is required to inform the owner of new power requirements and /or lumen output values if new replacement components prior to shipping replacement parts.

2. Label disposal and replacement information inside the luminaire and in the project operation and maintenance manuals along with O&M requirements listed in Division 01 of the specifications.

2.07 TRACK LIGHTING SYSTEMS

- A. Lighting Track:
 1. Extruded aluminum track with extruded poly-vinyl insulator.
 2. 20A, copper conductor strips with separate ground to provide electrical and mechanical connection for the specified track mounted luminaires.
 3. Number of circuits as indicated in luminaire schedule, with separate neutrals per circuit.
 4. Provide connectors, elbows, stems, feed ends, end caps and fittings to make a complete system.
- B. Track Fittings:
 1. Provide positive mechanical and electrical connection for track heads to track.
 2. Removable fitting either twists into or snaps into specified lighting track.
- C. Luminaire dimensions: Proper for the various wattage noted on the plans and as recommended by the luminaire manufacturer or as specified.
- D. Adjustable Lamp Mechanisms: Adjustable aiming which can be set to position lamp vertically and rotationally.
- E. Transformers: Provide proper lamp voltage to low voltage lamps. Magnetic transformers encapsulated for silent operation. Integrally mount Magnetic and electronic transformers to luminaire.
- F. Finish: Visible surfaces to be of color and texture as directed in Luminaire Schedule.
- G. Labels: Track and track fittings compatible and be UL labeled and listed as a system.

2.08 CUSTOM LUMINAIRES

- A. Custom luminaire manufacturer no less than five years of continuous experience in the design and manufacture of custom lighting elements of the type and quality shown.
- B. Specifications and drawings are intended to convey the features, function and character of the custom luminaire only and do not necessarily illustrate every component or detail required in the finished piece of equipment.
- C. Include details and components that are necessary for the proper appearance and functioning of the custom luminaire.
- D. Provide operational sample prototype luminaire for review and revision, if specified, of each custom luminaire type. Install and connect sample prototype luminaire by the contractor in a mutually acceptable location for demonstration and evaluation by the design team. Final judges on determining whether the prototype sample complies with specification is up to the Architect and Lighting Consultant.

2.09 COLD CATHODE SYSTEMS

- A. General:
 - 1. UL listed and labeled as a system.
 - 2. Manufacturer: AT least ten years continuous experience in producing cold cathode lighting systems with replaceable lamps.
- B. Lamp:
 - 1. Cold cathode T8, 3500 Kelvin tri-phosphor, 240 MA, with in-line or right angle electrodes as directed in the luminaire schedule.
 - 2. Straight or curved 1-inch diameter lamps as shown on Drawings.
 - 3. Interchangeable lamps in similar configurations.
- C. Socket: Surface mounted, in-line telescopic or right angle as shown in Luminaire Schedule, white finish.
- D. Transformer: Remote, 240 M.A., HPF.

2.10 NEON SYSTEMS

- A. General:
 - 1. UL listed components.
 - 2. Manufacturer: At least ten years continuous experience in fabricating and installing architectural neon lighting systems.
- B. Lamps: Neon, 5MM glass, color as indicated on Luminaire Schedule, with 90 degree or in line electrodes as required for continuous illumination.
- C. Transformer: Remote, sized to lamp runs, NEMA 1 soundproof enclosure.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Meet general requirements of NFPA 70, National Electric Code.
- B. Mounting heights specified on drawings:
 - 1. Wall Mounted Luminaires: Centerline of luminaire.
 - 2. Pendant Mounted Luminaires: Bottom of luminaire unless specifically identified in the Luminaire Schedule or on drawings.
- C. Support:
 - 1. Support by separate means from the building structure and not from the ceiling system, ductwork, piping or other systems.

2. Final decision as to adequacy of support and alignment will be given by the Architect.
- D. Level luminaires, align in straight lines, and locate as shown on the architectural elevations and reflected ceiling plan.
- E. Manufacturer's labels or monograms not visible after luminaire is installed, but must be included for future reference.
- F. When lamping tungsten halogen luminaires use silk gloves to insert lamps.
- G. DO not energize tungsten halogen luminaires during construction to prevent dust build up on lamp, socket and lamp chamber. Lamping occurs as last stage of construction.
- H. Recessed Luminaires:
 1. Trims fit neatly and tightly to the surfaces in which they are installed without light leaks or gaps.
 2. Install heat resistant non-rubber gaskets to prevent light leaks or moisture from entering between luminaires trim and the surface to which they are mounted.

3.02 COORDINATION OF WORK

- A. Architectural Reflected Ceiling Plans take preference as to the exact placement of the luminaires in the ceiling.
- B. Determine ceiling types in each area and provide suitable accessories and mounting frames where required for recessed luminaires. Luminaire catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a luminaire may be installed.

3.03 AIMING

- A. Aim luminaires with proper lamps installed.
- B. Aim directional luminaires, including but not limited to luminaires described in the Contract Documents or by the luminaire manufacturer as aimable, adjustable, or asymmetric as follows:
 1. Provide the lighting pattern for which the luminaire is designed.
 2. Provide the lighting pattern as shown on the drawings.
 3. Predetermined aiming points as shown on the drawings.
 4. Where aiming cannot be determined, request, in writing, clarification from the Architect, indicating luminaires needing clarification.
- C. Re-aim luminaires as determined by Architect during final project walkthrough.
- D. Install adjustable luminaires with dead zone of rotation away from intended aiming point.

3.04 PROJECT CLOSEOUT

- A. Leave luminaires clean at the time of acceptance of the work. If luminaires are deemed dirty by the Architect at completion of the work, clean them at no additional cost. Protective plastic wrap is to be removed from parabolic luminaires just prior to owner acceptance.

- B. Provide fixtures with new lamps operating at time of final acceptance. Exception: For fluorescent dimming fixtures, provide minimum 100 hour/maximum 200 hour, continuously lit lamps or per ballast manufacturer's recommendations.
- C. Where incandescent lamps are used for construction lighting. Replace lamps with new lamps just prior to occupancy by the owner.

END OF SECTION

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SECTION 27 00 00

COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. PROVIDE ALL LABOR, MATERIALS, TOOLS AND EQUIPMENT REQUIRED FOR THE COMPLETE INSTALLATION OF ALL COMMUNICATIONS HORIZONTAL CABLING FOR ALL SYSTEMS, INCLUDING BUT NOT LIMITED TO:
 - 1. 27 15 01.00 – COMMUNICATIONS HORIZONTAL CABLING APPLICATIONS
 - 2. 27 15 01.13 - VIDEO SURVEILLANCE CABLES
 - 3. 27 15 01.15 – ACCESS CONTROL CABLES
 - 4. 27 15 01.16 – VOICE COMMUNICATIONS CABLES
 - 5. 27 15 01.23- AUDIO/VIDEO CABLING

1.02 SCOPE OF WORK

- A. PROVIDE AND INSTALL A COMPLETE AND FUNCTIONAL HORIZONTAL CABLE PLANT FOR THE FOLLOWING SYSTEM LOCATIONS AS SHOWN ON THE CONSTRUCTION DRAWINGS, INCLUDING BUT NOT LIMITED TO, ALL NECESSARY PASSIVE COMPONENTS, TO ALLOW FULL OPERATION OF THE WIRING INFRASTRUCTURE UPON COMPLETION:
 - 1. VOICE/DATA LOCATIONS.
 - 2. WIRELESS ACCESS POINT LOCATIONS.
 - 3. VIDEO SURVEILLANCE LOCATIONS.
 - 4. ACCESS CONTROL LOCATIONS.
- B. ALL CABLES AND RELATED TERMINATIONS, SUPPORT AND GROUNDING HARDWARE SHALL BE FURNISHED, INSTALLED, WIRED, TESTED, LABELED, AND DOCUMENTED BY THE TELECOMMUNICATIONS CONTRACTOR AS DETAILED IN THIS DOCUMENT.
- C. PRODUCT SPECIFICATIONS, GENERAL DESIGN CONSIDERATIONS, AND INSTALLATION GUIDELINES ARE PROVIDED IN THIS DOCUMENT. QUANTITIES OF TELECOMMUNICATIONS OUTLETS, TYPICAL INSTALLATION DETAILS, CABLE ROUTING AND OUTLET TYPES WILL BE PROVIDED AS AN ATTACHMENT TO THIS DOCUMENT. IF THE BID DOCUMENTS ARE IN CONFLICT, FORMAL CLARIFICATION SHALL BE OBTAINED FROM IN THE FORM OF QUESTION CLARIFICATION REQUEST. THE SUCCESSFUL VENDOR SHALL MEET OR EXCEED ALL REQUIREMENTS FOR THE CABLE SYSTEM DESCRIBED IN THIS DOCUMENT.
- D. ALL ACTIVE NETWORK COMPONENTS SUCH AS ROUTERS, SWITCHES, HUBS, FIBER OPTIC TRANSCEIVERS, WIRELESS COMMUNICATIONS SYSTEM TRANSCEIVERS, ANTENNAE, BASE STATIONS AND CONCENTRATORS OR SERVERS SHALL BE SUPPLIED BY THE OWNER.

1.03 REGULATORY REFERENCES AND INCORPORATED DOCUMENTS

- A. THE FOLLOWING INDUSTRY STANDARDS ARE THE BASIS FOR THE STRUCTURED CABLING SYSTEM DESCRIBED IN THIS DOCUMENT.

1. TIA/EIA-568-C.1 COMMERCIAL BUILDING TELECOMMUNICATIONS CABLING
 2. TIA/EIA-568-C.0 GENERAL REQUIREMENTS
 3. TIA/EIA-568-C.2 BALANCED TWISTED PAIR CABLING COMPONENTS
STANDARD
 4. TIA/EIA-568-C.2.10 SPECIFICATIONS FOR AUGMENTED CATEGORY 6 CABLING
 5. TIA/EIA-568-C.3 OPTICAL FIBER CABLING COMPONENTS STANDARD
 6. TIA/EIA - 942 TELECOMMUNICATIONS INFRASTRUCTURE FOR DATA
 7. TIA/EIA-569-A COMMERCIAL BUILDING STANDARD FOR TELECOM
PATHWAYS
 8. TIA/EIA-606-A ADMIN STANDARD FOR THE TELECOM INFRASTRUCTURE
 9. J-STD-607-A COMMERCIAL BUILDING GROUNDING/BONDING
 10. NFPA 70 NATIONAL ELECTRIC CODE (NEC)
 11. ISO 11801 GENERIC CABLING FOR CUSTOMER PREMISES
- B. IF THERE IS A CONFLICT BETWEEN APPLICABLE DOCUMENTS, THEN THE MORE STRINGENT REQUIREMENT SHALL APPLY. ALL DOCUMENTS LISTED ARE BELIEVED TO BE THE MOST CURRENT RELEASES OF THE DOCUMENTS. THE CONTRACTOR HAS THE RESPONSIBILITY TO DETERMINE AND ADHERE TO THE MOST RECENT RELEASE WHEN DEVELOPING THE PROPOSAL FOR INSTALLATION.
- C. THIS DOCUMENT DOES NOT REPLACE ANY CODE, EITHER PARTIALLY OR WHOLLY. THE CONTRACTOR MUST BE AWARE OF LOCAL CODES THAT MAY IMPACT THIS PROJECT.

1.04 CONTRACTOR QUALIFICATIONS

- A. CONTRACTOR MUST POSSESS A VALID STATE CONTRACTOR'S LICENSE.
- B. TO THE SATISFACTION OF THE COLLEGE OF MARIN THE CONTRACTOR MUST PROVE THEIR EXPERIENCE AND QUALIFICATIONS BY SUBMITTING:
1. AT LEAST (3) SUCCESSFULLY, COMPLETED PROJECTS OF COMPARABLE SIZE AND COMPLEXITY WITH IN THE LAST THREE YEARS.
 2. MUST HAVE AN RCDD ON STAFF.
 3. BE A REGISTERED PANDUIT CERTIFIED PARTNER AND ABLE TO OFFER A 25 YEAR PANDUIT CERTIFICATION PLUS SYSTEM WARRANTY.

1.05 SUBMITTALS

- A. SUBMIT COMPLETE LIST OF ALL ITEMS OF MATERIALS TO BE FURNISHED, AND INSTALLED TO THE OWNER FOR COMPLIANCE REVIEW PRIOR TO PURCHASING THE MATERIALS. SUBMITTALS SHALL INCLUDE:
1. COMPLETE BILL OF MATERIALS AND EQUIPMENT, INCLUDING A COMPLETE LISTING OF THE CHARACTERISTICS OF THE EQUIPMENT AS SPECIFIED.
 2. ONE LINE DIAGRAM INDICATING ALL SYSTEM CONNECTIONS, ALL CLOSET LOCATIONS, RACK ARRANGEMENTS, CABINETS, AND WORKSTATION OUTLETS.
 3. LIST OF INSTRUMENTATION TO BE USED FOR SYSTEM TESTING, INCLUDING CERTIFICATE OF MANUFACTURERS CALIBRATION.
 4. 1/4TH SCALE PLAN OF ALL TELECOMMUNICATIONS ROOMS AND CLOSETS, INDICATING PROPOSED LAYOUT OF ALL EQUIPMENT AND CABLE TRAYS, TROUGHES, AND RUNWAYS.
- B. SUBMIT CONTRACTOR'S QUALIFICATIONS AS OUTLINED IN SECTION 1.04 ABOVE.

PART 2 - PRODUCTS

2.06 HORIZONTAL CABLING-

- A. ALL HORIZONTAL CABLING WILL BE A GENSPEED 6000 CATEGORY 6, CMR RATED UTP CABLE:
- B. PART NUMBER: 7133900
- C. OR EQUAL AS APPROVED BY DISTRICT.

2.07 PATCH CORDS-

- A. PANDUIT TX6-28 CATEGORY 6 UTP PATCH CORDS.
- B. PROVIDE THE FOLLOWING QUANTITIES:
1. (30) BLUE 10'
 2. (10) YELLOW 10'
 3. (10) RED 10'
 4. (10) PURPLE 10'
- C. PART NUMBER: UTP28SP10XX, (XX = COLOR).
- D. OR EQUAL AS APPROVED BY DISTRICT

2.08 BACKBONE CABLING -

- A. USE EXISTING BACK BONE CABLING.

2.09 JACKS -

- A. PANDUIT MINI-COM TX6 PLUS UTP JACK MODULES
- B. PART NUMBER: CJ688TGXX (XX = COLOR OF JACK)
- C. OR EQUAL AS APPROVED BY DISTRICT.

2.10 FACEPLATES

- A. PANDUIT MINI-COM CLASSIC SERIES SLOPED FACEPLATES WITH LABEL AND LABEL COVER
- B. PART NUMBER: CFPL*WHY (* = # OF PORTS; XX = COLOR IS WHITE)
- C. OR EQUAL AS APPROVED BY DISTRICT.

2.11 PATCH PANELS

- A. PANDUIT MINI-COM ALL METAL SHIELDED MODULAR PATCH PANELS
- B. PART NUMBER: CP**BLY (** = # OF PORTS)
- C. OR EQUAL AS APPROVED BY DISTRICT

2.12 HORIZONTAL WIRE MANAGER

- A. PANDUIT NETMANAGER HIGH CAPACITY HORIZONTAL CABLE MANAGER
- B. PART NUMBER: NMF4
- C. OR EQUAL AS APPROVED BY DISTRICT

PART 3 - EXECUTION

3.13 WORK STATIONS LOCATIONS:

- A. DATA LOCATIONS:
 - 1. EACH LOCATION CONSISTS OF (3) CAT6 DATA CABLES.
 - 2. TERMINATE CABLE 1 WITH A BLUE JACK
 - 3. TERMINATE CABLE 2 WITH AN ORANGE JACK
 - 4. TERMINATE CABLE 3 WITH A GREEN JACK.
 - 5. THESE CABLES ARE MOUNTED IN A WHITE 4-PORT SLOPED FACEPLATE.
 - a. SNAP THE BLUE JACK INTO POSITION #1,
 - b. SNAP A WHITE BLANK INTO POSITION #2
 - c. SNAP THE ORANGE JACK INTO POSITION #3
 - d. SNAP THE GREEN JACK INTO POSITION #4.
- B. WIRELESS ACCESS POINT LOCATION:
 - 1. EACH LOCATION CONSISTS OF (2) CAT 6 DATA CABLES WIRELESS ACCESS POINT LOCATIONS.
 - 2. BOTH CABLES ARE TERMINATED WITH PURPLE JACKS.
 - 3. MOUNT JACKS IN A 2-PORT WHITE SLOPED FACEPLATE.
- C. VIDEO SURVEILLANCE LOCATIONS:
 - 1. EACH LOCATION CONSISTS OF (1) CAT 6 DATA CABLE.
 - 2. TERMINATE THE CABLE WITH YELLOW CAT 6 JACK.
 - 3. MOUNT JACK IN A 1-PORT FACEPLATE.
- D. ACCESS CONTROL LOCATIONS:
 - 1. EACH LOCATION CONSISTS OF (1) CAT6 DATA CABLE.
 - 2. TERMINATE THE CABLE WITH A RED CAT6 JACK.
 - 3. MOUNT JACK IN A 1-PORT FACEPLATE.
- E. ALL JACKS SHALL BE TERMINATED USING THE T568B WIRING SCHEME. THE EIGHT-POSITION MODULE SHALL EXCEED THE CONNECTOR REQUIREMENTS OF THE TIA/EIA CATEGORY 6 STANDARD. THE JACK TERMINATION TO 4-PAIR, 100-OHM SOLID UNSHIELDED TWISTED PAIR CABLE SHALL BE ACCOMPLISHED BY USE OF A FORWARD MOTION TERMINATION CAP AND SHALL NOT REQUIRE THE USE OF A PUNCH DOWN OR INSERTION TOOL
- F. CABLES SHALL BE DRESSED AND TERMINATED IN ACCORDANCE WITH THE RECOMMENDATIONS MADE IN THE TIA/EIA-568-C DOCUMENT, MANUFACTURER'S RECOMMENDATIONS AND BEST INDUSTRY PRACTICES.
- G. PAIR UNTWIST AT THE TERMINATION SHALL NOT EXCEED 3.18MM (0.125 INCH).
- H. BEND RADIUS OF THE CABLE IN THE TERMINATION AREA SHALL NOT BE LESS THAN 4 TIMES THE OUTSIDE DIAMETER OF THE CABLE.

- I. THE CABLE JACKET SHALL BE MAINTAINED TO WITHIN 25MM (ONE INCH) OF THE TERMINATION POINT.

3.14 HORIZONTAL CABLE INSTALLATION

- A. CABLE SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND BEST INDUSTRY PRACTICES.
- B. A PULL CORD (NYLON; 1/8" MINIMUM) SHALL BE CO-INSTALLED WITH ALL CABLE INSTALLED IN ANY CONDUIT.
- C. CABLE RACEWAYS SHALL NOT BE FILLED GREATER THAN THE TIA/EIA-569-A MAXIMUM FILL FOR THE RACEWAY TYPE
- D. CABLES SHALL BE INSTALLED IN CONTINUOUS LENGTHS FROM ORIGIN TO DESTINATION (NO SPLICES).
- E. THE CABLE'S MINIMUM BEND RADIUS AND MAXIMUM PULLING TENSION SHALL NOT BE EXCEEDED.
- F. IF A J-HOOK OR TRAPEZE SYSTEM IS USED TO SUPPORT CABLE BUNDLES ALL HORIZONTAL CABLES SHALL BE SUPPORTED AT A MAXIMUM OF 48 TO 60 INCH (1.2 TO 1.5 METER) INTERVALS. AT NO POINT, SHALL CABLE(S) REST ON ACOUSTIC CEILING GRIDS OR PANELS.
- G. HORIZONTAL CABLES SHALL BE BUNDLED IN GROUPS OF NO MORE THAN 25 CABLES. CABLE BUNDLE QUANTITIES MORE THAN 25 CABLES MAY CAUSE DEFORMATION OF THE BOTTOM CABLES WITHIN THE BUNDLE AND DEGRADE CABLE PERFORMANCE.
- H. CABLE SHALL BE INSTALLED ABOVE FIRE-SPRINKLER SYSTEMS AND SHALL NOT BE ATTACHED TO THE SYSTEM OR ANY ANCILLARY EQUIPMENT OR HARDWARE. THE CABLE SYSTEM AND SUPPORT HARDWARE SHALL BE INSTALLED SO THAT IT DOES NOT OBSCURE ANY VALVES, FIRE ALARM CONDUIT, BOXES, OR OTHER CONTROL DEVICES.
- I. CABLES SHALL NOT BE ATTACHED TO CEILING GRID OR LIGHTING FIXTURE WIRES. WHERE SUPPORT FOR HORIZONTAL CABLE IS REQUIRED, THE CONTRACTOR SHALL INSTALL APPROPRIATE CARRIERS TO SUPPORT THE CABLING.
- J. ANY CABLE DAMAGED OR EXCEEDING RECOMMENDED INSTALLATION PARAMETERS DURING INSTALLATION SHALL BE REPLACED BY THE CONTRACTOR PRIOR TO FINAL ACCEPTANCE AT NO COST TO THE OWNER.
- K. CABLES SHALL BE IDENTIFIED BY A SELF-ADHESIVE LABEL IN ACCORDANCE WITH THE SYSTEM DOCUMENTATION SECTION OF THIS SPECIFICATION AND ANSI/TIA/EIA-606-A. THE CABLE LABEL SHALL BE APPLIED TO THE CABLE BEHIND THE FACEPLATE ON A SECTION OF CABLE THAT CAN BE ACCESSED BY REMOVING THE COVER PLATE.
- L. UNSHIELDED TWISTED PAIR CABLE SHALL BE INSTALLED SO THAT THERE ARE NO BENDS SMALLER THAN FOUR TIMES THE CABLE OUTSIDE DIAMETER AT ANY POINT IN THE RUN AND AT THE TERMINATION FIELD.

3.15 TERMINATION ROOM:

- A. CABLES SHALL BE DRESSED AND TERMINATED IN ACCORDANCE WITH THE RECOMMENDATIONS MADE IN THE TIA/EIA-568-C STANDARD, MANUFACTURER'S RECOMMENDATIONS AND BEST INDUSTRY PRACTICES.
- B. BEND RADIUS OF THE CABLE IN THE TERMINATION AREA SHALL NOT EXCEED 4 TIMES THE OUTSIDE DIAMETER OF THE CABLE.
- C. CABLES SHALL BE NEATLY BUNDLED IN GROUPS OF 24 CABLES AND DRESSED TO THEIR RESPECTIVE PATCH PANEL. EACH PANEL SHALL BE FED BY AN INDIVIDUAL BUNDLE SEPARATED AND DRESSED BACK TO THE POINT OF CABLE ENTRANCE INTO THE RACK OR FRAME.
- D. THE CABLE JACKET SHALL BE MAINTAINED AS CLOSE AS POSSIBLE TO THE TERMINATION POINT.
- E. EACH CABLE SHALL BE CLEARLY LABELED ON THE CABLE JACKET BEHIND THE PATCH PANEL AT A LOCATION THAT CAN BE VIEWED WITHOUT REMOVING THE

BUNDLE SUPPORT TIES. CABLES LABELED WITHIN THE BUNDLE, WHERE THE LABEL IS OBSCURED FROM VIEW SHALL NOT BE ACCEPTABLE.

3.16 COPPER TERMINATION TR

- A. CABLES SHALL BE DRESSED AND TERMINATED IN ACCORDANCE WITH THE RECOMMENDATIONS MADE IN THE ANSI/TIA-568-C STANDARD, MANUFACTURER'S RECOMMENDATIONS AND BEST INDUSTRY PRACTICE.
- B. PAIR UNTWIST AT THE TERMINATION SHALL NOT EXCEED 3.18MM (0.125 INCH). BEND RADIUS OF THE CABLE IN THE TERMINATION AREA SHALL NOT EXCEED 4 TIMES THE OUTSIDE DIAMETER OF THE CABLE.
- C. CABLES SHALL BE NEATLY BUNDLED AND DRESSED TO THEIR RESPECTIVE PANELS OR BLOCKS. EACH PANEL OR BLOCK SHALL BE FED BY AN INDIVIDUAL BUNDLE SEPARATED AND DRESSED BACK TO THE POINT OF CABLE ENTRANCE INTO THE RACK OR FRAME.
- D. THE CABLE JACKET SHALL BE MAINTAINED TO WITHIN 25 MM (ONE INCH) OF THE TERMINATION POINT.
- E. EACH CABLE SHALL BE CLEARLY LABELED ON THE CABLE JACKET BEHIND THE PATCH PANEL AT A LOCATION THAT CAN BE VIEWED WITHOUT REMOVING THE BUNDLE SUPPORT TIES. CABLES LABELED WITHIN THE BUNDLE, WHERE THE LABEL IS OBSCURED FROM VIEW SHALL NOT BE ACCEPTABLE.

3.17 FIRE STOP SYSTEM

- A. ALL PENETRATIONS THROUGH FIRE-RATED BUILDING STRUCTURES (WALLS AND FLOORS) SHALL BE SEALED WITH AN APPROPRIATE FIRESTOP SYSTEM. THIS REQUIREMENT APPLIES TO THROUGH PENETRATIONS (COMPLETE PENETRATION) AND MEMBRANE PENETRATIONS (THROUGH ONE SIDE OF A HOLLOW FIRE RATED STRUCTURE). ANY PENETRATING ITEM I.E., RISER SLOTS AND SLEEVES, CABLES, CONDUIT, CABLE TRAY, AND RACEWAYS, ETC. SHALL BE PROPERLY FIRE STOPPED. FIRESTOP SYSTEMS SHALL BE UL CLASSIFIED TO ASTM E814 (UL 1479) AND SHALL BE APPROVED BY A QUALIFIED PROFESSIONAL ENGINEER (PE), LICENSED (ACTUAL OR RECIPROCAL) IN THE STATE WHERE THE WORK IS TO BE PERFORMED. A DRAWING SHOWING THE PROPOSED FIRESTOP SYSTEM, STAMPED/EMBOSSSED BY THE PE SHALL BE PROVIDED TO THE OWNER'S TECHNICAL REPRESENTATIVE PRIOR TO INSTALLING THE FIRESTOP SYSTEM(S).

3.18 ALL FIRESTOP SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND SHALL BE COMPLETELY INSTALLED AND AVAILABLE FOR INSPECTION BY THE LOCAL INSPECTION AUTHORITIES PRIOR TO CABLE SYSTEM ACCEPTANCE. THE FIRESTOP SOLUTION MUST BE DHEC APPROVED.

3.19 GROUNDING AND BONDING

- A. THE FACILITY SHALL BE EQUIPPED WITH A TELECOMMUNICATIONS BONDING BACKBONE (TBB). THIS BACKBONE SHALL BE USED TO GROUND ALL TELECOMMUNICATIONS CABLE SHIELDS, EQUIPMENT, RACKS, CABINETS, RACEWAYS, AND OTHER ASSOCIATED HARDWARE THAT HAS THE POTENTIAL TO ACT AS A CURRENT CARRYING CONDUCTOR. THE TBB SHALL BE INSTALLED INDEPENDENT OF THE BUILDING'S ELECTRICAL AND BUILDING GROUND AND SHALL BE DESIGNED IN ACCORDANCE WITH THE RECOMMENDATIONS CONTAINED IN THE ANSI/J-STD-607-A TELECOMMUNICATIONS BONDING AND GROUNDING STANDARD.
- B. THE MAIN ENTRANCE FACILITY/EQUIPMENT ROOM IN EACH BUILDING SHALL BE EQUIPPED WITH A TELECOMMUNICATIONS MAIN GROUNDING BUS BAR (TMGB). EACH TELECOMMUNICATIONS ROOM SHALL BE PROVIDED WITH A TELECOMMUNICATIONS GROUND BUS BAR (TGB). THE TMGB SHALL BE CONNECTED TO THE BUILDING ELECTRICAL ENTRANCE GROUNDING FACILITY. THE INTENT OF THIS SYSTEM IS TO PROVIDE A GROUNDING SYSTEM THAT IS EQUAL IN POTENTIAL TO THE BUILDING ELECTRICAL GROUND SYSTEM. THEREFORE, GROUND LOOP CURRENT POTENTIAL IS MINIMIZED BETWEEN TELECOMMUNICATIONS EQUIPMENT AND THE ELECTRICAL SYSTEM TO WHICH IT IS ATTACHED.

- C. ALL RACKS, METALLIC BACKBOARDS, CABLE SHEATHS, METALLIC STRENGTH MEMBERS, SPLICE CASES, CABLE TRAYS, ETC. ENTERING OR RESIDING IN THE TR OR ER SHALL BE GROUNDED TO THE RESPECTIVE TGB OR TMGB USING A MINIMUM #6 AWG STRANDED COPPER BONDING CONDUCTOR AND COMPRESSION CONNECTORS.
- D. ALL WIRES USED FOR TELECOMMUNICATIONS GROUNDING PURPOSES SHALL BE IDENTIFIED WITH A GREEN INSULATION. NON-INSULATED WIRES SHALL BE IDENTIFIED AT EACH TERMINATION POINT WITH A WRAP OF GREEN TAPE. ALL CABLES AND BUS BARS SHALL BE IDENTIFIED AND LABELED IN ACCORDANCE WITH THE SYSTEM DOCUMENTATION SECTION OF THIS SPECIFICATION.
- E. THE TBB SHALL BE DESIGNED AND/OR APPROVED BY A QUALIFIED PE, LICENSED IN THE STATE THAT THE WORK IS TO BE PERFORMED. THE TBB SHALL ADHERE TO THE RECOMMENDATIONS OF THE J-STD-607-A STANDARD, AND SHALL BE INSTALLED IN ACCORDANCE WITH BEST INDUSTRY PRACTICE.
- F. A LICENSED ELECTRICAL CONTRACTOR SHALL PERFORM INSTALLATION AND TERMINATION OF THE MAIN BONDING CONDUCTOR TO THE BUILDING SERVICE ENTRANCE GROUND.

3.20 IDENTIFICATION AND LABELING

- A. THE CONTRACTOR SHALL DEVELOP AND SUBMIT FOR APPROVAL A LABELING SYSTEM FOR THE CABLE INSTALLATION. THE OWNER WILL NEGOTIATE AN APPROPRIATE LABELING SCHEME WITH THE SUCCESSFUL CONTRACTOR. AT A MINIMUM, THE LABELING SYSTEM SHALL CLEARLY IDENTIFY ALL COMPONENTS OF THE SYSTEM: RACKS, CABLES, PANELS AND OUTLETS. THE LABELING SYSTEM SHALL DESIGNATE THE CABLES ORIGIN AND DESTINATION AND A UNIQUE IDENTIFIER FOR THE CABLE WITHIN THE SYSTEM. RACKS AND PATCH PANELS SHALL BE LABELED TO IDENTIFY THE LOCATION WITHIN THE CABLE SYSTEM INFRASTRUCTURE. ALL LABELING INFORMATION SHALL BE RECORDED ON THE AS-BUILT DRAWINGS AND ALL TEST DOCUMENTS SHALL REFLECT THE APPROPRIATE LABELING SCHEME.
- B. ALL LABEL PRINTING WILL BE MACHINE GENERATED BY PANDUIT PANMARK SOFTWARE AND PANDUIT DESKTOP AND HAND-HELD PRINTERS USING INDELIBLE INK RIBBONS OR CARTRIDGES. SELF-LAMINATING LABELS WILL BE USED ON CABLE JACKETS, APPROPRIATELY SIZED TO THE OD OF THE CABLE, AND PLACED WITHIN VIEW AT THE TERMINATION POINT ON EACH END. OUTLET, PATCH PANEL AND WIRING BLOCK LABELS SHALL BE INSTALLED ON, OR IN, THE SPACE PROVIDED ON THE DEVICE.

3.21 TESTING AND ACCEPTANCE

3.22 GENERAL

- 1. ALL CABLES AND TERMINATION HARDWARE SHALL BE 100% TESTED FOR DEFECTS IN INSTALLATION AND TO VERIFY CABLING SYSTEM PERFORMANCE UNDER INSTALLED CONDITIONS PER THE REQUIREMENTS OF ANSI/TIA/EIA-568-C-1 SECTION 11. ALL PAIRS OF EACH INSTALLED CABLE SHALL BE VERIFIED PRIOR TO SYSTEM ACCEPTANCE. ANY DEFECT IN THE CABLING SYSTEM INSTALLATION INCLUDING BUT NOT LIMITED TO CABLE, CONNECTORS, FEED THROUGH COUPLERS, PATCH PANELS, AND CONNECTOR BLOCKS SHALL BE REPAIRED OR REPLACED TO ENSURE 100% USEABLE CONDUCTORS IN ALL CABLES INSTALLED.
 - 2. ALL CABLES SHALL BE TESTED IN ACCORDANCE WITH THIS DOCUMENT, THE ANSI/TIA/EIA STANDARDS, THE PANDUIT® CERTIFICATION PLUSSM SYSTEM WARRANTY GUIDELINES AND BEST INDUSTRY PRACTICE. IF ANY OF THESE ARE IN CONFLICT, THE CONTRACTOR SHALL BRING ANY DISCREPANCIES TO THE ATTENTION OF THE PROJECT TEAM FOR CLARIFICATION AND RESOLUTION.
- B. COPPER CHANNEL TESTING

1. ALL TWISTED-PAIR COPPER CABLE LINKS SHALL BE TESTED FOR COMPLIANCE TO THE REQUIREMENTS IN ANSI/TIA/EIA/568-C.2 FOR THE APPROPRIATE CATEGORY OF CABLING INSTALLED.

3.23 SYSTEM DOCUMENTATION

- A. UPON COMPLETION OF THE INSTALLATION, THE TELECOMMUNICATIONS CONTRACTOR SHALL PROVIDE THREE (3) FULL DOCUMENTATION SETS TO THE ENGINEER/END USER FOR APPROVAL. DOCUMENTATION SHALL INCLUDE THE ITEMS DETAILED IN THE SUB-SECTIONS BELOW.
- 1.01 DOCUMENTATION SHALL BE SUBMITTED WITHIN TEN (10) WORKING DAYS OF THE COMPLETION OF EACH TESTING PHASE. THIS IS INCLUSIVE OF ALL TEST RESULTS AND DRAFT AS-BUILT DRAWINGS. DRAFT DRAWINGS MAY INCLUDE ANNOTATIONS DONE BY HAND. MACHINE GENERATED (FINAL) COPIES OF ALL DRAWINGS SHALL BE SUBMITTED WITHIN 30 WORKING DAYS OF THE COMPLETION OF EACH TESTING PHASE. AT THE REQUEST OF THE ENGINEER, THE TELECOMMUNICATIONS CONTRACTOR SHALL PROVIDE COPIES OF THE ORIGINAL TEST RESULTS.
 - B. THE ENGINEER MAY REQUEST THAT A 10% RANDOM FIELD RE-TEST BE CONDUCTED ON THE CABLE SYSTEM, AT NO ADDITIONAL COST, TO VERIFY DOCUMENTED FINDINGS. TESTS SHALL BE A REPEAT OF THOSE DEFINED ABOVE. IF FINDINGS CONTRADICT THE DOCUMENTATION SUBMITTED BY THE TELECOMMUNICATIONS CONTRACTOR, ADDITIONAL TESTING CAN BE REQUESTED TO THE EXTENT DETERMINED NECESSARY BY THE ENGINEER, INCLUDING A 100% RE-TEST. THIS RE-TEST SHALL BE AT NO ADDITIONAL COST TO THE OWNER.
 - C. TEST RESULTS DOCUMENTATION SHALL BE PROVIDED IN ELECTRONIC FORMAT WITHIN THREE WEEKS AFTER THE COMPLETION OF THE PROJECT. THE MEDIA SHALL BE CLEARLY MARKED ON THE OUTSIDE FRONT COVER WITH THE WORDS "PROJECT TEST DOCUMENTATION", THE PROJECT NAME, AND THE DATE OF COMPLETION (MONTH AND YEAR). THE RESULTS SHALL INCLUDE A RECORD OF TEST FREQUENCIES, CABLE TYPE, CONDUCTOR PAIR AND CABLE (OR OUTLET) I.D., MEASUREMENT DIRECTION, REFERENCE SETUP, AND CREW MEMBER NAME(S). THE TEST EQUIPMENT NAME, MANUFACTURER, MODEL NUMBER, SERIAL NUMBER, SOFTWARE VERSION AND LAST CALIBRATION DATE WILL ALSO BE PROVIDED AT THE END OF THE DOCUMENT. UNLESS THE MANUFACTURER SPECIFIES A MORE FREQUENT CALIBRATION CYCLE, AN ANNUAL CALIBRATION CYCLE IS ANTICIPATED ON ALL TEST EQUIPMENT USED FOR THIS INSTALLATION. THE TEST DOCUMENT SHALL DETAIL THE TEST METHOD USED AND THE SPECIFIC SETTINGS OF THE EQUIPMENT DURING THE TEST AS WELL AS THE SOFTWARE VERSION BEING USED IN THE FIELD TEST EQUIPMENT.
 - D. THE FIELD TEST EQUIPMENT SHALL MEET THE REQUIREMENTS OF ANSI/TIA/EIA-568-C. THE APPROPRIATE LEVEL III TESTER SHALL BE USED TO VERIFY CATEGORY 6 CABLING SYSTEMS.
 - E. PRINTOUTS GENERATED FOR EACH CABLE BY THE WIRE (OR FIBER) TEST INSTRUMENT SHALL BE SUBMITTED AS PART OF THE DOCUMENTATION PACKAGE. ALTERNATELY, THE TELECOMMUNICATIONS CONTRACTOR MAY FURNISH THIS INFORMATION IN ELECTRONIC FORM. THE MEDIA SHALL CONTAIN THE ELECTRONIC EQUIVALENT OF THE TEST RESULTS AS DEFINED BY THE SPECIFICATION ALONG WITH THE SOFTWARE NECESSARY TO VIEW AND EVALUATE THE TEST REPORTS.
 - F. WHEN REPAIRS AND RE-TESTS ARE PERFORMED, THE PROBLEM FOUND AND CORRECTIVE ACTION TAKEN SHALL BE NOTED, AND BOTH THE FAILED AND PASSED TEST DATA SHALL BE DOCUMENTED.
 - G. THE AS-BUILT DRAWINGS ARE TO INCLUDE CABLE ROUTES AND OUTLET LOCATIONS. THEIR SEQUENTIAL NUMBER AS DEFINED ELSEWHERE IN THIS DOCUMENT SHALL IDENTIFY OUTLET LOCATIONS. NUMBERING, ICONS, AND DRAWING CONVENTIONS

USED SHALL BE CONSISTENT THROUGHOUT ALL DOCUMENTATION PROVIDED. THE OWNER WILL PROVIDE FLOOR PLANS IN PAPER AND ELECTRONIC (DWG, AUTOCAD REL. 14, PDF) FORMATS ON WHICH AS-BUILT CONSTRUCTION INFORMATION CAN BE ADDED. THESE DOCUMENTS WILL BE MODIFIED ACCORDINGLY BY THE TELECOMMUNICATIONS CONTRACTOR TO DENOTE AS-BUILT INFORMATION AS DEFINED ABOVE AND RETURNED TO THE OWNER.

- H. THE CONTRACTORS SHALL ANNOTATE THE BASE DRAWINGS AND RETURN A HARD COPY (SAME PLOT SIZE AS ORIGINALS) AND ELECTRONIC (PDF) FORM.

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SECTION 27 40 00

AUDIOVISUAL SYSTEMS

1 PART 1- GENERAL

1.1 PROJECT SCOPE

- A. This section covers the requirements for an Integrator to design, provide equipment for, and install instructional classroom technology. This is intended to supply a complete instructional technology classroom that can be arranged in multiple configurations. There will be a multimedia display as primary projection. Flexibility, integration of multiple technologies and sources, and multiple user groupings are essential to this concept. As an example, all audio and image sources should be capable of being shown on the screen and heard in the classroom. The work covered in this document consists of furnishing all labor, material and services necessary to install a complete audiovisual system as indicated on the project drawings and in these specifications.
- B. Deliverables: Prior to ordering materials or commencing any construction activities, the Integrator shall provide the Owner with a complete bill of materials, including all quantities of components, devices, equipment, and wiring required to complete this work. Submit product data, including manufacturer's data sheets for all proposed system components. Submit three copies with all specific items that will be provided clearly indicated and any options highlighted.

2 PART 2 - PRODUCTS

2.1 SYSTEMS DESCRIPTION

- A. The Extron PVS 407D is part of the PlenumVault System and is used in conjunction with the Extron PVT series of transmitters and Extron speakers. It has four video and audio twisted pair inputs, two HDMI inputs, and one HDMI output, and incorporates a built-in audio amplifier. The switcher accepts a combination of up to six HDMI digital signals, four of which can be computer video signals with stereo audio, and supports up to two analog VGA signals on the wall plates.
- B. A seventh input is a switchable analog audio only input for line-level audio such as an Apple iPod® or MP3 player. The dedicated auxiliary (Aux) mixed input on rear panel is always active, and it is independent of the switchable audio inputs (1-7).
- C. As part of the Extron PlenumVault system, the PVS 407D can be installed above a suspended ceiling in the Extron PVM 220 plenum rated enclosure, or installed at ceiling level within the Extron PMK 560 Pole Mount Kit. Alternatively, it can be mounted in either the Extron WMK 160 or USFM 100 wall mount kits that can be installed on a wall close to a projector or display device.
- D. The PVS 407D switcher is used in conjunction with the Extron digital PVT wall plates, (such as the PVT HDMI RGB), and the VoiceLift microphone system. It is equipped with an integrated 50 watt rms stereo amplifier capable of driving 4 or 8 ohm speakers.
- E. The switcher supports all standard single link HDMI 1.4 signals at resolutions up to 1920x1200 @ 60 Hz and HDTV resolutions up to 1080p @ 60 Hz, with 12-bit color. The switcher and the

PVT wall plates feature EDID Minder technology, which automatically manages the EDID information between the display device and each HDMI and RGB input source.

- F. The switcher has DSP audio processing incorporated that provides advanced control of ducking and other audio features.
- G. The switcher is also equipped with Ethernet control via the rear panel LAN ports, and supports audio file playback for pre-recorded announcements.
- H. The PVS 407D is ENERGY STAR® qualified. The switcher is an energy efficient product that conserves energy and reduces running costs. Provide a complete Audiovisual System for small to medium sized classrooms. The system switching and audio amplification equipment shall be securely mounted and concealed in an enclosure mounted near the display device. Audio and image source equipment can be connected to the system and displayed via four, active (powered) interface panels located throughout the room. The audio and image signals from source devices shall be transmitted from the active interface panels over standard UTP cabling architecture.

2.2 INPUTS EQUIPMENT

- A. The room will be equipped with a standard easy to operate interface (a tactile button keypad layout). The audio system may be monaural or stereo for program sound. The instructional media system will be controlled by a control system with a control panel mounted near the instructor area. System parameters can be monitored, administered and controlled over the data network. The instructional media equipment will be located within proximity to the instructor area or through a Graphical User Interface (GUI) on a computer to allow for ease of operation during instruction.
- B. The PlenumVault switcher receives the video and audio signals sent from PVT Wall plates, which can be located up to 150 feet away. The signals are sent over shielded twisted pair (STP) cable.
- C. In addition, there are two HDMI inputs (inputs 5 and 6) for HDMI source inputs, such as Apple TV® or Extron ShareLink devices. DVI inputs can also be connected to these two HDMI connectors when using the appropriate DVI adapter.
- D. The PVS 407D switcher has a separate analog audio input (input 7) that can be switched with the other six inputs. In addition, there is a dedicated port for connecting the optional VoiceLift microphone system, and another port for connecting an optional Priority Page Sensor.
- E. The System components shall all be correctly listed and labeled by Underwriters Laboratories Incorporated (UL) for their intended use.
- F. All products shall be new and under warranty at the time of installation. B-stock, previously installed, refurbished or used equipment shall not be provided on this project.
- G. The Integrator shall provide all options, accessories and hardware necessary to meet the function of the design even if they are not specifically listed (i.e. mounting kits, separate or additional power supplies, input modules, transformers, etc.).

2.3 OUTPUTS, CONTROL AND CONFIGURATION

- A. The PVS 407D has one HDMI output, an amplified audio output, and a line out audio output for assistive listening or recording devices
- B. The PlenumVault switcher can be controlled from either the front panel buttons, or software via the front panel USB, rear panel LAN ports, or RS-232 control via a MediaLink controller.
- C. The switcher has an RS-232 port which can be connected to a MediaLink Controller for remote control of the switcher. An IR pass-through port is available for routing IR transport control signals from a controller to the source device.
- D. In addition, the PVS 407D can be configured and controlled using the Extron Simple Instruction Set (SIS) of commands or through the Extron Product Configuration Software (PCS) program connected via the front panel USB port and TCP/IP connection. The female USB mini B connector located on the front panel can also be used for configuring the switcher settings and flash upgrading the firmware. Firmware upgrades can also be made remotely over the network by connecting to one of the four rear panel LAN ports.
- E. Four 10/100 Base-T network switch ports are also provided allowing network connectivity for multiple other devices, such as MLC controller, TouchLink panel and Ethernet controlled products, using a single LAN drop within the installation location.
- F. Three front panel controls allow the user to adjust the independent input gains, the VoiceLift microphone input level, and the Page Sensor sensitivity
- G. Audio & Speech Reinforcement:
 - 1. Speakers - In suspended ceiling applications, one (1) pair of Extron FF120 speakers are used.
 - a. These speakers feature a low profile, 3.25" deep, aluminized composite enclosure, rectangular shape with a metal grille.
 - b. The coverage angle of the speaker offers an extraordinarily wide dispersion area of 170 degrees, providing a very wide room coverage pattern.
 - c. Meeting the regulatory compliance safety specifications of NFPA90A, NFPA70; UL Listed for use in plenum airspaces: meets UL 2043 for heat and smoke release, meets UL 1480 for commercial and professional audio
 - d. The speakers feature a frequency response of 68 Hz to 18 kHz – 10 db, half space.
 - e. The power capacity is 16 watts of continuous pink noise or 32 watts of continuous program media.
 - f. The nominal impedance is 8 ohms.
 - g. The input connector uses (1) 5mm captive screw for 1 input
 - h. Connection from the PVS switcher to the FF120 speaker is provided by Plenum rated 18 Gauge Speaker Cable Extron SPK-18.
 - 2. VoiceLift Wireless IR Microphone:

- a. The integrated wireless microphone is lightweight and designed to be worn around the neck with a lanyard or clipped on the belt or lapel. The instructor's voice is picked up by the microphone and transmitted wirelessly to the receiver mounted on the ceiling near the center of the room or on an unobstructed wall. The signal is then passed to the line level aux mix input of the amplifier. This is used to amplify the sound level in the classroom up to approximately 15 dB above ambient room noise.
- b. Speech is mixed with the program audio and distributed out of the four (4) each speaker for even room coverage. Each microphone shall have volume control, a power switch and an auxiliary input to use for a MP3 player or other audio source. The IR microphone system can operate on two IR frequencies.
- c. The microphone will have an instant alert feature that may be configured to allow the instructor to request assistance in the classroom.

3. VoiceLift Wireless IR Receiver

- a. The receiver has a round base with dome shaped translucent cover. This allows for surface mounting on the ceiling and concealed wiring above the ceiling using plenum rated cables run to the dedicated VoiceLift Receiver input of the PVS Switcher.
- b. This device acts as the receiver of up to two room microphones and transmits their audio signal to the PVS Switcher for mix into the program content of presented material. The receiver has a contact closure that when wired and configured to the digital input of the MLC, can trigger instant alert messages to a designated text or email account.

4. VoiceLift Wireless IR Microphone Charging Station

- a. This device is constructed of high impact ABS plastic and acts as a holding and charging station of up to two of the Extron VoiceLift wireless IR microphones. It ships with its own power supply that acts as a recharging station for the two microphones.

5. Data Connectivity

The audio video system shall include a IP Link enabled MediaLink controller that allows remote monitoring, scheduling and control of the system over a network.

6. Energy Efficiency

The audio video system shall incorporate energy conservation features to reduce consumption and lower operating costs.

- a. The system shall incorporate an Auto Power Save Mode with fast power-up that automatically deactivates the audio amplifier after 30 minutes of inactivity. It quickly returns to full power status in less than one second upon signal detection
- b. The system shall incorporate a Standby Mode that allows the amplifier and twisted pair transmitters to be deactivated when not in use.
- c. The system shall incorporate monitoring and scheduling of system peripherals, such as sources and displays, to deactivate them when not in use or alert to unauthorized use.

3 PART 3 - EXECUTION

3.1 GENERAL

- A. All equipment and enclosures described in this specification shall be installed plumb and square per manufacturer's instructions.
- B. All equipment, except that designated as movable, portable or loose equipment, shall be secured and permanently attached to the permanent structure in a manner which will require the use of a tool (e.g.: screw driver, nut driver, etc.) for removal.
- C. All supports shall meet or exceed the load requirements of the intended application with a minimum safety factor of five.
- D. Provide support structure and hardware with a SAE Grade 8 load rating (min.).

3.2 ACCEPTABLE MANUFACTURERS - SYSTEMS

A. Manufacturer

Extron Electronics
1230 South Lewis Street
Anaheim, Ca 92805
714.491.1500 or 800.633.9876

B. System

4 Input PlenumVault System, part number XX-XXX-XXXXXX

- C. Substitutions: Exceptions to the specifications are not acceptable. College Standard system, No substitutions are permitted.
- D. All equipment part numbers shall be listed in the bill of materials and the system drawings specifications.

3.3 EXAMINATION

- A. Site Verification of Conditions: Verify that related conditions, including equipment that has been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
- B. All devices connected to equipment specified in this section shall bear the UL label and comply with the applicable National Electrical Code (NEC) standards.

3.4 INSTALLATION

- A. Integrator shall furnish all equipment, labor, system setup, and other services necessary for the proper installation of the products/system as indicated on the drawings and specified herein. System setup information shall include each component proper mounting and alignment and properly verified signal pathways and operation. Proper operational and network support control functions shall be verified.

- B. Install in accordance with manufacturer's handling and installation instructions.
- C. Install in accordance with all local and pertaining codes and regulations
- D. Utilize an Integrator with demonstrated experience in projects of similar size and complexity.
- E. Equipment shall be configured and in ready to use condition at the end of installation.
- F. Energize and commission equipment in accordance with manufacturer's instructions.
- G. Configure MLC 226 IP Plus Series using Global Configurator

3.5 PROTECTION AND CLEANING

- A. Storage and Protection: 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.
- C. Remove temporary tags, coverings, and construction debris from interior and exterior surfaces of the equipment. Remove construction debris from equipment area and dispose of properly.

END OF SECTION 27 40 00

SECTION 27 51 26

ASSISTIVE LISTENING SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Provide materials, equipment, fabrication, installation and tests a portable Assistive Listening System for (3) Offices in Building 11.

1.02 RELATED WORK

- A. Section 16050: Basic Electrical Materials and Methods

1.03 SUBMITTALS

- A. Provide submittals for materials and equipment in accordance with Section 16010: Basic Electrical Requirements.

PART 2 - PRODUCTS

2.01 THREE (3) WIRELESS FM TRANSMITTER WITH DIGITAL TUNING, LISTEN #LT-700-216 AND LAPEL MICROPHONE, LISTEN #LA-261.

2.02 SIX (6) WIRELESS FM RECEIVERS, LISTEN #LR-300-072, TWO PER OFFICE.

- A. Two (2) ear speakers, Listen #LA164 per office.
- B. Two (2) neck loops, Listen #LA-166 per office.

2.03 ONE (3) CASES, LISTEN #LA-306.

2.04 PROVIDE 2-AA DURACELL OR EQUAL BATTERIES FOR EACH TRANSMITTER AND RECEIVER.

2.05 QUANTITY OF FM RECEIVERS AS REQUIRED BY CODE, EQUAL TO 4% OF THE MULTIPURPOSE ROOM OCCUPANCY (SQUARE FOOTAGE OF COMPLETE MULTIPURPOSE ROOM DIVIDED BY SEVEN OCCUPANTS PER SQUARE FOOT), SINGLE CHANNEL, WRIST STRAP: LISTEN #LR-400-72 WITH EAR SPEAKER, LISTEN#LA-164. PROVIDE 2-AA DURACELL OR EQUAL BATTERIES PER EACH RECEIVER.

2.06 EQUIVALENT SYSTEM MANUFACTURERS (72 MHZ): PHONIC EAR, GENTNER

PART 3 - EXECUTION

3.01 INSTALLATION, TESTING AND TRAINING

- A. Test the transmitter and each receiver for proper operation. Store the transmitter and receiver in the original packages and store at a site location determined by the District.

- B. Provide a training seminar of minimum one hour duration to instruct school personnel in the operation of the system. Provide three copies of an Owner's Manual with individual catalog and specification sheets, and maintenance instructions at this time.

3.02 WARRANTY

- A. Provide documentation of the manufacturer's standard warranty of the equipment.

END OF SECTION

SECTION 28 10 00

ACCESS CONTROL SYSTEM

PART 1 – GENERAL

1.01 DESCRIPTION

Provide, install, program, configure and activate equipment that shall provide a complete and functional, centrally controlled Access Control and Alarm Monitoring System (ACAMS) with local and remote monitoring capabilities. The system shall be completely "turn-key" and shall include all the components listed in Section 2a of this specification.

- A. Work Included - The specified system shall be comprised of four primary components described below:
1. Central Server shall be rack mountable and housed in a telecommunication closet with connection to a facility's LAN. The server shall be managed with a user-friendly GUI based software platform for system control and shall be capable of running a single building or an entire campus. The server shall be equipped with sufficiently sized core processors and memory to control and manage a campus with a minimum of 3,000 doors and be upgradable to 10,000 doors. The server software shall include:
 - a. Dynamic user fields to program system parameters, personal user information and other programmable features. All access privileges are defined at the server but then downloaded to the doors where access enforcement takes place.
 - b. Alarms that identify a system problem (i.e. low battery) or alarm states (i.e. door ajar or forced entry) and any required corrective action by the system administrator. Alarms shall be visible at the server screen or can be sent via email or text to authorized personnel.
 - c. System Partitioning: optional function that provides the ability to partition the system to enable local administrators to create programming changes within their authorized zones. Partitioning rights and zones shall be set up and controlled by the Master Administrator.
 - d. Availability of zones (collections of door locks, buildings, etc) and user access groups (collection of scheduled access to rooms) minimize the labor necessary to define allowed access throughout a campus. An access group can have up to 500 door schedules and a user can be a member of up to 100 access groups.
 - e. The server shall provide constant monitoring of the health of the entire access control system.
 - f. Multi-layer encryption provides system security to help ensure the system cannot be hacked or compromised by outside influences with malicious intent.
 - 1) System must use at least AES128 (or equivalent) symmetric encryption on all communication links.

- 2) All devices and server shall be authenticated by PKI (Public Key Infrastructure).
- 3) Each device (lock or key) shall have a separate encryption certificate.
- 4) System administrator shall have the capability to periodically change encryption certificates.
- g. Server may be programmed locally (using SSL) or remotely via VPN tunnel.
- h. Easy interface with the most common Enterprise Resource Planning (ERP) applications.
- i. Access history shall be maintained for up to one year and must be easily accessible.
2. Wireless router (access point) provides all communication between the Central Server and the wireless access control units. Each router shall:
 - a. Be connected to the Central Server using CAT5E or higher network cabling.
 - b. Have the ability to be powered via Power-over-Ethernet (POE) or using an external 5V DC power supply.
 - c. Contain internal back-up batteries capable of providing up to 6 hours of continuous operation time.
 - d. Utilize Extreme Low Power RF communication technology operating at 2.4HGz in the ISM band that does not interfere with, or receive interference from, other existing wireless platforms.
 - e. Have a communication range of up to 1800 feet in open space and the ability to control up to 1000 lock units within the communication range. Internal walls and other obstructions could reduce the range and the number of lock units controlled by each router. Careful planning and site surveys shall be required to determine the best locations for wireless routers.
 - 1) For redundancy, best practice shall be to design the system to allow each lock to communicate with at least two routers.
 - f. Multi-layer encryption provides system security to help ensure the system cannot be hacked or compromised by outside influences with malicious intent.
 - 1) System must use at least AES128 (or equivalent) symmetric encryption on all communication links.
 - 2) All devices and server shall be authenticated by PKI (Public Key Infrastructure).
 - 3) Each device (lock or key) shall have a separate encryption certificate.
 - 4) System administrator shall have the capability to periodically change encryption certificates.
3. Wireless access control unit with or without locking hardware. Units designed with locking hardware shall be available in either mortise or cylindrical style lock sets. The access control units must also be compatible with Von Duprin Series 98/99 exit devices. Both shall be equipped with access control electronics and door open/ajar sensor integrated into the unit. These lock units shall be mounted directly in the door within range of at least one Wireless Router. Wireless access control units without lock hardware (powered wall readers) shall be used in conjunction with powered main doors, motorized garage or gate openers. These devices shall operate as definable range sensors with direct connection to the powered openers.

For individual device mounting details, please see associated drawings. Wireless access control units shall:

- a. Utilize patented Extreme Low Power RF communication technology that does not interfere with or receive interference from other existing wireless platforms.
- b. Run on three AA standard alkaline batteries for mortise or cylindrical lock sets, typical battery life with normal usage up to 4 years. Exit devices shall be equipped with 6 C-cell batteries and have this same lifetime. Powered wall readers shall run on voltage (12V/24V) supplied from the electronic door activation equipment. Backup batteries are also standard in each powered wall reader.
- c. Use approved Access Control List (ACL). Software for each unit shall be downloaded from the central server and locally stored. All access control decisions shall be made at the unit giving the system the ability to continue operating as normal in the event of a power failure.
- d. Be capable of supporting up to 1000 users, with upgradable memory for up to 70,000 users.
- e. Use Multi-layer encryption which provides system security to help ensure the system cannot be hacked or compromised by outside influences with malicious intent. Each lock shall have its own encryption key, which can be modified as desired via secure over-the-air administrative command.
 - 1) System must use at least AES128 (or equivalent) symmetric encryption on all communication links.
 - 2) All devices and server shall be authenticated by PKI (Public Key Infrastructure).
 - 3) Each device (lock or key) shall have a separate encryption certificate.
 - 4) System administrator shall have the capability to periodically change encryption certificates.
- f. Employ tamper protection and alarm issuance when the door lock is struck by a heavy object or tampered with in any way.
- g. Obtain secure over-the-air firmware upgrades. Code changes shall be complete in less than one minute.
- h. Store up to 30 calendars to create different work schedules for all user groups.
- i. Have access control by time and date; may be programmed as on-going access or single events, all decision making resident in the lock.
- j. Have access data logging and door ajar sensing via sensors integrated into the lock unit. Rules for door ajar alarm shall be user definable.
- k. Be capable of controlling multiple types of portals, i.e. office doors, main doors, gates, garages, etc.
- l. Have programmable activation distances which can be different for each lock unit types (i.e. office doors can have activation distance of a few inches to several feet while garage access can be up to sixty feet.)
- m. Be either 1) fully self contained for installation within inside doors or 2) independent controllers that interface with main door or garage automatic opening systems, including panic hardware and handicap requirements. The latter unit shall interoperate with ADA push-button requirements.
- n. Be capable of enabling real-time lockdown (<1 minute for 3,000 doors) for an

- entire campus or any subset of a campus without the need for partitioning.
- 1) During lockdown, first responders shall not be prevented from entering a building as long as they have a valid key. For response to an afterhours or emergency event, a Knox box shall be installed outside the main entrance where a "master" key shall be located. A minimum of one router shall be placed within an acceptable communication range of the Knox box to allow periodic updates to the "master" key located within.
 - 2) There shall be at least 4 user-defined threat levels to determine if an individual is allowed access during lockdown.
 - 3) A user's access group shall define the maximum threat level at which access is allowed.
- o. Constantly monitor battery usage and;
- 1) generate a "low battery voltage caution alarm" when voltage drops below a user defined threshold.
 - 2) generate an "imminent failure warning alarm" when voltage drops below a critical threshold in which a lock is not guaranteed to operate.
- p. Allow egress from inside a room/building without a "request to exit" device.
- q. Enable an "office mode" setting such that;
- 1) A door shall be automatically unlocked per a specified schedule, including days of the week, start and end times, start and end dates, and holiday calendar.
 - 2) An enhanced office mode shall be available whereby a door goes into the unlocked state only after the first valid user checks in. The standard office mode schedule is then followed.
 - 3) The unlocked condition shall have the ability to be manually overridden at the door by the door "owner." The state of the door can be changed manually an unlimited number of times during the day.
- r. Be equipped with an "auxiliary power supply" that will enable a door to be opened with a valid key, even when the internal batteries are below critical level.
- s. Have the ability to add "tailgate detection" equipment to ensure that only authorized individuals enter a building.
4. Hands-free transceiver (U-Key) carried by all users that require access to any lock on campus. Hands-free transceiver shall:
- a. Utilize patented Extreme Low Power RF communication technology that does not interfere with or receive interference from other existing wireless platforms.
 - b. Run on standard off-the-shelf coin cell battery and have typical battery life with normal usage of up to 4 years.
 - c. Use Multi-layer encryption which provides system security to help ensure the system cannot be hacked or compromised by outside influences with malicious intent.
 - 1) System must use at least AES128 (or equivalent) symmetric encryption on all communication links.
 - 2) All devices and server shall be authenticated by PKI (Public Key Infrastructure).
 - 3) Each device (lock or key) shall have a separate encryption certificate.
 - 4) System administrator shall have the capability to periodically change

- encryption certificates.
- d. Have multi-distance capability allowing a single key to be capable of activating an unlimited number of different types of doors, each at a different range. The range is programmed into the door lock via the server.
 - e. In addition to multi-distance capability, control shall be available within a transceiver so each user can have custom tailored lock activation distance depending on their physical need (i.e. wheelchair vs. normal user). The transceiver shall also operate automatic door openers when activation distance is reached.
 - f. Have the ability to remove lost transceivers from the system by either the system administrator and/or the user. The user shall have the ability to deactivate and report a lost or stolen key via the internet through a secure web portal. Reactivation may only be performed by the system administrator.
 - g. Shall receive firmware upgrades performed periodically through secure over-the-air communication with the router.
 - h. Have the ability to access stored user information including a picture of a key holder at a monitoring station to ensure the individual being granted access is the key owner.

1.02 BASIC DEFINITIONS

A. Abbreviations:

1. ACAMS Access Control and Alarm Monitoring System
2. IDF Intermediate Distribution Frame
3. IP Internet Protocol
4. MDF Main Distribution Frame
5. Server Central Server Room
 - f. Regional Server Regional Server in MDF
 - g. SCR Security Control Room
 - h. SSL Secure Sockets Layer
 - i. VPN Virtual Private Network
 - j. PoE Power over Ethernet

1.03 PERFORMANCE

Furnish and install a complete ACAMS which meets or exceeds the following performance requirements.

A. NEC Class II standards:

1. Furnish and install the ACAMS in such a way that it is fully compliant with the Class II limited power requirements of the NEC.

B. Underwriters' Laboratories Compliance:

1. Locking units mounted directly on doors must meet all UL standards for Fire Tests of Door Assemblies. The balance of ACAMS will fully satisfy all UL 294 requirements, both in terms of its design and documentation, and also in the completed installation.

- C. Ethernet Connectivity:
 - 1. Furnish and install ACAMS hardware and software possessing the ability to connect routers, servers and workstations over an existing LAN or WAN.

- D. Report Management
 - 1. The system shall have integrated reports that can be used to analyze user activity, including event and access logs.

- E. Alarm Presentation
 - 1. Alarm management screen must have the following attributes and functions:
 - a. ACAMS software must present alarms on the alarm screen in a “double-sort” fashion, with priority as the first sort, and initiation time as the second sort. Sort order must refresh in real time upon each addition or deletion of active alarm events.
 - b. Must have the ability to govern permissions granted to alarm management screen operators, and the option to deny them the ability to modify sort preferences.

- F. Administrator Permissions
 - 1. Furnish and install ACAMS which offers a “matrix” approach to the granting of administrator permissions. Provide different groups of administrators with the ability to manipulate any programmable set of system functions to which they are granted permission.
 - 2. Provide the capability of limiting or controlling administrators' ability to view, edit, add or delete any fields or attributes of the database.

- G. Operator Audit Trail
 - 1. Create a record of, and provide the ability to create reports of, all operator actions within the ACAMS software, including:
 - a. The time a change was made by an operator.
 - b. The operator's name.
 - c. The item's state before the change was made.
 - d. The item's state after the change.

1.04 SYSTEM TRAINING

- A. System integrator shall furnish personnel to execute the training plan.

- B. Establish a specific schedule that meets the convenience of customer.

- C. Provide training literature and outlines at the beginning of each session.

- D. Operator and management training:
 - 1. Provide a minimum of 24 hours total operator and management training time, with a mixture of class time and on-call time.
 - 2. Include system operation and database management.

- E. Technical maintenance training:
 - 1. Provide a minimum of 8 hours total technical maintenance training time.

1.05 DATABASE ASSISTANCE

- A. System integrator shall coordinate with the administrator to set up the initial database requirements and formats. Provide appropriate forms and written instructions. Provide examples of the sequence of completion for all related forms.

1.06 SUBMITTALS

- A. Provide submittals as required.
- B. At time of bid, provide a letter stating that the security integrator is a factory certified installation contractor.
- C. Submit proposed shop test schedule and procedure.
- D. Submit training plan and schedule.
- E. Submit as-built documentation.
- F. Submit spare parts list, if any. See Section 3.07.

PART 2 - PRODUCTS

2.1 WORK INCLUDED

1. Furnish and install a complete and operable system as described in these specifications and in the associated drawings. It shall be the responsibility of the integrator to provide a complete and operable system.
2. Review the Drawings and Schedules to identify any additional components required to provide a complete and operable system. Verify all quantities with those shown on the design Drawings and Details.
3. The ACAMS central components shall all be from the same system manufacturer.

2.2 MATERIALS

1. Furnish and install a complete ACAMS which includes the following equipment:
 - a. Central Server
 - b. Software
 - c. PoE switches (provided by customer)
 - d. Wireless Router (Access Points)
 - e. Wireless Access Control Units (lock units or sensors)
 - f. Transceivers (U-Keys)
 - g. Network cabling to wireless routers and power wall readers (can be

supplied by customer or system integrator)

2. The following optional items shall be provided as a part of the ACAMS.
 - a. VPN equipment for remote oversight and programming, if required
 - b. Automatic key readers for ease of data entry at key issue and key return station.
 - c. Auxiliary power supply that enables entry even when batteries are exhausted.
 - d. In-car unit for gate access.
3. Customer or system integrator shall be responsible for the installation, termination, testing and labeling of all network cabling connecting the Wireless Routers to the Central Server. Network cabling shall include all patch cords from patch panel to switch and switch to server.
4. Furnish and install all materials identified in the Drawings. Integrator shall perform a detailed site survey to confirm item unit counts and quantities with customer and/or System Designer.
5. Carefully review all details for exact type and quantity of parts and devices required to support field and head end security apparatus.
6. Furnish and install materials, equipment, software, and any other apparatus or support necessary to comply with the requirements articulated above in Part 1.01, DESCRIPTION.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

1. Aesthetics are an important consideration in installation. Install all components to provide aesthetically pleasing results. Coordinate the actual locations of all visible components in advance with customer.
2. Provide appropriate conductors for all security devices, per details in the plan drawings.
3. Locate and install all security devices and components in accordance with the details and floor plans. Integrator shall determine best locations for devices in the field, based on results of the previously performed site survey.
4. Install all accessible components with tamperproof security fasteners.
5. Comply with the wire marking provisions.
6. Before commencing installation, confirm that the necessary electrical power and grounding provisions are available to meet the security system manufacturer's stated requirements.
7. Customer or system integrator shall be responsible for installing and pulling wire and cable at required locations.

8. System integrator shall be responsible for SecureALL system door hardware installation.

3.2 SYSTEM INSTALLATION

1. Confirm that the locking hardware for individual doors is consistent with the SecureALL security design.
2. System Workstations. Install:
 - a. Loaded Client workstation software on the server located in the MDF rack.
 - b. Remote workstation, for remote access by the security manager.
Software and configuration only, PC to be customer provided.
3. Central Server and associated equipment. Install in the MDF room, refer to plans and details.
4. Install all door controllers per plans and details.

3.3 SYSTEM PROGRAMMING

1. Program the system database. Program the system “from the ground up” using consistent programming and naming conventions.
2. Program the hardware as defined in the Detail Package and on the Drawings.
3. Coordinate with the customer in the use of setting up the permissions for the system and definition of naming convention and abbreviations.
4. Point descriptions:
 - a. Input a description for each point.
 - b. Use descriptions that are consistent in form and character.
 - c. Use all uppercase characters.
 - d. Use consistent abbreviations throughout the database. If a word is abbreviated in one location, always use the same abbreviation.
 - i. Submit any additions or changes to customer for approval before loading the point descriptions in the database.
 - e. Geographic directions:
 - i. Use N for North, S for South, E for East, and W for West.
 - ii. Use only NE, NW, SE, or SW for combined directions.
 - iii. Use a single character (or combined characters) between two spaces preceding the name to qualify a building area, room, door, or device.
 - f. Order of Information:
 - i. Fixed and consistent sequence: building (1 character), space, floor (2 characters), space, room or area, space, description of device or object
 - ii. Examples.
 1. 7 01 LBY DR
 2. 7 01 LBY FIRE PNL ALM
 3. 9 04 BLDG OFFICE

3.4 SYSTEM TESTING

1. Site Test: After the system is installed:
 - a. Perform the appropriate system tests.
 - b. In addition, perform all manufacturer-recommended tests.

3.5 FINAL ACCEPTANCE TESTING

1. Integrator to perform field inspection and testing.
2. Integrator to provide the following As-Built documents:
 - a. Drawings to define the system configuration and settings.
 - b. Testing sheets to be filled out per point.
 - c. IP addresses provided for all devices, as required.
 - d. Cut sheets provided for each device.

3.6 WARRANTY SERVICE

1. Provide limited manufacturers' warranty that shall warrant the goods against faulty workmanship or the use of defective materials, and that such goods will conform to Seller's written specifications, drawings, and other descriptions for a period of two (2) years.
2. Service organization:
 - a. Factory-trained by system manufacturer.
 - b. Location within 100 miles of the job site.
3. Fully qualified repair and maintenance personnel within the service organization:
 - a. Available on a next day basis, 365 days a year.
 - b. Generally able to respond within a maximum 4-hour response time during normal business hours.
4. Normal Service for Equipment:
 - a. Defined as minor repairs, adjustments, or any service required for the system to be fully functional, and which, at the customer's discretion, does not fall into the category of Emergency Service.
 - b. Provide at no additional cost to customer during normal business hours, between 7:00 a.m. and 5:00 p.m., Monday through Friday.
 - c. Respond on a same-day basis for service calls requested by phone before 1:00 p.m. on a weekday.
 - d. If warranty service is requested after 1:00 p.m. on a weekday, or at any time on a weekend, respond on the next working day before 1:00 p.m.
5. Emergency service for Equipment:
 - a. Emergency service is defined as repairs, adjustments, parts, replacement of parts, or any service required to make the system fully functional and is beyond the category of Normal Service, at the option of the customer.

- b. Provide at additional cost to customer according to labor rate schedule contractually agreed upon.
 - c. Respond within a 4-hour period, 24-hours per day, 365 days per year.
 - d. Upon award of contract, provide customer with a cost estimate for emergency service.
6. Maintenance Service for Software:
- a. Provide at no additional cost to customer.
 - b. Respond within the next business day, during normal business hours.
7. Provide full factory technical support and same day shipping of replacement parts for all equipment.

3.7 SPARE PARTS

1. Prepare a list of all items that have a history of requiring repair or replacements of 6 months or less, are critical to the operation of the system, or are known to be long lead items for replacement.
2. Provide an inventory of spare parts for the items listed, as agreed with customer. These parts may be stored on site or at Contractor's storage facility, depending upon the criticality of the part and general availability.
 - a. 10 electronic keys
 - b. 5 door units
 - c. 1 wireless router

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SECTION 28 20 00
VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.01 SUMMERY

- A. All equipment and materials used shall be standard components, regularly manufactured, regularly utilized in the manufacturer's system.
- B. All systems and components shall have been thoroughly tested and proven in actual use.
- C. All systems and components shall be provided with the availability of a toll free 24-hour immediate technical assistance for either the dealer/installer at no charge.
- D. All systems and components shall be provided with an explicit manufacturer warranty.
- E. All Cameras, NVRs, DVRs, and Workstations shall be available to be shipped pre-configured and programmed to the systems requirements by the manufacturer.

1.02 VIDEO MANAGEMENT SOFTWARE - GENERAL:

- A. The Video Management Software (VMS) shall meet the requirements of business and government surveillance applications. The software shall be unique and power a line of Network Video Recorders, Digital Video Recorders, Encoders/Decoders, IP Cameras and Workstations. The software shall provide a complete and comprehensive application for the operation and maintenance of a video surveillance system. It shall provide full live digital video and audio surveillance over a standard 100/1000Base-T network by the use of a GUI incorporating video display areas, toolbars, control palettes, and interactive site map displaying system components.
- B. The software shall be available in two versions. One version shall provide full functionality except for recording capability. The second version shall have full functionality plus recording capability. Both versions of the software shall also be available either as a software package or preloaded in a workstation.
- C. The software shall offer network connectivity to other family components and share all video and control data over the network using standard network protocol. The number of network-connected components shall only be limited by the number of assigned IP addresses. There shall be no licensing fee for any cameras or edge devices manufactured by the VMS provider.
- D. The software shall provide an open platform that allows integration with ONVIF compliant commercial off-the-shelf (COTS) devices, such as: IP cameras, encoders and IP edge devices, including standard resolution and megapixel cameras, from numerous industry-leading manufacturers; licensing fees shall be charged on a per-camera basis and there shall be no license limit based on the number of cameras installed at a site. It shall support Unicast or Multicast according to the edge device capability.
- E. The software shall run on a COTS workstation with a minimum of Intel Core i5 processor, 4 GB of RAM and 5 GB of disk space. The software shall run on the Microsoft® Windows® Microsoft Windows 7 Professional 32 or 64-bit; and Windows 2003, 2008 or 2012 Server operating systems.

- F. The software, without any degradation to video quality, shall simultaneously offer:
 - 1. 16-channel continuous video playback.
 - 2. 16-channel video playback transmission to the network.
 - 3. 16-channel continuous video receiving from the network.
 - 4. Recording of up to 95 cameras on a single NVR, depending on resolution, quality and fps settings.
 - 5. User selectable video archiving of pre-existing recordings.
 - 6. Video export in AVI, MPEG-4 or Xvid and viewable on a standard DVD and media player.
 - 7. Video archives in a verified, secure USB, CD or DVD format.
 - 8. Support for the GUI to display on a widescreen monitor (16:9/16:10).

- G. The software shall offer features including the simultaneous display, playback, distribution and archive of multiple channels of video and audio. Cameras, microphones and sensors shall be the primary input devices. Each channel of video and audio data shall have the capability of being displayed, played back, distributed and archived simultaneously across several servers and clients across the network. The software shall allow recording (version dependent) and viewing at different frame rates (fps). Each sensor channel shall support a NO or NC device. A bookmark feature shall be available.

- H. A web-based interface shall be provided to access the VMS from any standard web browser enabled device. It shall provide live viewing, playback and PTZ controls. Groups shall be accessible through the web viewer. A Mobile App shall be available for both Apple and Android smart phones and tablets. The mobile application shall be able to view live or recorded video from any device on the system. It shall be able to view concurrent multiple video stream, up to 4 on phones and 9 on tablets. The mobile application shall have full control of PTZ, including presets, and quick and simple playback. Pinch to zoom on live and recorded video shall be available.

- I. The software shall allow control of a DVR or NVR using a keypad or serial host connected to the serial port. The keypad or serial host shall have the ability to start or stop video, play back video, control PTZ movement and start and stop macros.

- J. The software shall support playback from the main screen without losing live video viewing in the following formats:
 - 1. Edge Playback - by using a right mouse-click, the user can playback video from any edge device that supports edge recording directly from the user interface of the edge device.
 - 2. Quick playback – by using a right mouse-click, the user will be able to select and launch playback for a specific camera in a pre-defined number of seconds before the live image. The playback window will open adjacent to the live one.
 - 3. Playback from time – shall allow setting the playback to start from a specific date, time and database on the network. This shall allow playing back the same camera several times.

- K. The software shall be provided on DVD or USB format in a suitable case.

- L. An integral Events Management System (EVM) shall enable the Digital Video Recording and Management Network Software to interface with an external control/management system, for example, a License Plate Recognition System, and correlate recorded and live video to events received from the external control system. The EVM shall receive external data over an IP network in various formats, including XML, from the external system. The data shall be stored in a SQL database maintained on a standalone or shared server. The

SQL server shall use Microsoft® SQL Server® 2012 Express Edition database software, which is available as a free download from Microsoft as a minimum. The full SQL server version shall run as well.

- M. The EVM system shall be easily configurable from within the Digital Video Recording and Management Network Software. Using the internal events settings, a user shall be able to set up the following:
1. Define where the EVM database shall be located. Options include the local machine or external server.
 2. Select whether a display message shall pop up to inform a user when an event has occurred and define the look of the message and how long it displays. An option for no message display shall also be provided.
 3. Trigger alarms or the execution of a macro upon an event occurrence. An option shall be provided to trigger both an alarm and a macro.
 4. Assign cameras and/or microphones to an event by associating a particular camera, microphone or camera/microphone combination to a condition or set of conditions received from the external control system. The user shall have to option to filter received events by employing "equal to", "not equal to" and "contains" operands.
 5. Configure the database by creating information fields, and specifying their display properties, field type (numeric or alpha-numeric) and whether they may be edited or not.
 6. Maintain the database by allowing the user to backup, restore or clear the database. The system shall offer to ability to filter by date, the clearing of the database. For example, clear all events older than August 1, 2010.
 7. The system shall display a snapshot providing a still photo of the event, time of the event, camera name and other details. For recorded events, the user can specify a time up to 59 seconds for the snapshot to save prior to the event occurring on the video. This shall enable the user to see if there were any significant actions that occurred prior to the event.
 8. Create Events Queries that shall search the database and retrieve events as specified in the queries. Events Queries shall have the ability to be saved and run at any time.
- N. The VMS shall be support an Access Control System. The Access Control System can map to any camera in the VMS system to view or record them.
- O. Users shall have the ability to generate Events History Reports which shall contain all information related to an event. The user shall have the option to display the reports in either a list or thumbnail view. The reports shall contain camera and site names and event dates and times. Selecting an event in either view will enable to user to play back video for the event. Controls shall be provided to specify whether playback should begin when the event occurred or up to 30 minutes prior to the event occurring. The user shall have to option to add notes about the event to the database and to save a snapshot (jpg) of the event for reference purposes. The system shall also display information regarding edits, if any were made to the video.

1.03 VIDEO MANAGEMENT SOFTWARE – SETUP, CONFIGURATION AND SECURITY

- A. The software shall offer a full multi-user authorization login application. This application shall offer levels of authorization based on defined sites and functions. In addition, a full setup utility shall be available for the Administrator to configure authorizations. A user shall be able to log in by default, as an Administrator or Guest. Guest authorization shall be configurable for specific system operations. Authorization rights setup shall be performed using the Site Authorization screen. Group rights shall be available to configure by specific

site. Rights shall provide authority to perform all system functions. The software shall offer a full multi-user authorization process as follows:

1. User groups shall be created once globally and shall function in all components connected to the network. Active directories of users and groups on other servers shall be able to be imported.
2. Users shall be created once globally and shall be given rights to particular groups.
3. Groups shall be authorized and given specific access to each unit, permitting "function-specific" profiles. Individual user authorizations within the groups shall allow certain users access to certain cameras.
4. Users created and authorized for each unit shall be able to log in to any recorder and workstation and automatically have their group rights for that machine follow them.
5. There shall be no virtual limit on the number of groups and users that can be authorized in the software on DVRs or NVRs.
6. The number of groups and users authorized on the IP cameras and encoders/decoders will be limited to 20 groups and 100 users.
7. The software shall allow for each group to be authorized or denied access, per component, to:
 - a. Login.
 - b. Logout.
 - c. Site List.
 - d. Setup.
 - 1) Network Setup & Site Name
 - 2) User and Group Management
 - 3) Site Authorization
 - 4) Auto Login
 - 5) Macro Create-Edit
 - 6) Alarm Setup
 - 7) Authentication Settings
 - 8) Camera, Microphone and Device Setup
 - 9) Pre & Post Alarm
 - 10) Storage Database Utilities
 - 11) Auto Record
 - 12) Exit to OS
 - 13) RS-232/422/485 Setup
 - 14) Picture Quality and Resolution Setup
 - 15) Registration
 - 16) Manual Record and Playback Setup
 - 17) Central Failure Notification
 - 18) Recording Verification
 - 19) Auto/Manual fps Setup
 - 20) Texting and Email
 - 21) Display Settings
 - 22) Remote cameras and alarm names
 - 23) Data storage allocation
 - 24) Low Bandwidth
 - 25) Language Translation Utility (LTU) Setup
 - 26) Map Sets
 - 27) Reset Nucleus
 - 28) Backup and Restore
 - 29) Settings Summary
 - 30) Scheduler for Macros
 - 31) Camera Grouping
 - 32) Vicon and Non-Vicon Open Standard Cameras
 - 33) Non-Vicon Open Standard Camera Format

- 34) Video Analytics Engine
 - 35) Scheduling, display and alarm notification
 - 36) Remote pre/post alarm recording
 - 37) Backup utility for setup configuration
 - 38) Video masking
 - 39) Thumbnail Search
 - 40) Recording Management
 - e. Reports.
 - 1) Device Status
 - 2) Alarm History
 - 3) Recording Status
 - 4) Audit Log
 - 5) RVS Log
 - 6) CFN Log
 - 7) Save Logs
 - f. Scheduler/Macro.
 - 1) Run Macro
 - 2) Stop Macro
 - 3) Stop all Macro & Scheduler
 - 4) Resume Scheduler
 - 5) Show Macro
 - g. Shutdown
 - h. Manual Record
 - i. Stop
 - j. Video Quality
 - k. Change fps
 - l. Change Low Bandwidth
 - m. Site Map
 - n. Groups
 - o. Picture
 - p. Audio
 - q. Controls
 - r. Matrix
 - s. Export Image
 - t. Print
 - u. PTZ
 - v. Playback
- B. All users created shall be able to log in to any workstation on the system. A user, given appropriate access, shall be able to remotely configure all components connected to the network. The programming shall include the complete operation of the recorders, including but not limited to:
- 1. Network Settings and Site Name
 - 2. Site Authorization
 - 3. Auto Login
 - 4. Storage Database
 - 5. Registration
 - 6. Macro Editor
 - 7. Schedule for Macros
 - 8. Alarms
 - 9. Manual Record and Quality Buttons on Screen
 - 10. Recording Verification
 - 11. Authentication
 - 12. Map Sets

13. RS232/422/485 Controls
 14. LTU
- C. The software shall permit viewing of live video from any camera connected to any recorder on the network.
- D. The software shall allow for the simultaneous recording of the same camera in two locations over the network (version dependent).
- E. The software shall provide the ability to save any event that was tagged as an alarm (video motion detection, video loss or input received from the EVM system to be saved to a separate database, where it cannot be overwritten. The feature shall be named Video Vault.
- F. An Archive Wizard shall be provided that simplifies the process of creating archives and saving video to removable media, such as: CD, DVDs or solid-state drives. An embedded player shall be packaged with each archived video clip for playback on any machine.
- G. The software shall provide an advanced method for creating and executing extensive software commands. This shall be achieved by the use of macros. Macro configuration shall be defined for recorded cameras and microphones, command duration, recording location (version dependent), local viewing, device ID, picture quality, refresh mode, recording rate (fps) (version dependent), related devices (sensors) and alarm activation.
- H. Macros shall allow an authorized user to create and schedule software commands that shall include but not be limited to:
1. Sequencing cameras, including multi-screen displays, in a local and remote recorder.
 2. Execute remote macros existing on recorders currently connected to the network.
 3. Record cameras at different qualities and frame rates from any recorder on the network (version dependent).
 4. Send alarm condition to any recorder and workstation on the network. By the use of macros, an authorized user shall be able to program the destination component of the alarm condition.
 5. Run applications or batch files, such as: open a word processor, spreadsheet program, calculator, media player or start a batch program to run additional tasks.
 6. Run an audio file on alarm; for example, audible instructions.
 7. Send an email, text message, start video or any other task that can be initiated by a batch file in response to a Central Failure Notification (CFN) or Recording System Verification (RVS) notification.
 8. An authorized user shall be able to program and execute macros remotely without the need to be physically located at the recorder that the macros will be programmed on.
 9. The Schedule/Macro button shall allow the running of preconfigured combinations of camera, sensor and PTZ programmed routines.
 10. Macro scheduling shall include but is not limited to:
 - a. Days of the week when a macro is active.
 - b. Start and end time for when a macro is active.
 - c. If a macro is to run continuously or not.
 - d. A macro shall be able to run every:
 - 1) 5 min, 10 min, 1/4 hour, 1/2 hour, 3/4 hour, 1 hour, 2 hours, 3 hours, 4 hours, 6 hours, 8 hours, 12 hours.
 - 2) A macro shall be able to be scheduled to run for 1-256 cycles.
- I. The network and sites configuration shall allow:

1. Set up of a System Nucleus and Backup Nucleus. The Backup Nucleus shall maintain an updated backup of all System Nucleus settings for recovery in case of failure. The system shall provide failover and redundancy and be fully operational in the event of a System Nucleus failure. Each device shall have an updated backup table to allow operation should the System Nucleus fail. A Network Settings menu shall provide a comprehensive worksheet for each networked device. When all units have been set up, the resulting connected devices shall define the site.
 2. Site Authorization: Workstation shall be set up using remote recorder or workstation GUI. Site name and authorization shall be established by User and Group. Permissions shall be assigned for all system functions. Authorization settings shall be able to be sent to other Workstations and duplicated.
 3. Time synchronization of all components on the network.
 4. All appropriate networking features including each server IP, Subnet and Gateway.
- J. Device configuration shall have the ability to be configured for system recognition and operation. Valid devices shall be:
1. Cameras, fixed or with integrated PTZ
 2. Microphones
 3. Sensors
 4. Relays
- K. All devices shall be assigned a unique ID number and title descriptor. PTZ cameras shall be setup for RS-422 protocol and supported with existing manufacturer's drivers where applicable.
- L. There shall be a Central Failure Notification (CFN) System used to identify all possible site errors. The CFN shall be accessible from only the Nucleus unit. The log shall be in a time/date order and be manually reviewed for errors.
- M. There shall be a Site Map feature. It shall allow the installation and configuration of a custom screen map used to identify and access site-installed components (recorders, cameras, microphones, etc.). The ideal map shall be a jpg image format in the size of 980 x 735 pixels. In addition, text boxes and sub-maps shall be added to maps, further defining the layout. The utility shall also provide full installation, configuration and editing of maps. Maps of smaller sizes shall have the ability to be moved anywhere on the screen.
- N. There shall be a Language Translation Utility (LTU). It shall allow a manual translation of the entire GUI into any language that uses varying alpha-numeric character sets. The utility shall also store files to enable changing from one language to another.
- O. The system shall provide alarm notification via e-mail, text messaging, and work station text. Macros shall be created to view/listen and record video and audio, PTZ cameras at preset positions, trigger alarms over the network and send email or text message for alarms or on schedule.
- P. Storage Database Utilities shall allow setup and usage of detected hard disks locally. Any networked recorder, workstation or server shall be a candidate to add to the picture database. Once established, any recorder shall use established hard disks for recording data.
- Q. Alarm Setup: Recorder alarms shall be established by adding detectors and configuring motion detection on video. The triggering of the recorder's detectors shall be used to send alarms to remote units and generate email or text messages. In addition, detectors shall be able to be edited and deleted.

- R. Authentication: The video from the recorder's cameras shall be enabled to verify the authentication of the video and present an authentication symbol on the displayed video for both live and recorded playback.

1.04 VIDEO MANAGEMENT SOFTWARE – USER INTERFACE

- A. The software installed in both recorders and workstations shall be similar in:
1. Graphical User Interface, therefore an operator shall need to learn only one interface for both control and programming of the system.
 2. Functions, offering the ability to remotely configure most system components from any recorder or workstation.
 3. The application shall display a Main Window and Login Window, where all configuration and operation shall be accomplished.
 4. The login window shall consist of a User Name and Password field.

The user interface shall serve both operators and system administrators. For the operator, the controls shall be laid out in a familiar VCR type control array, with Playback, Stop, fast forward, still, slow motion, etc. right under the viewing panes. The workspace area shall enable the operator to select the number of panes to display, view system activity, select quality levels and perform many other functions without having to drill down through menus or search for these commonly used functions. The interface shall also react to user interaction. For example, when a PTZ camera is selected, a full set of controls shall be provided, enabling the operator to control the camera and all of its functions. The system administrator shall easily access functions such as scheduling macros and producing reports from the toolbar at the top of the Main Window. The Setup button on the toolbar shall provide access to the System Settings menu. The System Settings menu shall provide access to all of the features of the software.

- B. The Main Window shall provide the following:
1. The Site and Device List depicting all recorders, servers and workstations connected to the network.
 2. Within the Site and Device List, each unit shall be depicted with all connected devices such as:
 - a. Cameras connected, differentiating between PTZ and fixed cameras.
 - b. Microphones.
 3. A multi-screen display area that allows for screen displays of:
 - a. Single Camera
 - b. Quad
 - c. 3 x 3
 - d. 4 x 4
 - e. 6-way
 - f. Full screen of any of the above selected multi-screens shall allow for the viewing of the particular multi-screen in full screen mode by hiding the graphical user interface.
 4. PTZ controls:
 - a. When a Vicon protocol PTZ camera is selected, an operator shall be able to:
 - 1) Control pan, tilt, zoom, iris and focus.
 - 2) Execute preset positions.
 - 3) Program preset positions.
 - 4) Complete programming of menus embedded in the selected dome.
 - 5) All PTZ programming and control shall be achieved remotely without requiring an operator to be present at the recorder the PTZ camera is connected to.

- 6) PTZ control shall be performed dynamically onscreen, not requiring an operator to click on arrows to move the PTZ camera.
 - 7) The PTZ control shall be fully variable by dynamically moving the cursor across the video display.
 - b. Other PTZ protocols shall be supported by the VMS.
 5. Access to all available programming menus.
 6. On-demand recording of video currently viewed shall allow for the recording of any camera from any recorder connected to the network.
- C. The Site and Device List shall provide a physical list of all known network site areas and connected cameras, PTZ cameras and microphones. The cameras, PTZ cameras and microphones shall be represented by graphical symbols. The user shall also have the option of showing the cameras and devices by logical camera grouping instead of the Site List. Components in the Site and Device List shall be selectable and configurable. PTZ controls shall offer:
1. When a PTZ camera is selected, an operator shall be able to:
 - a. Control pan, tilt, zoom, iris and focus.
 - b. Execute preset positions.
 - c. Program preset positions.
 - d. Complete programming of menus embedded in the selected dome.
 - e. All PTZ programming and control shall be achieved remotely without requiring an operator to be physically located at the recorder the PTZ is connected to.
 - f. PTZ control shall be performed on the video screen without the need for an operator to click on any arrows depicting direction of the device to be moved.
 - g. The PTZ control shall be fully variable and shall permit an operator to obtain higher pan and tilt speeds by simply clicking-and-dragging the mouse cursor on the video screen.
- D. Viewing of live cameras shall be performed by:
1. Clicking on the desired camera in the Site and Device List.
 2. "Drag-and-Drop" operation of cameras from the Site and Device List to the appropriate multi-screen space.
 3. "Drag-and-Drop" operation of the recorder from the Site and Device List to the appropriate multi-screen space.
 4. "Drag and Drop" operations from a camera group list to the appropriate multi-screen space.
 5. "Drag and Drop" operations from a graphical map to the appropriate multi-screen space.
- E. The Navigator Window shall graphically display recorded video. It shall contain all function buttons necessary to access the video on-screen. These functions include but are not limited to:
1. A scalable timeline shall be available to define "from" and "to" time/date intervals of video and audio.
 2. Cameras and microphones shall be selected from the Navigator List and displayed in the timeline in different colors for video and audio
 3. The display mode shall be selected from a palette to configure the number of cameras played back.
 4. An "Export Video" button shall be used to create a video clip in the following formats: AVI, MPEG, Xvid of the selected single camera video segment.
 5. A "Museum Search" button shall be available to search selected video segments for "Area of Interest" (AOI) events using a scalable sensitivity setting. A "Thumbnail Search" button shall be available to quickly search all ONVIF recorded video, using 16

- thumbnail images spread evenly across a specifiable time range. A single click on thumbnail launches playback. An interface shall be provided to export video.
6. A Play button shall be available to display the Main Window with the Video Display Area containing the selected video segments ready for review.
 7. Video retrieval in the Navigator Window shall be performed by:
 - a. Selecting the Display Mode for required number of cameras.
 - b. Selecting the device (recorder or workstation) where video was previously stored or archived.
 - c. Selecting the cameras and microphones to be played back.
 - d. By "Drag-and-Drop," similar to the live view, selected cameras and microphones are inserted into the multi-screen displays so that an operator can view a mix of previously recorded cameras and live video on the same screen.
 - e. The timeline shall provide a graphical interface depicting color-coded bars that indicate video previously recorded as well as all alarmed video and audio.
 - f. Video indicator bar shall indicate recording with no sensed motion
 - g. Any recorders on the network shall be capable of playing back, by utilizing the multi-screen displays, a mix of videos previously recorded on any other server on the network, or archived.
 - h. The Navigator Window shall offer the ability to playback cameras:
 - 1) One by one.
 - 2) Time synchronized (precise timeline when the cameras were recorded).
 - 3) By double-clicking any alarm report line or alarm window.
- F. Access to programming and more advanced screens shall be done by means of an immobile, permanently docked toolbar located on the top live screen. The toolbar shall provide access to the following major functionality of the system:
1. The Scheduler/Macro.
 2. Reports.
 3. Setup.
 4. Logout and Shutdown buttons.
- G. The operator shall have the ability to launch web pages or any other type of web-based information such as embedded HTML or PDF documents from within the user interface. Along with informational websites such as traffic, weather or news reports, internal operating procedures such as operation during emergencies, lockdowns, severe weather, etc. shall be launched and controlled from the VMS system and have passcode protected authorization.
- H. Authentication shall be configured using the Authentication Settings screen. Authentication display shall be configured by site and affect the destination video. A check box shall be available to enable video authentication and view the status of the video generated. The video authentication scheme shall utilize a 128 bit MD5 algorithm.

1.05 VIDEO MANAGEMENT SOFTWARE – VIDEO QUALITY

- A. The encoders and IP cameras shall employ a compression algorithm based on:
1. Optimized MPEG-4, JPEG (Normal and Full) and H.264. The software running on the DVRs and NVRs shall support the algorithms used by the devices.
 2. User selectable levels of resolution (quality) depending on camera not requiring a need to restart the application or the digital video recorder. It shall be selectable using a 4-position bar from the main screen. There shall be 4 levels of resolution (4 CIF, 2 CIF, CIF, and HCIF) with 2 levels of compression comprising 8 quality levels total, which shall be accessible from the Setup menu selections.

- B. User selectable resolution shall include capture sizes (camera dependant) of:
1. 360 x 122 pixels, 432 x 146, PAL.
 2. 360 x 244 pixels, 432 x 293, PAL.
 3. 720 x 244 pixels, 864 x 293, PAL.
 4. 720 x 488 pixels, 864 x 586, PAL.
 5. 1280 x 720 pixels (0.9 MP)
 6. 1280 x 1024 pixels (1.3 MP)
 7. 1600 x 1200 pixels (2.0 MP)
 8. 1920 x 1080 pixels (2.1 MP)
 9. 2048 x 1536 pixels (3.1 MP)
 10. 2592 x 1944 pixels (5.0 MP)

1.06 VIDEO MANAGEMENT SOFTWARE – ADD-INS

- A. An Access Control system shall be available for integration with digital video recording management and network software. The Access Control (VAX) system shall meet the requirements of business and government access control systems. The system shall monitor and control facility access as well as video detection, temperature and communications loss monitoring. The system shall provide control and access to users on Local Area Networks (LAN), Wide Area Networks (WAN), wireless networks and the Internet. The system shall provide video viewing playback and PTZ control from the VMS.
- B. A License Plate Recognition (LPR) system option shall be available to enable the digital video recording management and network software to integrate with an external license plate recognition system. The external LPR system shall link to the Events Management (EVM) system and video and license plate data captured by the LPR system shall be provided to the EVM system, where the data shall be stored along with the related digital video management system video. Event thumbnail images of the license plates and corresponding video may be called up for viewing and review. Operators shall have the ability to generate “white lists” and “black lists” of plate numbers thereby classifying certain reads to automate events, such as alarms, based upon a vehicle’s status.

1.07 VIRTUAL MATRIX DISPLAY CONTROLLER OPTION

- A. A Virtual Matrix Display Controller (VMDC) shall be available for digital video recording management and network software. The VMC shall provide the following capabilities:
1. Display any camera on the network on any monitor on the network.
 2. Allow the use of both 4 x 3 and 16 x 9 monitors.
 3. Allow control of the system from VMDC PC GUI, PLC or a keypad.
 4. Supports 4 keypads and up to 5 monitors per workstation.
 5. Map capability.
- B. A keypad shall be provided to provide the following functions:
1. Control PTZ functions.
 2. Control camera switching to monitor.
 3. Control quick playback to monitor.
- C. The VMDC shall be available as software ready to be installed on a suitable PC, preinstalled on a rack or tower unit.

1.08 ENCODER OPTIONS

- A. Encoders shall be available that convert analog camera inputs into streamed IP video data:
1. A four channel unit shall be available that shall be an H.264 encoder.

2. A single channel unit shall be available that shall be an H.264 encoder.
3. An 8-channel unit shall be available.
4. A 16 channel unit shall be available.

1.09 APPROVED MANUFACTURERS

- A. The Digital Video Recording Management and Network software shall be Vicon's Model VWS-SWV8 (software only), VWS-PCV8 (preloaded workstation) or VPK-SWV8 (software only), VPK-XXTBV8 (preloaded PEAK NVR, where XX is the hard drive size).
- B. The Virtual Matrix System software shall be Vicon's Model VMDC-SWV8 (software only), VMDC-2V8, 4V8, or 6V8 (preloaded tower PC with 2, 4 or 6 monitor outputs) or VMDC-2V8, 4V8 or 6V8-RK (preloaded rack PC with 2, 4 or 6 monitor outputs). This shall have a separate specification.
- C. The LPR shall be integration with a partner.
- D. The keypad shall be Vicon model V1500C-SCCS-1. This shall have a separate specification.
- E. The encoders shall be Vicon models H264-ENCDR (4-channel), VN-901T (single-channel) EXPRESS-8 (8-channel) and EXPRESS-16 (16-channel). These shall have separate specifications.
- F. Digital Video Recording Management and Network Workstation shall be available to be shipped pre-configured and programmed to the systems requirements by the manufacturer. Virtual Matrix Systems shall be available to be shipped pre-configured and programmed to the systems requirements by the manufacturer. The keypad and encoders shall be available to be shipped pre-configured and programmed to the systems requirements by the manufacturer.

1.10 DIGITAL NETWORK VIDEO RECORDER

- A. The digital network video recorder (NVR) shall be a PC computer with a Microsoft® Windows® 7 Embedded* (64-bit) operating system. It shall be fully equipped with the Digital Video Management Software. The workstation shall require an external monitor, keyboard and mouse for operation.
- B. As a minimum, the NVR shall have Intel® Core™ i5 processor. It shall have a minimum of 4 GB of RAM memory, a minimum 250 GB hard drive, USB ports, and monitor outputs (DVI and HDMI).
- C. The NVR shall be housed in a desktop or rack-mount case with all suitable connectors available on the back panel. It shall be constructed of steel and plastic materials. It shall also be operated indoors in a temperature range not to exceed 32 to 104° F (0 to 40° C) and a humidity range not to exceed 0 to 95% relative, in a non-condensing atmosphere. The NVR shall employ a Universal Voltage Power Supply requiring 105 - 240 VAC @ 50 - 60 Hz. A rack-mounting kit shall be provided.
- D. The NVR shall offer internal hard-drive storage with the following capacities:
 1. 500 GB.
 5. 1 TB.
 6. 1.5 TB.
 7. 2 TB.
 8. 3 TB.

- 9. 5 TB.
- 10. 6 TB.

E. The NVR shall be preloaded with ViconNet Video Management Software.

*A full windows O.S. is available on request. **The desktop and 1U rack-mount versions support up to a certain drive size. Larger drive capacity is available, but may require a larger tower or 2U chassis. Contact your sales representative.

1.11 ELECTRICAL SPECIFICATIONS

- A. Input Voltage: 105-240 \pm 10% VAC, 50/60 Hz.
- B. Current: 0.66 A @ 115VAC; 0.33 A @ 240 VAC.
- C. Power Consumption: 76 W.
- D. CPU Intel® Core™ i5.
- E. RAM Memory 4 GB minimum.
- F. Heat Output: 266 btu/hour.
- G. Operating System Hard Drive: 250 GB minimum.
- H. Storage: 500 GB to 6 TB. Depending on model.
- I. Operating System: Microsoft Windows 7 Embedded.
- J. LAN Interface: 100/1000 Base T Ethernet interface on main board.
- K. DVD Drive: Internal DVD/CD/RW drive not available on most units; external USB DVD can be used.
- L. Front Panel Controls/Indicators: Power, network and hard drive activity LEDs, USBs.
- M. Certifications: FCC Class A, CE.

1.12 MECHANICAL SPECIFICATIONS

- A. Application: Indoor.
- B. Mounting: Standard desktop or rack unit mounted in a standard EIA compliant rack, 19 in. (483 mm) wide opening. Rack height is 1.75 in. (44 mm) or 1 RU.
- C. Dimensions-Rack: Width (W): 19.0 in. (483 mm).
Depth (D): 16 in. (406mm).
Height (H): 1.75 in. (44.45 mm), 1 RU.
- D. Dimensions-Desktop: Width (W): 2.13 in. (44 mm).
Depth (D): 6.59 in. (167.5 mm).
Height (H): 6.59 in. (167.5 mm).
- E. Weight-Rack: 18.2 lb. (8.3 kg) approximately.
- F. Weight- Desktop: 8.1 lb. (3.7 kg) approximately.
- G. Construction: Steel and plastic.
- H. Color: Black.

1.13 ENVIRONMENTAL SPECIFICATIONS

- A. Operating Temperature Range: 32 to 104°F (0 to 40°C).
- B. Operating Humidity Range: 0 to 95%, non-condensing.

1.14 CERTIFICATIONS

- A. CE
- B. FCC, Class A

1.15 WARRANTY

- A. 3 years, parts and labor

1.16 APPROVED MANUFACTURERS

- A. The ViconNet Digital Video Recording Management and NVR shall be Vicon's VPK-XTBVY where X is the hard drive size and Y is the ViconNet version; the rack version shall be VPK-XTBVY-R1 where X is the hard drive size and Y is the ViconNet version The ViconNet Digital Video Recording Management and Network Workstation desktop version shall be Vicon's VWS-PCVX where X is the ViconNet version; the rack version shall be VWS-PCVX-R1 where X is the ViconNet version.
- B. Digital Video Recording Management and Network Workstation shall be available to be shipped pre-configured and programmed to the systems requirements by the manufacturer.

1.17 FIXED DOME VANDALPROOF DAY/NIGHT IP CAMERA

- A. The fixed dome, true day/night camera shall incorporate a fixed camera/lens combination. The camera domes shall be available as indoor/outdoor models. The cameras shall offer in-ceiling mounting or surface-mounting. The cameras shall also have the ability to be mounted to a standard 4 x 4 electrical box. An adapter shall be available for pendant mounting on a standard 1 ½ NPT fitting.
- B. The day/night camera shall be available in SD (D1) 720p and 1080p versions. Models with IR illuminators shall be available. The cameras shall provide dual/triple streaming video and support H.264, M-PEG-4 and M-JPEG compression.
- C. The cameras shall be constructed with a metal housing with a clear, high-impact, polycarbonate plastic dome and black mask. All camera models shall be protected with tamper-resistant screws.
- D. The cameras shall work on a 10-BaseT or 100Base-TX network interface.
- E. The cameras shall have an internal heater, powered by 24 VAC input power. The cameras shall also be powered by 12 VDC or PoE.
- F. The camera position shall have a three-axis adjustment, allowing for adjustment of pan (355°), tilt (70° from vertical) and lens rotation (roll), for any angle of view required. A 3 to 9 mm varifocal autoiris lens shall be included to adapt to changing lighting conditions.
- G. The camera shall be designed for easy installation and setup. The extensive web browser menus shall allow set up of white balance, AGC, backlight compensation, digital wide dynamic range, motion detection, digital zoom, privacy masks and many other functions.

1.18 FIXED DOME CAMERA AND OPTICS SPECIFICATIONS

A.	Imaging Device:	1/2.8-inch progressive scan RGB CMOS
B.	Day/Night Performance:	True day/night (IR cut filter)
C.	Digital Zoom:	1 – 10X (client software)
D.	Sensitivity:	Color: 0.08 fc (0.8 lux); B&W: 0.02 fc (0.2 lux);DSS: 0.001 fc (0.01 lux); IR Color: 0.02 fc (0.2 lux); IR B&W: 0.0 fc/lux, IR On @ f/1.2 lens at 50 IRE
E.	Max. Resolution:	1080p, 720p and SD (D1) models
F.	IR Distance (IR models only):	65 ft (20 m) (with 24 IR LEDs)
G.	Zoom/Focus Adjust:	Screw lever adjustable (manual) or motorized focus and zoom
H.	Automatic Gain Control (AGC):	Selectable
I.	Backlight Compensation:	On/Off
J.	Motion Detection:	
K.	Privacy Mask:	8 zones/size
L.	Dynamic Noise Reduction:	Selectable: On/Off
M.	Iris Control:	Automatic
N.	White Balance:	Automatic/Light Source
O.	Electronic Shutter Speed:	1/4-1/20,000 sec
P.	Focal Length:	3-9 mm
Q.	Aperture:	f/1.2
R.	Field of View:	Horizontal: 93°-31.7°

1.19 ELECTRICAL SPECIFICATIONS

A.	Input Voltage:	24 VAC, 12 VDC or PoE.
B.	Current:	12 VDC No IR/ IR: 250/470 mA; 24 VAC IR/No IR: 300/520 mA; PoE: 70/1300 mA. Heater: 0.6 A (24 VAC only).
C.	Power Consumption:	12 VDC No IR/ IR: 3/4 W; 24 VAC IR/No IR: 3.3/6.5 W; PoE: 3.5/6.4 W. Heater: 20 W (24 VAC only).
D.	Connectors:	Power: screw terminal. Network/PoE: RJ-45. Alarm: screw terminal. Audio: jacks. Micro SD card slot. Composite output provided for installation.

1.20 NETWORK VIDEO TRANSMISSION SPECIFICATIONS

A.	Compression:	H.264, MPEG-4, M-JPEG.
B.	Video Streams:	10 concurrent sessions maximum.
C.	Video Resolution:	1920x1080 (1080p), 1280x720 (720p), 704x480/576 (D1), 352x240/288 (CIF), 640x480 (VGA), 320x240 (QVGA), model dependent.
D.	Frame Rate:	2.5-30 fps (2.1-25 fps PAL).
E.	Network Interface:	10Base-T, 100Base-TX.
F.	Streams:	Dual or triple streaming.

- G. Web Browser: Internet Explorer, Safari, Firefox, Google Chrome, Opera.

1.21 OPERATIONAL

- A. Alarm Capabilities: 1 in, 1 out. Alarm out.
B. Control Display: Web browser menu-driven system allowing full configuration of the camera
C. Tilt and Horizontal Adjustment: Pan, 355°; tilt, 70° from vertical and rotation about its axis (roll/azimuth).
D. Lens Adjustment: Manual: Focus: focus lever screw. Zoom: zoom lever screw. Motorized zoom and focus models.

1.22 ENVIRONMENTAL SPECIFICATIONS

- A. Operating Temperature: Without Heater (12 VDC/PoE): 14 to 122° F (-10 to 50°C).
With Heater: -40 to 122° F (-40 to 50°C).
B. Humidity: Up to 90% relative, non-condensing

1.23 MECHANICAL SPECIFICATIONS

- A. Construction: Die cast aluminum base with clear polycarbonate plastic dome and black mask. Tamperproof screws.
B. Dimensions: Height: 5.0" (127.4 mm); 7.5" (188 mm) with pendant mount.
Housing Diameter: 6.06" (154 mm).
Dome Diameter: 4.3" (109.97 mm).
C. Weight: 2.5 lb (1.1 kg)
D. Camera Mount: Indoor or outdoor. Surface or flush, in-ceiling mount (with optional mounting kit), pendant on standard 1 1/2" NPT (with optional pendant adapter). May be mounted to a 4x4 electrical box without the need for an adapter plate.

1.24 CERTIFICATIONS

- A. CE
B. UL
C. FCC, Class A
D. IP66
E. IK10

1.25 WARRANTY

- A. 3 years, parts and labor

1.26 APPROVED MANUFACTURERS

- A. The fixed dome, color camera shall be Vicon Industries Model V920D Series.
B. The fixed dome, day/night camera shall be available to be shipped pre-configured and programmed to the systems requirements by the manufacturer.

1.27 NETWORK PTZ CAMERA DOME

- A. The compact network dome shall be comprised of a camera/lens and pan/tilt drive in an attractive covert enclosure. It shall be sold in a variety of prepackaged configurations with choices in environment, mounting configuration, camera resolution, and lower dome types. A pressurized and high-impact version shall be available.
- B. The motorized dome shall employ a modular design with an internal CPU and a customer interface board that provides connections for an external power supply input, four alarm inputs, one relay output and network wiring. On-board memory shall be retained in the housing; installation and servicing shall be easy.
- C. The network dome shall provide network video transmission using either MPEG-4, open platform H.264 or M-JPEG compression. The dome shall support ONVIF open architecture connectivity to enable third party software recording. The camera dome shall transmit high quality video across the network for remote viewing and recording and shall be configurable remotely from network digital video recorders and master workstations
- D. Alarm inputs shall be individually programmable for their functional state (enabled or disabled), reporting state (report on or off), active state (high or low), acknowledge mode (manual, momentary or automatic), automatic acknowledge dwell time control, set and reset action (action when triggered or reset) and displayed title text. The relay output shall be output type (momentary or latching).
- E. Programmable titling shall be provided for the camera and every preset position, alarm, relay, and sector. Titles shall be enabled or disabled individually or globally. The overall position of the titles and display frame position shall be programmable. The capability to fade titles after a programmable time shall be provided.
- F. There shall be 79 individual programmable preset positions available, each having a variable preset solve speed of 1 sec (nominal) and accuracy of 0.1°. The dome's 360 degree view shall be programmable for a maximum of 16 sectors. Each sector shall have the capability to be blanked out (no video display). In addition, the blanked out area shall be scalable. The number and size of sectors shall be programmable and have a custom title.
- E. There shall be eight tours available with 32 steps per tour. Tour steps shall include preset positions with speed control, relay control, alarm acknowledge, save/recall camera status, repeat tour, call another tour, call an autotour and dwell timing control. There shall be two autotours available with 256 pan, tilt and zoom functions per autotour. Timing shall be dynamic or as is actually programmed with the joystick and push buttons.
- F. Pan and tilt functions shall be programmable. Maximum manual pan and tilt speeds shall be programmable. Maximum pan speed shall be 400 degrees/sec and maximum tilt speed shall be 150 degrees/sec. Pan and tilt speeds shall also be scalable to the zoom setting.
- G. Two camera/lens combinations shall be available. The first camera/lens shall be a 1/3-in. solid state progressive scan CCD day/night 1.3 megapixel (720p) with a 4.7-84.6 mm varifocal lens (optical 30x zoom). The second camera/lens shall be a 1/2.8-in. solid state progressive scan CMOS day/night 2.0 megapixel (1080p) with a 4.7-94 mm varifocal lens (optical 20x zoom). The camera shall feature wide dynamic range to provide the highest quality image with excellent contrast.
- H. The camera shall provide high level, programmable functions. Configuration of the dome shall be done through a web browser interface. The gain control shall be adjustable. The shutter speed shall be automatic or manual. The camera shall have white balance gain using

- red and blue scales. Backlight compensation or Wide Dynamic Range shall be programmable. Synchronization shall be internal.
- I. The outdoor/high-impact/pressurized pendant model shall be mounted using a die-cast aluminum housing and 1-1/2 inch NPT threaded fitting and shall include a molded thermoplastic sunshield and additional environmental control.
 - J. A real time clock and scheduler shall be available on all models. Up to 64 events shall be able to be scheduled for action at a programmed time of day. Events that may be scheduled include a preset, turning a relay on or off, enabling or disabling an alarm, and calling a tour or an autotour.
 - K. 16 individual zoom-scalable programmable privacy masks shall be available for simultaneous display on screen; 80 total shall be available.
 - L. Programmable azimuth and compass display shall be available. The compass shall be programmed for absolute North and shall display 8 compass headings (N, NE, E, SE, S, SW, W, NW). Pan and tilt degrees shall be displayed with a 1° resolution.
 - M. Motion detection capability shall be available. There shall be 12 predefined zones for motion detection. Each zone has 3 sensitivity levels. Programmable actions may be associated with each detection zone, including calling another preset, turning a relay on or off, and calling a tour or an autotour.
 - N. The capability to freeze an image during a preset solve shall be available. The control shall be global and affect all preset solves. The freeze of an image during preset solve conserves bandwidth and storage when recording using a motion compensated recording system.
 - O. The capability to flip (invert) the video image shall be available. This feature is useful when mounting units in an inverted position. All pan/tilt and compass displays are automatically adjusted for the inverted image.
 - P. Multilanguage menu system shall be provided, including English, Spanish, French, German and Italian.
 - Q. The dome shall have a maximum video transmission rate of 30 fps (25 fps PAL).
 - R. Audio input shall be provided.
 - S. The dome shall be capable of 10 simultaneous viewing/recording streams per camera.

1.28 NETWORK VIDEO TRANSMISSION

- A. Compression: H.264, M-JPEG
- B. Video Output: 720p: 1280 x 720 @ 30 fps
1080p: 1920 x 1080 @ 30 fps
- C. Programming Interface: ONVIF, NTCIP or Vicon API
- D. Protocols: IP, HTTP, RTSP/RTP, DNS client, FTP, SMTP, PPPoE, TCP/IP, DHCP, UDP, Multicast, NTP, DDNS, IGMP, ARP, SOAP, WSDL, WS-Discovery

1.29 CAMERA SPECIFICATIONS

- E. Imaging Device: 720p: 1/3-inch solid state progressive scan CCD
1080p: 1/2.8-inch solid state progressive scan CMOS
- F. Effective Picture Elements: 720p:1348 x 976 (H x V)
1080p: 2096 x 1097 (H x V)
- G. Synchronization In: Internal
- H. Horizontal Resolution: 720p: 600 TVL (color and B&W)
1080p: 900 TVL (color and B&W)
- I. Shutter Speed: 720p: Automatic/Manual: 1/4 to 1/10,000 sec
1080p: Automatic/Manual: 1/0.75 to 1/30,000 sec
- J. Gain Control: Automatic/Manual
- K. WDR : On/Off selectable
- L. Backlight Compensation: On/Off selectable
- M. Sensitivity: 720p: Color: 0.18 fc (1.8 lux)
B&W: 0.002 fc (0.02 lux) @50IRE, f/1.6, 1/4s, IR off
1080p: Color: 0.16 fc (1.6 lux)
B&W: 0.004 fc (0.04 lux) @50IRE, f/1.6, 1/8s, IR off
- N. Iris Control: Automatic
- O. Digital Noise Reduction: On/Off selectable (1080p version)
- P. Video Focus: Automatic/Manual (near-far)
- Q. White Balance: Automatic/Manual; red/blue gain adjustable
- R. Lens: 720p: 4.7 – 84.6 mm, f/1.6 (wide) - f/2.8 (tele);
55.2° – 3.2° horizontal angle of view
1080p: 4.7 – 94 mm, f/1.6 (wide) - f/3.5 (tele);
55.2° –2.9° horizontal angle of view

1.30 ELECTRICAL SPECIFICATIONS

- A. Input Voltage: 18-30 VAC. (Will operate within spec on voltages up to 32 VAC.
For voltages between 30-32 VAC, use a Class 3 indoor/dry or outdoor/wet power supply.) PoE+ on indoor unit only.
- B. Current (@ 24 VAC): Indoor: 1.0 A
Outdoor: 2.2 A
- C. Power Consumption: Indoor: 20 W max
Outdoor: 70 W max, including heater.
- D. Heat Equivalent: Indoor: 70 btu/hr
Outdoor: 245 btu/hr
- E. Power Connector: 2-position removable screw terminal block
- F. Network Connector: RJ-45 CAT 5
- G. Audio Connector: 2 1/8-in. phono jacks
- H. Alarm Input: 8-position removable screw terminal block
- I. Video Out: RJ-45 connector
- J. Relay: 4-position removable screw terminal block.
- K. Radio Frequency Emission Rating: FCC Class A

1.31 ENVIRONMENTAL SPECIFICATIONS

- A. Operating Temperature: Indoor: 32° to 131°F (0° to 55°C)
Outdoor: -40° to 131°F (-40° to 55°C) continuous rotation

1.32 PHYSICAL SPECIFICATIONS

- A. Diameter: Outdoor Pendant

Diameter: 9.0-in. (228 mm).
Height: 10.3-in. (262 mm).
Lower Dome: 5.9-in. (150 mm)

B. Weight: Outdoor Pendant: 7.2 lb (3.3 kg).

1.33 MECHANICAL SPECIFICATIONS

A. Application: Outdoor/Impact-Resistant; IP66, NEMA 4X;
NEMA TS2-2003 V02.06
Pressurized; IP67; NEMA TS2-2003 V02.06
Indoor Pendant; IP52
Indoor In-Ceiling; IP51

1.34 CERTIFICATIONS

- A. FCC, Class A
- B. CE
- C. ONVIF compliant

1.35 WARRANTY

- A. 3 years, parts and labor

1.36 APPROVED MANUFACTURERS

- A. The camera dome shall be Vicon Industries Model Surveyor HD series:
720p/1.3MP models:
 - SN130W (Outdoor Pendant)
 - SN130M (High-Impact)
 - SN130P (Pressurized)1080p/2MP models:
 - SN220W-L (Outdoor Pendant)
 - SN220M-L (High-Impact)
 - SN220P-L (Pressurized)
- B. The network PTZ dome camera shall be available to be shipped pre- configured and programmed to the systems requirements by the manufacturer.

2.37 OUTDOOR FIXED IP CAMERA DOME

- A. The indoor/outdoor fixed camera dome shall incorporate a varifocal camera/lens combination. The camera dome shall be available for indoor/outdoor surface mounting. The high-resolution day/night camera shall be available with an integral 3-13 mm manual varifocal fixed iris lens or 2.8-8.5 mm motorized varifocal remote focus, autoiris lens. Day/night operation shall be achieved using a built-in IR-cut filter. IR illuminators shall be available; IR distance shall be 50 ft (15 m) with 22 IR LEDs. A clear polycarbonate lower dome that is secured by tamperproof screws shall be included.
- B. The camera position shall have a three-direction adjustment, allowing for adjustment of pan, tilt and lens rotation (azimuth/roll), for any angle of view required.
- C. The camera dome shall be powered by PoE.

- D. The camera dome shall have simultaneous dual streaming video and support H.264 and M-JPEG compression. The camera shall be available in 4 resolutions, 1 MP (720p) and 2 MP (1080p), 3 MP and 5 MP. The camera dome shall transmit full duplex, bi-directional (two-way) audio that is synchronized with the H.264 video stream.
- E. Camera features shall include electronic iris, AGC, BLC, white balance, flip and rotate, and motion detection; WDR (1, 2, 3 MP versions only),
- F. The camera dome shall meet the FCC requirements for a Class A device. It shall include support for the industry-standard ONVIF interface. It shall be IP66-rated (NEMA 4) to withstand rain, dust and vandalism and IK10 rated for impact resistance.
- G. The camera dome shall provide a slot for an SD card for local storage.
- H. The fixed-position camera dome shall meet or exceed the following design and performance specifications.

2.38 DAY/NIGHT IP CAMERA DOME SPECIFICATIONS

- A. Imaging Device: 1/3.2-inch progressive scan CMOS; NE model: 1/2.7-inch
- B. Max. Resolution: 1 megapixel (720p), 2 megapixel (1080p), 3 megapixel and 5 megapixel models
- C. Shutter Speed: 1/8000 sec
- D. Automatic Gain Control: On/Off selectable
- E. Sensitivity: Color: 1-3 MP: 0.2 lux, 5 MP: 0.3 lux; B&W: 0.05 lux without IR
- F. Tilt and Horizontal 3-axis adjustment: pan (360°), tilt (90°) and roll (lens Adjustment: may be rotated on its axis 350°)
- G. Lens Adjustment: Model Dependent: Manual focus and zoom adjustment, fixed iris or motorized zoom and focus, autoiris
- H. Focal Length: 3-13 mm manual varifocal; 2.8-8.5 mm motorized varifocal
- I. Horizontal Field of View: 3-13 mm day/night: 32°- 93°; 3-13 mm WDR/IR: 26°- 95°; 2.8-8.5 mm WDR/IR: 37°- 90°; 2.8-8.5 mm 3 MP: 39°- 95°; 2.8-8.5 mm 5 MP: 39°- 99°
- J. IR Distance: 50 ft (150 m) with 22 IR LEDs; IR range of 800-940 nm

2.39 ELECTRICAL SPECIFICATIONS

- A. Input Voltage: PoE
- B. Power Consumption: PoE: <4 W
- C. Connectors: Power: PoE RJ-45
Video/Data: RJ-45
I/O Relay, Audio In/Out, Analog Output: Requires optional cable or backbox
Slot for SD card
- D. Radio Frequency Emission Rating: FCC Class A; CE

2.40 ENVIRONMENTAL SPECIFICATIONS

- A. Operating Temperature: -30° to 122°F (-34° to 50°C)
- B. Humidity: 10% to 80% relative, non-condensing

2.41 PHYSICAL SPECIFICATIONS

- A. Construction: Die-cast aluminum base; aluminum trim ring
Dome: clear polycarbonate; tamperproof screws
- B. Dimensions: Height: 3.9 in. (100 mm),
Diameter: 6.0 in. (152 mm)
Dome Diameter: 3.86 in. (98 mm)
- C. Weight: Approximately 2 lb (0.9 kg)

2.42 MECHANICAL SPECIFICATIONS

- A. Camera Mount: Surface mount
- B. Adjustments: 3 axis adjustment, pan (360°), tilt (90°) and roll/azimuth (350°)

2.43 NETWORK VIDEO SPECIFICATIONS

- A. Communication Platform: Open platform; compatible with ViconNet Digital Video Management System
- B. Compression: H.264; MPEG-4; M-JPEG
- C. LAN Interface: 10 Base-T/100 Base-TX, Multicast
- D. Video Channels: Dual streaming
- E. Max. Resolution/Frame Rate: 720p: 1280x720
1080p: 1920x1080
3 MP: 2048x1536
5 MP: 2560x1920
720p/1080p: 30 fps; 3 MP: 20 fps; 5 MP: 10 fps
- F. Web Browser: Internet Explorer, Firefox, Google Chrome, Safari
- G. Users: Live viewing for up to 10 clients
- H. Image Settings: Auto exposure; flip horizontal and vertical and rotate 180°; configurable brightness, contrast, saturation, and sharpness; auto white balance, AGC; BLC; WDR (1,2,3 MP versions); motion detection; AC lighting control (50 or 60 Hz)
- I. Supported Protocols: TCP/IP, HTTP, HTTPS, RTSP, RTP, CIFS, SMTP, DHCP, NTP, DNS, UDP, uPnP, ARP, SNMP, ICMP, Zeroconf, APIPA, Telnet, multicast

2.44 CERTIFICATIONS

- A. CE
- B. FCC, Class A
- C. IP66
- D. NEMA4
- E. IK10
- F. RoHS
- G. ONVIF
- H. PSIA

2.45 WARRANTY

- A. 3 years, parts and labor

2.46 APPROVED MANUFACTURERS

- A. The outdoor fixed color IP dome camera shall be Vicon Industries Models IQM55WR-B5, IQM61NE-B5, IQM61WR-B5, IQM61WR-A4, IQM62NE-B5, IQM62WR-B5, IQM62WR-A4, IQM63WR-A4 and IQM65NR-A4.

2.47 OUTDOOR FIXED IP CAMERA DOME

- A. The outdoor IP camera shall incorporate a varifocal camera/lens combination. The camera shall include an integral for wall/ceiling/parapet mounting and a power/data back box. The high-resolution day/night camera shall be available with a wide choice of integral manual varifocal IR corrected fixed iris lenses. Day/night operation shall be achieved using a built-in IR-cut filter.
- B. The camera position shall allow for adjustment of pan (360°) and tilt (180°) for any angle of view required.
- C. The camera dome shall be powered by PoE, 12-24 VDC or 24 VAC.
- D. The camera dome shall have simultaneous dual streaming video and support H.264 and M-JPEG compression. The camera shall be available in 5 resolutions, 1 MP (720p), 2 MP (1080p), 3 MP, 5 MP Camera features shall include electronic iris, WDR (1, 2, 3 MP versions only), AGC, BLC, white balance, flip and rotate, and motion detection.
- E. The camera dome shall meet the FCC requirements for a Class B device. It shall include support for the industry-standard ONVIF interface. It shall be IP66-rated (NEMA 4) to withstand rain, dust and vandalism.
- F. The camera shall meet or exceed the following design and performance specifications.

2.48 DAY/NIGHT IP CAMERA DOME SPECIFICATIONS

- A. Imaging Device: 1/3-inch CMOS; 1/2.5-inch CMOS (5 MP);
1/2.3-inch CMOS (12 MP)
- B. Max. Resolution: 1 megapixel (720p), 2 megapixel (1080p), 3 megapixel,
5 megapixel and 12 megapixel (4K) models
- C. Shutter Speed: 1/20,000 sec; 1/8000 (12 MP)
- D. Automatic Gain Control: On/Off selectable
- E. Sensitivity: Color: 1-3 MP/12 MP: 0.2 lux, 5 MP: 0.3 lux; B&W: 0.05 lux
without IR @f/1.4

- F. Tilt and Horizontal Pan (360°) and tilt (180°)
- G. Lens Adjustment: Manual focus and zoom adjustment; fixed iris
- H. Focal Length: 1 MP: 12-40, 4-12 or 3.3-10 mm varifocal
2/3 MP: 12-40, 4-12, 3.3-10 or 1.8-3 mm varifocal;
5 MP: 12-40, 4-12 or 1.8-3 mm varifocal;
12 MP: 4.5-10 mm varifocal
- I. Horizontal Field of View: 3.3-10 mm: 27°-70°; 4-12 mm: 30°-74°
12-40 mm: 9°-18°; 1.8-3 mm: 75°-106°
4.5-10 mm: 41°-80°

2.49 ELECTRICAL SPECIFICATIONS

- E. Input Voltage: PoE, 12-24 VDC or 24 VAC
- F. Current: PoE: 0.2 A; 12 VDC: 0.7 A; 24 VAC/VDC: 0.3 A
- G. Power Consumption: <8 W including heater
- H. Connectors: Power: PoE RJ-45
Video/Data: RJ-45

- I. Radio Frequency
Emission Rating: FCC Class B; CE

2.50 ENVIRONMENTAL SPECIFICATIONS

- A. Operating Temperature: -22° to 122°F (-30° to 50°C)
- B. Humidity: 10% to 80% relative, non-condensing
- C. Ratings: IP66/NEMA 4

2.51 PHYSICAL SPECIFICATIONS

- A. Construction: Cast aluminum enclosure/arm/back box;
polycarbonate lens cover; tamperproof screws
- B. Dimensions: Height: 9.58 in. (243.2 mm),
Width: 5.18 in. (131.7 mm),
Diameter: 15.36 in. (390.1 mm)
- C. Weight: Approximately 6.25 lb (2.839 kg)

2.52 MECHANICAL SPECIFICATIONS

- A. Camera Mount: Surface mount (wall/ceiling/parapet)
- B. Adjustments: 3 axis adjustment, pan (360°), tilt (180°)

2.53 NETWORK VIDEO SPECIFICATIONS

- A. Communication Platform: Open platform; compatible with ViconNet Digital Video Management System, ONVIF/PSIA
- B. Compression: H.264; MPEG-4; M-JPEG available
- C. LAN Interface: 10 Base-T/100 Base-TX, Multicast
- D. Video Channels: Dual streaming
- E. Max. Resolution/Frame Rate: 720p: 1280x720
1080p: 1920x1080
3 MP: 2048x1536
5 MP: 2592x1944
12 MP: 4000x3000
720p: 60 fps; 1080p: 30 fps; 3 MP: 20 fps; 5 MP: 10 fps; 12 MP:

15 fps

- F. Web Browser: Internet Explorer, Firefox, Chrome, Safari, Mozilla, Opera
- G. Users: Live viewing for up to 10 clients
- H. Image Settings: Auto exposure; flip horizontal and vertical and rotate 180°; configurable brightness, contrast, saturation, and sharpness; auto white balance, AGC; BLC; WDR (1,2,3 MP versions); motion detection; remote back focus
- I. Supported Protocols: TCP/IP, HTTP, HTTPS, RTSP, RTP, CIFS, SMTP, DHCP, NTP, DNS, UDP, uPnP, ARP, SNMP, ICMP, Zeroconf, APIPA, Telnet, multicast.

2.54 CERTIFICATIONS

- A. CE
- B. UL, cUL
- C. FCC, Class B
- D. IP66
- E. NEMA4
- F. RoHS 2
- G. ONVIF
- H. PSIA

2.55 WARRANTY

- A. 3 years, parts and labor

2.56 APPROVED MANUFACTURERS

- A. Campus standard – Vicon Industries
- B. The outdoor IP camera shall be Vicon Industries Models IQ861NE-V6, IQ861NE-V7, IQ861NE-V17, IQ861WE-V6, IQ861WE-V7, IQ861WE-V17, IQ862NE-V6, IQ862NE-V7, IQ862NE-V17, IQ862NE-W2, IQ862WE-V6, IQ862WE-V7, IQ862WE-V17, IQ862WE-W2, IQ863NE-V6, IQ863NE-V7, IQ863NE-V17, IQ863NE-W2, IQ863WE-V6, IQ863WE-V7, IQ863WE-V17, IQ863WE-W2, IQ865NE-V6, IQ865NE-V7, IQ865NE-W2, IQ8712NE-V18.
- C. Or equal as approved by the District.

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SECTION 28 30 00

FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements Specification Sections, apply to this Section.
- B. Provisions of Division 28, Electronic Safety and Security Section 28 05 00, Common Work Results for Electronic Safety and Security, apply to this Section.

1.02 SUMMARY

- A. This Section includes:
 - 1. Control Panel
 - 2. Central Station Reporting
 - 3. Strobe Synchronization
 - 4. Software
 - 5. Remote Equipment
 - 6. Detection Devices
 - 7. Manual Pull Stations
 - 8. Annunciation Devices
 - 9. Electromagnetic Door Holders
 - 10. Addressable Accessories
 - 11. Controlled Devices
 - 12. Cable
- B. Related Sections include:
 - 1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables
 - 2. Section 26 05 33, Raceways and Boxes for Electrical Systems
 - 3. Section 26 05 53, Identification for Electrical Systems

1.03 SUBMITTALS

- A. Shop drawings produced in AutoCAD with Fire Marshal's stamp of approval.
- B. Product data with wiring schematics.
- C. AutoCAD wiring diagrams of each type of device.
- D. AutoCAD riser diagram of the complete systems/
- E. Battery and voltage drop calculations based on intended routing and wiring.
- F. Prepare shop drawings of the system by the manufacturer in AutoCAD and submitted to the Fire Marshal for approval. The approved shop drawings will be utilized as the installation drawings. The shop drawings show actual conduit routing and conductors as to be installed. Update drawings to include revisions and changes to the system during construction and installation.

1.04 QUALITY ASSURANCE

- A. Approve and install equipment in accordance with NFPA, ADA and IBC requirements and UL listed both in individual components and as a system. ISO-9000 certified; UL and FM listed and meet NFPA 72.
- B. Furnish evidence that there is an experienced and efficient service organization which carries a stock of repair parts for the system to be furnished and that the organization is capable of providing repair service within 24 hours of a trouble call.
- C. Install system by an electrical contractor experienced in the installation of addressable fire alarm systems and certified by the national institute for certification in engineering technologies (NICET) for fire alarm systems. Control equipment factory representative services be obtained to provide engineered system floor plans and point-to-point drawings on AutoCAD. Representative to supervise the installation, system start-up, programming, make final adjustments and provide testing of the completed system. The factory representative provides a letter of system certification to the Architect.

1.05 CONTRACTOR DESIGN

- A. Equipment shown on the contract drawings indicate the general nature of the fire alarm system, but does not necessarily show components required. Provide a complete fire alarm and communications system as needed to meet applicable codes and requirements under this section.
- B. Review various sets of drawings for initiating and notification devices, and add devices if needed to comply with the requirements of NFPA 72.
- C. Raceway, routing, and wiring for field devices are not shown on the drawings except for a few specific design requirements.

1.06 SYSTEM DESCRIPTION

- A. Operate automatic fire detection systems in a local, supervised non-coded fashion. The system low voltage operating at 24V DC. Fully addressable with analog technology for sensors. Signal circuits either class A or B without changing modules. Design system Class B. Load circuits to 75 percent capacity maximum.

- B. Signal, visual and audible alarms, flow and tamper module circuits supervised for opens, shorts and grounds. Open, short or ground causes a trouble on the system, sound the audible trouble sounder and annunciate at the control and remote annunciator: the device, location, and nature of the trouble condition.

1.07 SYSTEM OPERATION

- A. Operation of manual or automatic initiating device cause an audible and visual alarm to sound, activate the control-by-event program and perform auxiliary functions.
- B. Annunciate fault in the circuits at the control panel and the remote annunciators.
- C. Utilize a single pair of wires to power, transmit, and receive data from the addressable analog initiating devices and to transmit commands to the remote control points. Size wire for the length of communications loop but in no event less than number 18-2 wire size.

1.08 SEQUENCE OF OPERATION

- A. The system alarm operation subsequent to the alarm activation of manual station, automatic initiating device, or sprinkler flow/pressure switch is to be as follows:
 - 1. Audible alarm indicating appliances sound a digitized tone until silenced by the alarm silence switch at the control panel.
 - 2. Visual alarm indicating appliances (xenon strobes) display a continuous pattern until extinguished by the alarm silence switch.
 - 3. Doors normally held open by door control devices release. Signal door lock systems to unlock.
 - 4. A supervised signal to notifies an approved central station to activate.
 - 5. Combination fire/smoke dampers de-energizes to normally closed position.
- B. Alarm activation of elevator lobby, hoistway, or machine room smoke or heat detector in addition to the operations listed above, cause the elevator cab to be recalled according to the following sequence:
 - 1. If the alarmed detector is on another floor other than the preferred level of egress, recall elevator cab to the preferred level of egress.
 - 2. If the alarmed detector is on the main egress level, the elevator cabs recalled to the predetermined alternate recall level as determined by the local authority having jurisdiction.
 - 3. The activation of heat detector in an elevator hoistway or machine room automatically disconnect power to the elevator motor via base-mounted contacts activating the elevator feeder shunt-trip circuit breaker. Refer to drawings.
- C. Control panel has a dedicated supervisory service indicator and a dedicated supervisory service acknowledge switch.

- D. The activation of standpipe or sprinkler valve tamper switch activates the system supervisory service audible signal and illuminate the indicator at the control panel.
 - 1. Activating the supervisory service acknowledge switch will silence the supervisory audible signal while maintaining the supervisory serviced LED on indicating the tamper contact is still in the off-normal state.
 - 2. Restoring the valve to the normal position cause the supervisory service indicator to extinguish thus indicating restoration to normal position.
- E. The activation of sprinkler pre-action system pressure or low air switch activate the system supervisory service audible signal and illuminate the indicator at the control panel.
 - 1. Activating the supervisory service acknowledge switch will silence the supervisory audible signal while maintaining the supervisory service indicator on indicating the pressure/air contact is still in the off-normal state.
 - 2. Restoring the air pressure to the normal causes the supervisory service indicator to extinguish thus indicating restoration to normal position.
- F. Immediately display alarm and trouble conditions on the control panel front alphanumeric display and of remote annunciators. If more alarms or troubles are in the system the operator may scroll to display new alarms.
- G. Alarm list key that will allow the operator to display alarms, troubles, and supervisory service conditions with the time of occurrence.
- H. In normal operation, fire alarm system close combination fire/smoke dampers when corresponding fan system is OFF. Fire alarm system open combination fire/smoke dampers when corresponding fan system is ON.

1.09 CONNECTION TO EXISTING NETWORK

- A. General: Communication between peer-to-peer fire alarm control panels via TCP/IP over existing Ethernet, RS-485, RS-232 or other previously established panel system communication protocol.
- B. Provide hardware, software and system integration to seamlessly integrate to the existing server for common system graphics, alarming, paging out of alarms via existing system.
- C. Provide upgrade to existing control monitoring to accept new alarm points.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Honeywell Notifier (fire alarm control panel)
- B. Simplex (horns, strobes, controls, etc.)

2.02 GENERAL

- A. Furnish labor, materials, and equipment required for a complete and operating system of manual and automatic initiating devices, control panels, auxiliary relays, power supplies with batteries and accessories necessary to accomplish the desired sequence of events.
- B. Fully electronic and addressable systems as described below with monitoring and annunciation of system alarms and troubles.

2.03 CONTROL PANEL

- A. Provide processor, switches, relays, solid state indicator lamps and displays, wiring, terminals, etc., as required for operation, supervision and control of complete system.
- B. General:
 - 1. Microprocessor based, point identified system utilizing twisted pair 18 to 12 AWG, depending on distance, class B communication loop.
 - 2. Equip for a minimum of four loops.
- C. Cabinet:
 - 1. 16-gauge enameled steel designed for two level access.
 - 2. Level 1 gives access to the interface control panel.
 - 3. Level 2 gives access to the electronics.
- D. Outputs: Two general alarm signal circuits, programmable signal circuits, alarm contacts, trouble contacts, and RS485 annunciator line circuit.
- E. Controls and Displays:
 - 1. Alarm silence, trouble silence, alarm/trouble acknowledge, and reset switches, 80-character LCD display, touch keypad, and power indicator.
- F. Power Supply: Minimum 1.8A of regulated, filtered power at 24 VDC plus 3A unregulated.
- G. Failsafe Auxiliary Degrade Alarm Circuit: System will perform basic detection and alarm function and send a signal to the fire department with the CPU failed.
- H. Two-Way Loop: System capable of addressing and operating smoke detectors, manual pull stations, open contact devices and addressable auxiliary control relays on the same two-wire communication loop.
- I. Battery Back-up:
 - 1. Self-charging sealed lead battery backup for system auxiliary power supplies and remote annunciators in accordance with code requirements (operate 24 hours, then alarm for 5 minutes, minimum).
 - 2. Monitor batteries and initiate a trouble signal if disconnected or discharged more than 15 percent.

2.04 CENTRAL STATION REPORTING

- A. Provide universal digital alarm communicator transmitter (UDACT) integral to fire alarm control panel enclosure or in stand-alone enclosure as required.

2.05 STROBE SYNCHRONIZATION

- A. Synchronize strobes to 1Hz flash to comply with the Americans with Disabilities Act (ADA).

2.06 SOFTWARE

- A. Field Configuration Program: Provide programmable operating instructions for the system resident program stored on a non-volatile EEPROM.
- B. Programming: Perform at the location of the fire alarm control using a laptop computer system; hard copy of the system configuration is to be updated and maintained at the site.
- C. Control-By-Event:
 - 1. Program each address for selective alarm output, zone verification operation, control point activation on alarm or trouble and transmit alarm to the fire department.
 - 2. Programmed control point activation to provide selective control.

2.07 REMOTE EQUIPMENT

- A. Annunciator Control Panels: Alphanumeric display module:
 - 1. 80 character LED/LCD display, back lighted.
 - 2. System acknowledge, signal silence, and system reset touchpad control switches.
 - 3. Time/date display.
 - 4. Integral sounder with subsequent alarm/trouble resound.
 - 5. Flush mounting.
- B. Transponders:
 - 1. Up to 26 field configurable circuits of any mix.
 - 2. Full LED/LCD display of alarm and trouble per point.
 - 3. Status displays and controls including power, on-line, local alarm and local trouble LED/LCD's plus reset and lamp test switches.
 - 4. Power supply, charger and battery as required for control panel.
- C. Lamp Driver Modules:
 - 1. Field selectable alarm and trouble or alarm only.

2. Integral system trouble lamp on-line/power LED/LCD, alarm and trouble resound with flash function of new events, serial RS-485 interface to control panel, capable of being powered remotely or locally with supervision.
 3. Integral lamp test function.
- D. Power supplies, with integral chargers and batteries current limited low energy as recommended by the manufacturer but sized for 25 percent spare capacity.

2.08 DETECTION DEVICES

- A. Analog photoelectric smoke detectors provide for individual addressing of each detector. Sensor is constantly monitored to measure change in its sensitivity due to the environment caused by dirt, aging, temperature, humidity, etc.
- B. Give an advanced indication to the control panel of the need for maintenance and can be specific as to where the maintenance is needed . It is to be mounted on a two wire standard device base. Photoelectric detectors located within the elevator shaft rated for installation within a pressurized shaft.
- C. Duct smoke detector housing assemblies accommodate the mounting of an analog/addressable detector along with a standard, relay or isolator detector mounting base. Housing protects the measuring chamber from damage and insects. Utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to twelve feet. Provide drilling templates and gaskets to facilitate locating and mounting the housing.
1. Provide sampling tube length as required to accommodate air duct width.
 2. Provide remote status/alarm LED indicator and keyswitch test station for each duct smoke detector.
 3. Duct smoke detector air velocity range includes design air velocity of the ductwork in which the duct smoke detector is to be installed.
- D. Analog thermal detectors consist of a dual thermistor sensing circuit for fast response. Sensor is continually monitored to measure changes in their sensitivity due to temperature. Advanced indication to the control panel of the need for maintenance and can be specific as to where the maintenance is needed. Mount on a two wire standard device base. Equip thermal detectors in elevator shafts and machine rooms with a set of auxiliary contacts for elevator equipment use. Rate thermal detectors located within elevator shaft for installation within a pressurized shaft.
- E. Projected Beam Type Smoke Detectors:
1. 4-wire 24 VDC and powered from the control panel four-wire smoke power source.
 2. Consists of a separate transmitter and receiver capable of being powered separately or together.
 3. Operate in either a short range of 30-feet to 100-feet or a long range of 100-feet to 300-feet.
 4. Feature a bank of four alignment LEDs on both the receiver and transmitter that are used to ensure proper alignment without the use of special tools.

5. The beam detector features automatic gain control that compensate for gradual signal deterioration from dirt accumulation on lenses. Ceiling or wall mount as shown on the drawings. Carry out testing out using calibrated test filters. Provide a key activated remote test station.
 6. Provide monitor modules for alarm and trouble and control relay module for reset.
- F. Provide addressable monitor modules an address for a single, normally open initiating device such as a waterflow switch, manual station, etc. UL approved to extend the sensor loop to lengths up to 2,500-feet.

2.09 MANUAL PULL STATIONS

- A. Single action, addressable, constructed of metal construction with a key reset switch for positive authorized resetting action. The unit to be keyed the same as the control unit.
- B. Covers for manual pull stations. Cover includes local audible notification powered by a replaceable battery.

2.10 ANNUNCIATION DEVICES

- A. Horn and Combination Horn/Strobe:
 1. Mount to a recessed box with an extension ring.
 2. Front of the unit allows for candela light levels as required by ADA for the spacing as installed.
 3. Horns provide a 100 dba peak sound output with field adjustable output level.
 4. Finish: per Architect.
- B. Strobe Lights:
 1. Triangular with FIRE on white plastic lens, polarized 24 VDC, mounting single gang on four square box.
 2. Front of the unit allows for candela light levels as required by ADA for the spacing as installed.
 3. Strobe candela level adjustable field from 15-110 CD.
 4. Mount at 80-inches or as shown on drawings.
 5. Finish: per Architect.
- C. The candela rating of each strobe installed apparent to the Fire Marshal and to qualified service personnel either as installed or with the removal of the faceplate. If faceplates are interchangeable between strobes of different ratings the indication of candela rating not on the faceplate.

2.11 ELECTROMAGNETIC DOOR HOLDERS

- A. Equipment consists of an armature contact plate with adjustable pivot mount, install on door. Mount behind the door on the wall or floor a heavy-duty electromagnet, in a durable enclosure.

- B. Fail-Safe operation, loss of power releases the door holder for the door to close.
- C. Unit accepts 12VDC, 24VAC/VDC or 120VAC. Coordinate voltage by the fire alarm system installer/supplier. Circuitry required for the systems operation provided by the system installer.
- D. Door holder equipment of the same manufacturer as the fire alarm system to ensure system compatibility and proper UL compatibility listings.

2.12 ADDRESSABLE ACCESSORIES

- A. Control Modules:
 - 1. Connects to the same loop as the initiating devices and provides a form C relay contact.
 - 2. Program module to transfer from either a trouble or alarm input from any or combination of any addressable device.

2.13 CONTROLLED DEVICES

- A. Mechanical control system for control of air handlers and smoke/fire rated dampers.
- B. Fire protection tamper, flow, dry system and preaction system.

2.14 CABLE

- A. Plenum rated as recommended by System Manufacturer and the building construction methods.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Install in accordance with code, UFC, UBC, NFPA 72, 101 and the manufacturer's instructions.
 - 2. Review proper installation of each type of device with manufacturer's agent.
 - 3. Install wiring, raceway and outlet boxes required for a complete system as indicated in the Contract Documents.
 - 4. Comply with applicable requirements of Section 26 05 33, Raceways and Boxes for Electrical Systems, for boxes and surface mounted raceways.
- B. Typical Wiring:
 - 1. Install manufacturer's recommended listed cable to connect devices as recommended by the manufacturer.
 - 2. Run cable in conduit where exposed to physical damage.

C. Detectors:

1. Locate 48-inches clear of supply air vents and 12-inches clear of lights and sprinkler heads.
2. Install detector heads not more than two weeks prior to substantial completion. Verify the design locations shown conform to the actual construction.
3. Do not locate detectors in close proximity to air supply vents.
4. Bring cases of uncertain applicability to the attention of the Architect for resolution prior to roughing in.

D. Duct Smoke Detectors

1. Provide/maintain working access to duct smoke detectors.
2. Locate duct smoke detectors in accordance with code requirements. Locations must ensure adequate airflow within the duct housing.
3. Locate remote status/alarm LED indicator and keyswitch test station at readily accessible location out of general view directly below duct smoke detector location. Identify locations on fire alarm shop drawings prior to installation.

E. Install remote annunciator as indicated on plans and where required by Fire Marshal. Coordinate prior to rough-in.

F. Provide auxiliary power supplies as required and extend the 120V power to the power supply as required and per NEC.

G. Provide visual devices and alarm devices as required. Device locations are diagrammatic showing intent of area coverage. The exact placement, sound or light level is to be per the requirements and the listing of the manufacturer's equipment.

3.02 LABELING

- A. Label alarm initiating devices with 1/2-inch by 1-inch lamicoid nameplates, indicating control panel point designation. Locate nameplates in the vicinity of the device as approved by the Owner.
- B. Provide Brady type wire markers to identify conductors at each junction or terminal. Use numbers indicated on the wiring diagrams.

3.03 TESTS

- A. Provide the service of a competent, factory-trained technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during the programming, final connections, adjustments and tests for the system.
- B. When the system is complete and prior to the substantial completion, furnish testing equipment and perform the following tests:
- C. Before energizing system, check for correct wiring connections and test for short circuits, ground faults, continuity, and insulation.

- D. Test the insulation on installed wiring by standard methods as recommended by the equipment manufacturer.
- E. Open supervised circuits to see if the trouble signal activates.
- F. Ground supervised circuits and verify response of trouble signals.
- G. Check installation, supervision, operation, and sensitivity of smoke detectors as recommended by the manufacturer to ascertain that they will avoid false alarm signals yet provide the required automatic detection.
- H. Test each device for proper operation and auxiliary function.
- I. Submit a print out of the entire test procedure to the engineer with the letter of certification for the completed fire alarm system.
- J. When defects in the work are detected, make repairs and repeat the tests as required.
- K. Test system for NFPA standby and alarm runtime for the actual load on the system batteries and recharge time of system batteries.
- L. Perform required and necessary verification of the system operating functions with the Architect and Owner's facility staff prior to turnover of the complete system for final test observed by the Fire Department. Perform tests in the presence of the Owner or the Owner's Representative. A System Certification verifying the proper system operation is required prior to acceptance. Instruct Owner's personnel in system operation, maintenance and programming for a minimum of 20 hours. The cost of retesting as a result of the failure of the system to operate in accordance with these specifications, drawings, or applicable codes paid for by the contractor to the Owner.

3.04 WARRANTY SERVICE AND INSTRUCTION

- A. The fire alarm system will be checked on a monthly basis by the fire alarm system service organization for a period of one year after beneficial occupancy. The monthly checks will consist of reviewing the operation of the system with the Owner's operating and maintenance personnel, providing additional hands on instruction, and assisting in execution of programming revisions. Each monthly visit will consist of not less than two hours of on-site time and no more than four hours. The monthly visits will be scheduled with the Owner not less than one week in advance.

3.05 EXTRA STOCK/SPARE PARTS

- A. Provide the following equipment to be turned over to the owner with the operation and maintenance manuals.
 - 1. Two photoelectric smoke detector heads
 - 2. Two thermal heat detector heads
 - 3. One addressable dry contact modules
 - 4. Two horns
 - 5. Two horns/strobes

6. One manual pull stations
7. One complete set of fuses to match panel counts

3.06 TRAINING

- A. Provide operation and maintenance training for Owner's personnel.
- B. Conduct a minimum of two maintenance training sessions upon completion of the work. Maintenance training sessions include a walk-thru of the completed facilities identifying the location, address, and means of access to every device monitored by the fire alarm system.
- C. Conduct training sessions for two operator levels.
- D. Operator training. Provide a minimum of three refresher and system update training sessions of on-the-job training.
- E. Supervisor training. Provide a system update training session for supervisory functions.
- F. Training sessions with fully qualified, trained representative, of the equipment manufacturer who is thoroughly knowledgeable of the specific installation.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Specifications for clearing, grubbing and disposing of vegetation, including bushes, brush, trees, stumps, fallen timber, logs, roots, rubbish, refuse trash, and debris within the indicated site limits.
- B. Protection from injury or defacement of trees and other vegetation and objects indicated to be preserved.
- C. Removal, salvage, or other disposition of slabs, footings and foundations; existing pavement, curbs and gutters, sidewalks, headwalls, walls, and steps; utility service facilities; guardrail and posts, highway and street signs and fences; and other miscellaneous structures and site improvements which interfere with construction.

1.02 REFERENCES

- A. California Code of Regulations, Title 8, Chapter 4, Subchapter 4 Construction Safety Orders.
- B. California Code of Regulations, Title 24, Part 2, California Building Code, Chapter 33, Site Work, Demolition and Construction.
- C. State of California, Department of Transportation (Caltrans), Standard Specifications.

1.03 JOBSITE CONDITIONS

- A. Stockpile salvaged material in a secured location.
- B. Clear and restore areas used for the Contractor's convenience. Restore such areas to their original condition, and provide mulching, seeding and planting as required.
- C. Protect survey markers and monuments, existing improvements, and adjacent properties from removal and damage.
- D. Give written notices to utility companies and municipal departments requesting discontinuance of services to areas which will be affected by the site preparation work.

PART 2 - EXECUTION

2.01 MATERIALS AND EQUIPMENT

- A. Furnish all materials, tools, equipment, facilities, and services as required for performing site clearing and preparation work.

PART 3 - EXECUTION

3.01 CLEARING AND GRUBBING

- A. Perform clearing and grubbing as necessary to remove vegetation and objectionable material from the site. Clear the site within the limits indicated, and remove cleared materials and debris from the site.
- B. Remove stumps and roots completely in excavation areas and under embankments where the original ground level is within 3.5 feet of subgrade or slope of embankments. In embankment areas, where the original ground level is more than 3.5 feet below the subgrade or slope of embankment, cut off trees, stumps, and brush to within six inches of the ground.
- C. Do not start earthwork operations in areas where clearing and grubbing are not complete, except that stumps and large roots may be removed concurrently with excavation.
- D. Where the work includes requirements for wood chip mulch, acceptable material from clearing and grubbing activities may be used to produce such mulch.

3.02 TREE BRANCHES

- A. Remove tree branches overhanging trackways, roadways, and other designated areas of the site to within 20 feet of finish grade. Cut off branches neatly and close to the tree boles. Remove other branches as necessary to present a balanced appearance. Treat scars resulting from tree branch removal with a heavy coat of an approved asphaltic tree paint.

3.03 REMOVAL

- A. Remove existing pavements, structures, and site improvements which interfere with construction, where demolition is not indicated.
- B. Remove walls and masonry construction to a minimum depth of two feet below existing ground level in areas where such items do not interfere with construction.
- C. Slabs may be broken for drainage and left in place where they are not detrimental to the structural integrity of the fill or structure to be placed above.

3.04 DISPOSAL OF REMOVED MATERIALS AND DEBRIS

- A. Dispose of removed materials, waste, trash, and debris in a safe, acceptable manner, in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction.
- B. Burying of trash and debris on the site will not be permitted. Burning of trash and debris at the site will not be permitted.
- C. Remove trash and debris from the site at frequent intervals so that its presence will not delay the progress of the work.
- D. Removed materials, waste, trash, and debris shall become the property of the Contractor and shall be removed from the District's property and disposed of in a legal manner. Location of disposal site and length of haul shall be the Contractor's responsibility.

3.05 SALVAGE

- A. Items or materials to be salvaged are indicated on the Contract Drawings and in the Contract Specifications.
- B. Protect metallic coatings on salvaged items. Remove adhering concrete from salvaged items.
- C. Repair, or replace with new material, salvaged material damaged or destroyed due to Contractor's negligence.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Specifications for excavating, backfilling and compacting for the installation of pipe and pipeline appurtenances (i.e. manholes, catch basins, area drains, etc.)

1.02 RELATED SECTIONS

- A. Section 32 11 23 – Aggregate Base

1.03 REFERENCES

- A. North Marin Water District Standard Specifications - Latest Edition
- B. Novato Sanitary District Standard Specifications - Latest Edition
- C. PG&E Standard Specifications - Latest Edition
- D. AT&T Standard Specifications - Latest Edition
- E. Marin County Uniform Construction Standards, May 2008
- F. California Plumbing Code - Latest Edition
- G. Caltrans Standard Specifications and Drawings - Latest Edition

PART 2 - PRODUCTS

2.01 BACKFILL MATERIAL

- A. Trench backfill shall consist of Class 2 Aggregate Base, unless otherwise noted.

2.02 PIPING MATERIAL

- A. All piping material shall conform to respective utility agency and the California Plumbing Code.

2.03 BURIED WARNING AND IDENTIFICATION TAPE

- A. Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3-inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, 'CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

1. Warning Tape Color Codes.

Red: Electric

Yellow: Gas, Oil; Dangerous Materials.

Orange: Telephone and Other Communications.

Blue: Water Systems.

Green: Sewer Systems.

White: Steam Systems.

Grey: Compressed Air.
2. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.
3. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3-feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.04 DETECTION WIRE FOR NON-METALLIC PIPING

- A. Detection wire shall be insulated single strand, solid copper wire with a minimum of 12 AWG.

PART 3 - EXECUTION

3.01 EXCAVATION

A. GENERAL

1. Keep trench dry throughout construction operations.
2. Trench excavation shall follow the alignment of the pipe or utility centerline.
3. No more than 100 LF of trench shall be open at one time.

B. Shoring and Bracing

1. Contractor is responsible for any damage or injury resulting from his construction operations. Contractor shall perform, at his own expense, all necessary repair work or reconstruction.
2. Contractor will be responsible for all shoring with bracing design and installation.

C. Excavation Required Beyond Trench Limits

1. Excavation (bell holes) where necessary in the sides and bottom of the trench at pipe joint locations shall be large enough to make joints and permit inspection.
2. Excavation to a greater depth than shown on the plans may be ordered by the Project Geotechnical Consultant if the native material at the bottom of the trench will not provide proper support for the pipe or if the excavation is in rock.
3. Remove all adjacent, saturated material where pipeline leaks occur.

3.02 UTILITIES

A. Location

1. Approximate known locations of underground utilities and structures are indicated on the plans. Contractor shall determine exact location of underground utilities and structures prior to construction.
2. Adjustments of pipe alignment and elevation will be authorized by the Owner where exploratory work indicates the need.

B. Excavation Around Utilities

1. Excavation and other work under or adjacent to utilities shall not interfere with their safe operations and use.
2. Probe carefully to determine the exact location of utility and hand excavate where necessary to avoid damage.
3. In the event of damage incurred during construction near such structures or property, Contractor shall immediately notify the Owner and other appropriate utility or public safety authorities and shall arrange for immediate repairs at Contractor's expense.

C. Tunneling Under Utilities

1. Tunneling may be allowed for short distances with the approval from the Project Geotechnical Consultation

3.03 BLASTING

- A. Blasting will not be permitted.

3.04 BACKFILL OF TRENCHES

- A. Prior to backfilling, the trench shall be cleared of all wood and debris.
- B. Backfill pipeline trenches to the level of the original ground surface or the underside of the pavement base course.
- C. Backfill material shall not be dropped directly on the pipe.

- D. Carefully remove timbering, sheeting, shoring and sheet piling, according to the instructions of the shoring system designer or the manufacturer, using methods that will minimize caving. If caving is occurring, the shoring system will be required to remain in place up to one to six inches above the top of the pipe.
- E. Jetting of trench backfill is not permitted.
- F. If trench has been excavated below the specified depth, that portion of the trench shall be backfilled with Class 2 or select material and compacted before pipe installation, at the Contractor's expense.
- G. If pipe or conduit has less than 18 inches of final cover, trench shall be backfilled with Control Density Fill (CDF) to a depth specified by the Engineer.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Specifications for furnishing, spreading, and compacting aggregate base course for pavements as indicated.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):

ASTM D2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D3017 Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

- B. State of California, Department of Transportation (Caltrans), Standard Specifications:

Section 17 Watering

Section 26 Aggregate Bases

- C. State of California, Department of Transportation (Caltrans), Standard Test Methods:

Calif. Test 201 Method of Soil and Aggregate Sample Preparation Aggregates

Calif. Test 202 Method of Tests for Sieve Analysis of Fine and Coarse Aggregates

Calif. Test 205 Method of Determining Percentage of Crushed Particles

Calif. Test 216 Method of Test for Relative Compaction of Untreated and Treated Soils and Aggregates

Calif. Test 217 Method of Test for Sand Equivalent

Calif. Test 229 Method of Test for Durability Index

Calif. Test 301 Method of Test for Resistance "R" Value of Treated and Untreated Bases, Subbases and Basement Soils by the Stabilometer

PART 2 - PRODUCTS

2.01 AGGREGATE BASE MATERIAL

- A. Class 2 aggregate base shall be free of vegetable matter and other deleterious substances. Coarse aggregate, material contained on the No. 4 sieve, shall consist of material of which 25

percent by weight shall be crushed particles as determined by California Test Method No. 205. Class 2 aggregate base shall conform to one of the following gradings, determined in accordance with California Test Method No. 202:

Percentage Passing Sieves for 3/4" maximum

Sieve Sizes	
2 inch	----
1 1/2 inch	----
1 inch	100
3/4 inch	90-100
No. 4	35-60
No. 30	10-30
No. 200	2-9

B. Class 2 aggregate base shall conform to the following additional requirements:

Tests	Test Method No. Calif.	Requirements
Resistance (R-Value)	301	78 min.
Sand Equivalent	217	22 min.

Tests	Test Method No. Calif.	Requirements
Durability Index	229	35 min.

2.02 SOURCE QUALITY CONTROL

A. Submit certificate of compliance for approval prior to installation of material.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Call for an inspection by the Engineer and obtain written acceptance of the prepared subgrade or subbase before proceeding with the placement of aggregate base course.
- B. The subgrade or subbase to receive aggregate base course, immediately prior to spreading, shall conform to the compaction and elevation tolerances indicated for the material involved and shall be free of standing water and loose or extraneous material.

3.02 INSTALLATION STANDARDS

- A. Aggregate base course shall be applied over the prepared subgrade or subbase and compacted in accordance with Section 26 of the Caltrans Standard Specifications.
- B. Aggregate base course shall be minimum uniform thickness after compaction of dimensions indicated. Where not indicated, compacted thickness shall be six inches for driveways/sidewalks and eight inches for roadways.
- C. All compaction expressed in percentages in this section refers to the maximum dry density as determined by California Test Method No. 216.

3.03 SPREADING OF MATERIAL

- A. Aggregate for base course shall be delivered as uniform mixture of fine and coarse aggregate and shall be spread in layers without segregation.
- B. Aggregate base course material shall be free from pockets of large and fine material. Segregated materials shall be remixed until uniform.
- C. Aggregate base material shall be moisture-conditioned to near optimum moisture content in accordance with the applicable requirements of Section 17 of the Caltrans Standard Specifications.
- D. Aggregate base course six inches and less in thickness may be spread and compacted in one layer. For thicknesses greater than six inches, the base course aggregate shall be spread and compacted in two or more layers of uniform thickness not greater than six inches each.

3.04 COMPACTING

- A. Relative compaction of each layer of compacted aggregate base material shall be not less than 95 percent as determined by California Test Method No. 216.
- B. Thickness of finished base course shall not vary more than 3/4 inch from the indicated thickness at any point. Base which does not conform to this requirement shall be reshaped or reworked, watered, and recompact to achieve compliance with specified requirements.
- C. The surface of the finished aggregate base course at any point shall not vary more than 3/4 inch above or below the indicated grade.

3.05 FIELD QUALITY CONTROL

- A. Perform field tests in accordance with ASTM D2922 to determine compliance with specified requirements for density and compaction of aggregate base material, and with ASTM D3017 to determine moisture-content compliance of the installed base course.

END OF SECTION

SECTION 32 12 16

ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Specifications for providing asphaltic concrete paving as indicated.

1.02 RELATED SECTIONS

- A. Section 32 11 23 – Aggregate Base
- B. Section 32 17 23 – Pavement Marking

1.03 REFERENCES

- A. State of California, Department of Transportation (Caltrans), Standard Specifications
 - Section 39 Asphalt Concrete
 - Section 92 Asphalts
 - Section 93 Liquid Asphalts
 - Section 94 Asphaltic Emulsions
- B. State of California, Department of Transportation (Caltrans), Standard Test Methods
 - Calif. Test 202 Method of Tests for Sieve Analysis of Fine and Coarse Aggregates
 - Calif. Test 304 Method of Preparation of Bituminous Mixtures for Testing
 - Calif. Test 366 Method of Test for Stabilometer Value
 - Calif. Test 375 Determining the In Place Density and Relative Compaction of AC Pavement

1.04 PROTECTION

- A. Protect concrete pavements and walks, curbs and bases, and other improvements adjacent to the operations with suitable materials. The Contractor shall be responsible for any damage caused by the Contractor's employees or equipment and shall make necessary repairs. Building and other surfaces shall be covered with paper or other protection, where required. All damage caused by the Contractor's operations shall be prepared or replaced as required.

PART 2 - PRODUCTS

2.01 BASE COURSE MATERIAL

- A. Class 2 Aggregate Base. Percentage composition by weight of aggregate base material shall conform to the 3/4 inch maximum grading when determined by California Test 202.

2.02 TACK COAT (VERTICAL SURFACES)

- A. Tack Coat: Diluted SS-1 or SS-1h emulsion or undiluted RS-1 emulsion in conformance with Section 94 or the Caltrans Standard Specifications.

2.03 ASPHALT PAVING MATERIALS

- A. Paving Asphalt: All purpose, aged residue, steam refined, PG 64-16 grade, in accordance with Section 92 of the Caltrans Standard Specifications.
- B. Aggregate: Type A, with the grading of the combined aggregate conforming to 1/2 inch maximum size, medium grading, as specified in Section 39 of the Caltrans Standard Specifications.
- C. Mixing Facilities: Asphalt concrete surfacing material shall be furnished from an approved commercial asphalt central mixing plant.

2.04 SOURCE QUALITY CONTROL

- A. Contractor shall submit Certificate of Compliance from manufacturer for approval prior to installation.

2.05 A.C. DIKE/BERM

- A. A.C. dikes shall be per Caltrans Standard A87, Type B. Dikes shall be installed by means of a continuance automatic curbing machine.
- B. A.C. berms shall be installed as detailed in the drawing.

PART 3 - EXECUTION

3.01 PLACING OF BASE COURSE

- A. The Contractor shall call for an inspection by the Engineer and obtain written approval of the subgrade before proceeding with the base course.
- B. Base course shall be minimum uniform thickness after compaction of dimensions indicated. Where not indicated, compacted thickness shall be six inches for parking stalls and eight inches for roads, driveways, and aisles of parking areas.
- C. Base course shall be placed over finished subgrade and compacted in accordance with Section 32 11 00 - Aggregate Base.

- D. After base course has been completed, the Contractor shall call for an inspection by the Engineer and obtain written approval before proceeding with application of the asphalt wearing surface.

3.02 PLACING ASPHALT CONCRETE

- A. Areas to be paved shall be covered with a layer of hot asphalt concrete surfacing not less than the thickness indicated after compaction. Where not indicated, compacted thickness shall be two inches for parking stalls and three inches for roads, driveways, and aisles of parking areas.
- B. Paving asphaltic concrete shall be delivered, laid, rolled, and finished in accordance with Section 39 of the Caltrans Standard Specifications.
- C. Before placing asphalt concrete, a tack coat (paint binder) shall be applied to all vertical surfaces against which asphalt concrete surfacing will be placed. Tack coat (paint binder) shall be applied in accordance with Section 39-4 of the Caltrans Standard Specifications at the rate of from 0.02 to 0.10 gallons per square yard.
- D. Finish surface of the wearing course shall be thoroughly compacted, smooth, and free from ruts, humps, depressions, cold joints, or other irregularities.
- E. Finish paving shall conform to slopes, lines, and finish grades indicated, and shall drain properly. Where adjacent surfaces are intended to be flush (as at concrete gutters, walks, and paving), they shall conform smoothly at all joints.
- F. Ridges, indentations, and other objectionable marks left in the surface of the asphalt concrete by paving or rolling equipment shall be eliminated by rolling. The use of equipment that leaves ridges, indentations, or other objectionable marks in the asphalt concrete shall be discontinued, and other acceptable equipment shall be employed.
- G. Where cold joints are indicated or necessary, cut back the placed and compacted cold asphalt a minimum of three inches with a concrete or masonry power saw, so that a vertical face of compacted full thickness material is exposed. Treat this surface with a tack coat before proceeding with the placement of new asphaltic concrete surfacing.
- H. Finish paving shall conform to finish elevations within plus or minus 0.01 of a foot and shall be level to within plus or minus 1/4 inch in 10 feet when measured with a 10 foot straightedge in any direction.

3.03 FIELD QUALITY CONTROL

- A. The Contractor shall control the quality of the work and shall provide adequate testing to assure compliance with these Specifications.
- B. After completion of paving work, all paving shall be flooded with water, and any resulting "ponds" shall be ringed with chalk. Such hollows shall be corrected with addition of asphalt paving materials and rerolling until all paving is completely level and free from hollows and high spots.
- C. The Engineer shall perform in-place density and compaction tests of the completed pavement in accordance with California Test 375 to determine compliance with specified requirements. Test shall be performed as often as necessary to verify compliance, but not less frequently than the following:

1. One test for each street or driveway intersection for which asphalt pavement replacement is required.
2. One test for every 1,000 square yards of asphalt pavement at locations where the paved area exceeds 1,000 square yards.

3.04 MAINTENANCE OF PAVEMENT

- A. Upon completion of final rolling, traffic shall not be permitted on the finished pavement for at least six hours, and until the asphalt concrete has cooled sufficiently to withstand traffic without being deformed.
- B. Finished pavement shall be maintained in finished clean condition until the work is accepted by the District.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Specifications for providing traffic striping and control markings on pavement, parking stall striping, and painted curbs as indicated.

1.02 RELATED SECTIONS

- A. Section 32 12 16 – Asphaltic Concrete Paving

1.03 REFERENCES

- A. State of California, Department of Transportation (Caltrans), Standard Specifications/ Manuals
 - Section 84 Traffic Stripes and Pavement Markings
 - Section 85 Pavement Markers
 - Traffic Manual Standard Drawings Latest Edition
- B. State of California, Department of Transportation (Caltrans), Standard Test Methods
 - Calif. Test 669 Testing for Specification Compliance of Non-Reflective and Reflective Pavement Markers
- C. California Air Resources Board (CARB)
 - CARB/VOC Permissible Content of Volatile Compounds (VOC in Paints)

1.04 SUBMITTALS

- A. Shop Drawings

Submit drawings and diagrams, indicating stripe width of roadway divider stripes and parking stalls, configuration and dimensions of directional arrows, style and size of letters for “compact car” designation, configuration and dimensions of international handicapped symbol, and any other traffic control markings on pavement, such as “in” and “out” or “enter” and “exit” designations.

- B. Certificate of Compliance

Submit evidence or affidavit which certifies that paint to be used complies with latest CARB/VOC regulations.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Traffic Line Paint

Provide paint conforming to the requirements of Section 84 of the Caltrans Standard Specifications, white in color for traffic striping, parking stalls, and other control markings on pavement, yellow in color for traffic control markings where indicated, blue in color for handicapped parking stalls, red in color for curbs where no parking is indicated, white in color for curbs where passenger discharge and pickup is indicated.

B. Thermoplastic Traffic Stripes and Pavement Markings

Provide thermoplastic traffic stripes and pavement markings where indicated, including glass beads, conforming to the requirements of Section 84 of the Caltrans Standard Specifications.

C. Paint for parking stalls and ADA Striping shall be waterborne, white, State Specification PTWB-01R2 (March 2010)

D. Markers

Provide markers and adhesive in accordance with Section 85 of the Caltrans Standard Specifications.

Markers for hydrants 4" x 4" x 3/4", blue prismatic, high-impact plastic conforming to ASTM D-788, Grade 8 and shall conformed to the local Fire Protection District Standards. The hydrant markers shall be attached to the pavement using a hot melt bituminous adhesive conforming to Section 85 of the Standard Specifications.

PART 3 - EXECUTION

3.01 APPLICATION

A. Provide traffic striping and control markings on pavement and parking stalls in accordance with the layout, configurations, and dimensions indicated on the Contract Drawings or Construction Drawings and approved shop drawings.

B. Paint application equipment shall conform to the requirements of the Caltrans Standard Specifications. Place markers in accordance with Section 85 of the Caltrans Standard Specifications.

C. Traffic control markings and parking stalls shall be applied with the use of substantial cutout patterns and templates, or with striping equipment which applies straight, uniform width, sharp lines. Coverage of paint shall be thorough and complete in accordance with the paint manufacturer's instructions and recommendations.

D. Where "enter" and "exit" control markings are side-by-side on pavements, indicating two-way traffic, such as "enter and "exit" designations shall be different colors, such as white and yellow, with a centerline separating the two directions of traffic.

E. Traffic control markings and parking stalls shall be sharp and accurate, straight where required, without fuzziness at edges of lines.

- F. Accessible parking stalls shall include the International Accessible Symbol.
- G. At completion, Contractor shall check the work thoroughly and shall touch-up traffic control markings and parking stalls which are not distinct or thorough in coverage, or which are not uniform in color.
- H. Pavement markers shall be placed according to the State Traffic Manual details, except as modified by the project plans or Engineer. All missing and/or broken reflectors shall be replaced within the project limits. The blue reflector shall be installed in the center of the traffic lane adjacent to each fire hydrant. It is the contractor's responsibility to locate each fire hydrant. Pavement markers shall be applied within four days of resurfacing.

3.02 FIELD QUALITY CONTROL

- A. Perform tests in accordance with Caltrans Test 669 to verify compliance with Specification requirements.

END OF SECTION

APPENDIX

Owner Performance Requirements

Report No. 2 Acoustics and Noise Control

Acoustic Partition Details

Report No. 3 VRF Units Exterior Noise Control

- A Fabric Wrapped Panel Information
 - B Low Pressure HVAC Systems Acoustic Requirements and Performance Criteria
 - C Plumbing System Noise and Vibration Control
 - D Emergency Backup Generator Acoustic Requirements and Performance Criteria
 - E Sound Masking Design Guidelines and Performance Criteria
 - F Operable Partition Acoustic Requirements and Design Guidelines
- Acoustics Product Data Sheets
- Lighting Cut Sheets



ACOUSTIC ARTS AND ENGINEERING

College of Marin, Building 11 Renovation Project #1

March 8, 2017

Report No. 1 - Acoustics

Owner Performance Requirements - Final

Tim Schmidt
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INTRODUCTION

The following outlines acoustic design criteria and performance requirements for the Building 11 Renovation Project located on the Indian Valley Campus of the College of Marin in Novato, California.

The existing 2 story building will be re-purposed to include new administrative offices and meeting rooms for human resources occupying the second floor. The 2nd floor will be completely reconfigured. A central reception/lounge area will be surrounded by perimeter offices, storage rooms, a kitchenette, an elevator, toilet rooms, and meeting rooms. Existing offices, the elevator, the IT room, and restrooms on the first floor will be maintained. The first floor finishes and mechanical systems will be replaced.

The acoustics scope includes the following design items:

- Interior noise and reverberation control
- sound isolation
- impact isolation
- control of building services noise and vibration
- exterior noise insulation

The transmission of speech and activity noise to meeting rooms and private offices is a key concern on the second floor. The second floor will be occupied by the Human Resources department. Concurrent conversations and unrelated speech in the Lounge may be distracting in the offices or meeting rooms. Acoustically sealed doors and separations are recommended. A sound masking system is recommended to further improve acoustic privacy. The sound masking system itself may be installed in the future as part of a separate project.

ACOUSTIC STANDARDS

Acoustic design *requirements* are based on industry accepted acoustic design practices and standards, and fundamental principles for achieving satisfactory acoustic conditions for worship spaces, presentation spaces, offices, and classrooms.

The following design standards apply:

- ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- ASTM E413 Classification for Rating Sound Insulation
- ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

DESIGN GUIDELINES

The following industry design guidelines should be used to establish acoustic criteria and requirements:

- 1) American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 2011 ASHRAE Handbook – HVAC Applications, Chapter 48.3, Table 1, or current version.
- 2) ASTM E 557, Standard Guide for the Installation of Operable Partitions

REGULATORY CODES

The project design must comply with the acoustic performance requirements included in the following regulatory codes:

- 1) California Green Building Standards Code (Part 11 of Title 24, California Code of Regulations). Version 2016 Green Building Standards Code, effective January 1, 2017.

ACOUSTIC DESIGN CRITERIA

EXTERIOR NOISE

Located away from roadways and with low volumes of local traffic, exterior noise levels due to transportation sources are not a concern. Standard exterior wall constructions and insulated glazing are sufficient to protect interior spaces from traffic noise associated with the roadway and parking area closest to the site. During my site visit I observed that the site was relatively quiet with a sound scape comprised mostly of creek noise, birds, wind, etc.

PROJECT GENERATED NOISE

New outdoor mechanical equipment is proposed near the building 11 and will serve Buildings 8 – 12. Outdoor mechanical equipment can generate excessive exterior noise and will impact the project without proper noise controls.

A new back-up power diesel generator will be located approximately 38 feet from Building 11. This equipment is for back-up power only and will not be operated except during a power outage. Building 11 and other buildings will be exposed to occasional outdoor noise from the short-term operation (testing) of the back-up power generator.

It is assumed that the generator will not be tested during occupied hours, and the generator noise would not impact the project during normal operations.

During a power outage, the generator will operate while the building is occupied, and considerations should be given to the placement of the generator, the orientation, and the design of an enclosure. The noise levels should be mitigated as much as possible. Note that achieving a stringent criterion based on “normal” operations would not be feasible. Generator enclosures and noise control systems are very expensive. For this reason, a noise criterion is proposed for the generator operations that is higher than the criterion for continuous operating equipment.

Noise from proposed VRF units is also a concern.

The existing windows will be replaced with insulated glazing units (IGU). The second floor will have a mix of fixed and operable windows. The preferred noise control strategy is to enclose the outdoor mechanical equipment with solid constructions, to shield all offices from a direct view of the equipment, and to reduce the noise levels at the source. The generator can be oriented so that the exhaust is directed away from the project, and the walkways. This end of the unit is expected to have the highest noise levels.

Buildings 8 through 12 will be occupied from 6:30 a.m. to 10:30 p.m. Monday through Friday, and on Saturdays from 6:30 a.m. to 12:00 p.m. It is reasonable to assume minimal foot traffic around the buildings outside of these times.

Outdoor Emergency Generator

The testing should be scheduled during times when the surrounding buildings are not occupied such on a Sunday.

Project generated noise from the operation of the backup generator should not exceed 55 dBA at the windows of surrounding buildings and should be limited to maximum 65 dBA at public walkways near the equipment.

A solid, acoustically rated barrier wall may be needed to shield the adjacent buildings from the direct generator noise.

VRF units

The primary outdoor noise emissions from the project will be from VRF units located adjacent to Building 11, on the east side. A total of 4 VRF condenser units will be located on the pad which is approximately 8 ft from the East Side of Building 11. It is expected that these will be running continuously while the buildings are occupied. VRF noise will potentially impact nearby buildings as well as Building 11.

Project generated noise from the operation of the VRF units should not exceed 35 dBA at the exterior walkways.

A solid, acoustical barrier around the VRF units will help to shield the closest offices on Level 1. The exact location and size of the barrier to be determined. The primary objective is to achieve line of sight shielding to the surrounding buildings and particularly the offices with operable windows.

REVERBERATION TIME

A key acoustic parameter used to characterize interior acoustic performance is the reverberation time. The T60 metric is a common measure (in seconds) of reverberation and quantifies the persistence of sound in an enclosed space. The T60 is defined by the time required for an acoustic signal to drop 60 decibels in level starting from the interruption of a loud signal. For example; a T60 of 1.4s is associated with a space where an 80-decibel sound drops to 20 decibels in 1.4 seconds. The T60 can be a single number specified at the 500 Hz or 1k Hz octave bands, or as the average time over a wider range of frequencies.

The single number T60 performance criteria shall be the average of T60 values in octave bands 500 Hz, 1000 Hz, and 2000 Hz, and will include no more than 0.1s variation between adjacent bands.

MEETING ROOM

The following outlines reverberation time requirements for the Meeting Room.

- Room reverberation time (T60) at or below 0.8s (unoccupied), and with the meeting rooms combined.
- The T60 shall be either the maximum value or the average of all values in octave bands 500 Hz, 1000 Hz, and 2000 Hz, and shall have no more than 0.2s variation between these adjacent bands.
- The following table presents recommended octave band T60 criteria:

Table 1: Reverberation Time Criteria

Room Condition	Recommended Maximum Reverberation Time, T60 (seconds) ^{1,2}						
	125 Hz	250 Hz	500 Hz	1kHz	2kHz	4kHz	8kHz
Unoccupied	1.2	1.0	0.9	0.8	0.7	0.65	0.6

Table notes:

1. Measured or modeled reverberation time in each octave band from 250 Hz to 4k Hz should be characterized by a smooth decay and without significant dual slopes to at least 30dB below the start of the decay slope.
2. No perceptible flutter echo or audible discrete late sound reflections.

RECEPTION / LOUNGE

This space will have a high ceiling and large room volume. This generally increases the reverberation time.

- Room reverberation time (T60) at or below 1.2 s (unoccupied).
- The T60 performance shall be the average of T60 values in octave bands 500 Hz, 1000 Hz, and 2000 Hz.

PRIVATE OFFICES

- Room reverberation time (T60) at or below 0.8 s (unoccupied).
- The T60 performance shall be the average of T60 values in octave bands 500 Hz, 1000 Hz, and 2000 Hz, and will include no more than 0.1s variation between adjacent bands.

FILE ROOM

- No acoustic requirements

SOUND ISOLATION

Doors

The project does not require a confidential level of acoustic privacy in any interior spaces. However, improved acoustic performance is recommended between offices, meeting rooms, and also across walls with entry doors. Doors are typically the weak link in the acoustic separation and sound flanking around the door bottom, or through gaps between the door panel and the jamb can significantly reduce the acoustic performance of the door.

Type DR1 is an acoustically non-rated door type but is acoustically sealed on three sides. This is recommended in all private offices and meeting rooms which will be carpeted. This is an acoustically improved standard solid wood door with acoustic seals at jambs and door head. Where there is carpeting the door bottom will not be sealed. By keeping the gap at the door bottom as small as possible the flanking is controlled. Vision lites in the door should also be specified with thick glazing and perimeter gaskets.

Partitions

Solid, full height, acoustically rated partitions are recommended between occupied spaces.

The following presents basic sound isolation criteria for interior separations on level 2. Note that existing partitions on level 1 will not be upgraded. These constructions are not acoustically tested and/or may not meet the recommended criteria.

Private Office / Private Office

partition: STC 45, Type A1

door: no door

Private Office / Reception

partition: STC 32 – 35 (storefront glazing)

door: acoustically sealed type DR-1

Office / Elevator Shaft

partition: STC 54 (shaft + furred wall), Type A3

door: no door

Meeting Room / Private Office

partition: STC 50, Type A2

door: no door

Meeting Room / Reception Area

partition: STC 45, Type A1

door: sliding door (acoustically treated/sealed)

Meeting Room / Meeting Room

partition: operable partition rated STC 50

Office / Restroom (Level 1)

partition: existing - with a partial furred wall.

door: no door

BUILDING SERVICES NOISE

The building ventilation systems, plumbing systems, and other systems must be designed to minimize noise and to achieve a subjectively neutral background ambient sound in the key offices and meeting spaces.

The following table presents recommended maximum background noise limits for building services equipment and systems:

Table 2: Noise Criteria

Room Description	Background Sound Level LAeq	Noise Criteria NC
Stair well	40	35
Private Office	35	30
Meeting Rooms	35	30
Reception / Lounge	40	35
Corridors/Toilet	40	35
Kitchenette	40	35

Table notes:

1. Audible noise due to operation of HVAC sources should have no noticeable vibration induced noise content, rumble, distinct tones, or impulsive characteristics. Sound levels are based on all equipment operating normally and together.
2. Maximum sound level at any location in the room as measured at ear height and minimum 4 ft from any wall or sound reflective surface.

Noise emissions from low pressure mechanical systems should be controlled by specifying quiet fan units. FCUs located above the offices should be located away from the Reception/Lounge. Sheet metal and flexible ducts should be installed above the hard lid ceilings, and configured to achieve good airflow (non-turbulent) conditions.

Duct air velocities should not exceed the recommended air velocities for the project based on NC criterion of space served. Refer to maximum recommended duct velocities.

∞ End of Document ∞



ACOUSTIC ARTS AND ENGINEERING

College of Marin, Building 11 Renovation Project #1

March 10, 2017

Report No. 2 – Acoustics and Noise Control

Acoustic Design Recommendations

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INTRODUCTION

The following outlines acoustic design strategies and detailed recommendations for the Building 11 Renovation Project located on the Indian Valley Campus of the College of Marin in Novato, California.

The existing 2 story building will be re-purposed to include new administrative offices, meeting rooms, as well as a common Reception/Lounge area.

The following acoustic design items are addressed:

- Interior noise and reverberation control
- sound isolation
- impact isolation
- control of building services noise and vibration
- exterior noise insulation

Exterior noise control recommendations related to proposed outdoor mechanical equipment will be issued separately (Report No 3).

Refer to the previously issued Owner Performance Requirements for acoustic design requirements and design criteria for each space.

March 10, 2017

Acoustics

INTERIOR ACOUSTICS

The following outlines interior acoustic strategies and preliminary finish recommendations for each space:

Reception / Lounge

The Reception / Lounge will be open to the deck and will have a relatively large room volume. This space will be more reverberant due to the large volume. The entire open area on the second floor will have an exposed ceiling deck. The existing deck is a wood plank construction and will be mostly sound reflective.

A key interior acoustics concern is general noise intrusion from activity and talking in and around the stairwell and open areas to the perimeter meeting rooms and private offices.

This reception area is expected to be used for breaks and may have concurrent conversations and casual meetings. The offices and meeting rooms are for HR and will be used for sensitive discussions. Therefore, control of speech transmission warrants acoustically sealed separations, at a minimum at the perimeter offices.

The offices will be occupied by the HR department and occupants may be discussing issues of a personal nature. Since the client has not requested a high level of acoustic privacy between these areas the design strategy calls for cost effective systems as much as possible, while avoiding acoustically rated doors and glazing. It is assumed that the meeting rooms are not be as acoustically sensitive as the offices.

The reception area should be acoustically treated with sound absorptive finishes to control noise and sound reflections. Carpeting is specified throughout and batt insulation will be installed above the ceilings of the perimeter offices and meeting rooms (exposed to the reception area volume). These finishes will help to reduce general room reverberation and may be sufficient.

Future acoustical improvements to the reception area may be achieved by surface mounting wall treatments such as fabric wrapped wall panels. These will be beneficial if the reception area is more active/noisy than expected. Wall panels can generally be easily installed after the building is occupied.

A sound masking system is recommended if sensitive meetings and discussions from the meeting rooms should not be overheard in the open work area. Note that a sound masking system should only be installed in the open area, not in private offices.

The following outlines the acoustic finishes recommended for this space:

Surface above Offices and Meeting Rooms:

- Exposed batt insulation is recommended on top of the surfaces above the private offices and meeting rooms. This is for reverberation control in the high ceiling space (reception). Standard, unfaced batt insulation (R19 or thicker) may be specified. A minimum coverage area of 50% is recommended.

Recommended products:

Standard, unfaced, R19 batt insulation, cotton, or fiberglass.

Floor:

- Current design indicates ¼" thick carpet tiles in all areas. Standard commercial carpet is sufficient to dampen walking/impact noise. Carpet pad is not required.

Wall Finishes:

- In the future, after the building is occupied and the room activity level is better understood, some wall areas may be treated with surface mounted acoustic wall panels. These should be specified with a minimum NRC 0.85. A fabric wrapped panel or a digital printed art panel may also be installed.

Install a minimum of 48 ft² coverage area distributed between at least 3 wall surfaces in the Open Area to start. Exact layout tbd.

Recommended products:

Decoustics, Type AP Panel (see data sheet 1A).

Lamvin, fabric wrapped panel (see data sheet 1B).

Wall Technology, fabric wrapped panel (see data sheet 1C).

A sound masking system is recommended if sensitive meetings and discussions should not be overheard in the open work area. A sound masking system should only be installed in the open area. Refer to appended guidelines and requirements.

PRIVATE OFFICES

The following outlines the acoustic finishes recommended for private offices:

Ceilings:

- The ceiling will be gyp bd and will not be acoustically treated.

Floor:

- Current design indicates ¼" thick carpet tiles in all offices. Standard commercial carpet is sufficient to dampen walking/impact noise from the second floor. Carpet pad is not required.

Wall Finishes:

- Wall surfaces in private offices do not require acoustic finishes.

MEETING ROOM

The following outlines the acoustic finishes recommended for this space:

Ceilings:

- The ceiling will be gyp bd and will not be acoustically treated.

Floor:

- Current design indicates ¼" thick carpet tiles. Standard commercial carpet is sufficient to dampen walking/impact noise. Carpet pad is not required.

Wall Finishes:

- Operable walls will have felt material to improve the acoustics of the meeting rooms. However, when the operable wall is closed the benefit of the felt is no longer relevant. Also note that the space will be more reverberant when the meeting rooms are combined.
- Acoustic wall panels are recommended in the meeting room and should be specified with a minimum NRC 0.85. A tackable panel may be used.

Minimum total 24 ft² coverage area is recommended across several wall surfaces for each meeting room with most of the treatment installed on the end walls. These treatments are important if the rooms are used for teleconferencing which requires that the reverberation and echoes be controlled.

March 10, 2017

Acoustics

Wall panels can generally be easily installed after the building is occupied.

Recommended products:

Decoustics, Type AP Panel (see data sheet 1A).

Lamvin, fabric wrapped panel (see data sheet 1B).

Wall Technology, fabric wrapped panel (see data sheet 1C).

STAIR

The following outlines the acoustic finishes recommended for this space:

Ceilings:

- The stair will be open to the main open area on level 2.

Wall Finishes:

- Not required.

Stair Treads:

- Carpet is recommended on stair treads.
- The stairs will be maintained and are currently noisy due to resonance related to foot fall impact. The stair framing should be reinforced and treads stiffened with additional materials and screw attachment.

Stiffening plates of plywood can be screw attached to the existing treads from the bottom and with additional adhesive applied to the full area of the reinforcing plates. The screws should be spaced every 12".

- Current design indicates ¼" thick carpet. Standard commercial carpet is sufficient to dampen walking/impact noise. Carpet pad is not required.
- The void under the stairs should be insulated with a rigid polyester fiber insulation board at the back wall of the janitor storage space. Data sheets have been provided.

TOILETS

Noise intrusion from the restrooms is concern. The toilet fixtures should be selected for quiet operation.

Electric hand dryers are not recommended as these tend to generate high levels of noise and may transmit through the wall to the offices.

Where hand dryers are a priority select hand dryers with a low air speed and a quiet noise rating. Recommendations are pending.

March 10, 2017

Acoustics

File Room

- Acoustic wall finishes are not required

SOUND ISOLATION - RECOMMENDATIONS

Refer to schematic level details for partitions issued previously.

The following outlines sound isolation strategies and preliminary partition recommendations for each separation:

Floor Construction

I understand that the floor separation includes a 3" thick layer of lightweight concrete over 3/8" thick plywood over 3 x 6 T&G planking. The joists are at least 16" deep. The clearance (air space) above the first floor finish ceiling is roughly 3'-3".

The ceiling tile specified for the lower floor spaces is an Armstrong Ultima Beveled Tegular Tile ceiling with a CAC 40 and NRC 0.75 rating.

The floor separation should include minimum R19, un-faced, batt insulation in the joist cavity.

Interior Partitions:

Refer to schematic details (acoustic types) issued previously

- Solid partitions with 25 metal stud framing, 24" on center are proposed.
- Interior partitions separating enclosed offices: Type A1
- Partitions separating the Private Offices from Meeting Rooms should be Type A2
- Partitions separating the Private Offices from a restroom should be Type A3
- Outlets in the demising partitions should be sealed with putty pads, and all joints should be filled with acoustical sealant.

March 10, 2017

Acoustics

At sensitive areas that require an upgraded constructions or where equipment noise is a concern such as in the elevator machine room or the IT room the following measures may be needed – to be confirmed:

1. Additional gypsum board layers.
2. Add extra layer of damped gypsum board such as Quiet Rock damped gypsum board Type 510 ES may be installed over existing partitions that will be maintained.

Door Types

Doors should be solid wood panel doors installed with perimeter acoustic compression seals such as Type S88 by Pemko or equal by Zero International. Refer to attached data sheets for information. Vision lites in solid doors will reduce the sound isolation performance unless high performance glazing and airtight gaskets are specified.

Sliding Doors at Meeting Rooms

The sliders at the meeting rooms are aluminum framed glass. Glass has limited acoustical performance and sliding doors are challenging to acoustically seal on the top, bottom, and one side.

If the meeting rooms will be used for teleconferencing a slightly higher level of acoustic privacy is recommended. Tele-conference participants often use a higher than normal voice level to be understood. This is particularly relevant in larger meetings with a single microphone in the center of a table, and with a large distance from the microphone to the talker. If the speech privacy is a priority the meeting room sliding doors should be designed with seals, including bottom seals, and special treatments to mitigate speech transmission between the meeting rooms and the Reception/Lounge.

The sliding doors as proposed cannot be fitted with bottom seals or top seals, or seals at outside end of the door panels.

- A carpeted floor finish is recommended under the door to help reduce flanking under the door.
- The door should be installed with minimal clearance/gap under the door, between the door panels, and between the door and the wall.
- A minimum ½" thick glazing recommended.
- Acoustical compression seals should be specified at the meeting stiles. Refer to attached data sheet.

Operable Partition in the Meeting Room

The operable partition in the Meeting Room should be acoustically rated and the surround designed to reduce sound flanking. Note that high performance operable partitions are heavier and can be very costly, and the acoustic performance of the separation is limited. Modern Fold operable partition systems (or equal manufacturer) may be specified with performance ratings ranging from STC 41 up to STC 55. A minimum STC 47 system is recommended for this project. Please confirm that this if a higher degree of acoustic separation is required between these two rooms.

Refer to appended acoustic requirements and guidelines for operable partitions.

Ceilings

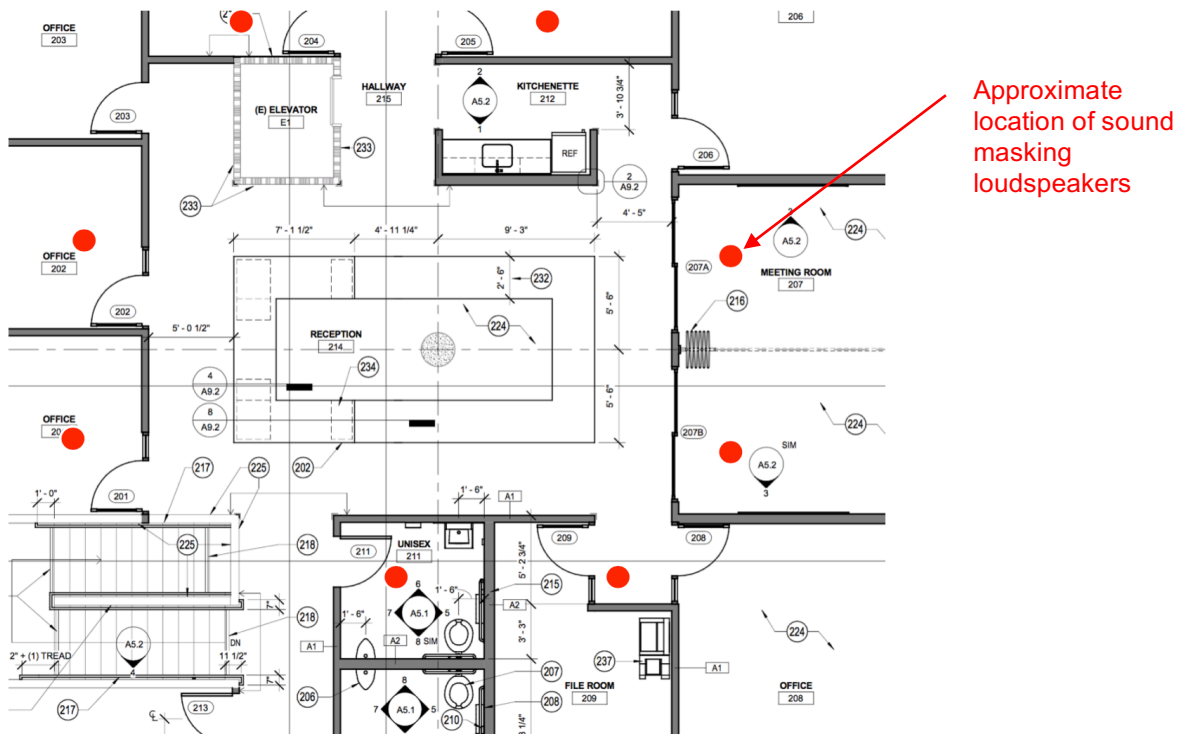
1. Ceilings in the offices and meeting rooms on the second floor will be gypsum board. The demising walls may terminate at this ceiling. Specify a minimum 5/8" thick Type X gypsum board ceiling. All fixtures should be acoustically sealed. Recessed fixtures should be enclosed with a gypsum board enclosure, taped and caulked airtight.
2. Mechanical equipment should be mounted on vibration isolation pads, on separate framing from the ceiling.
3. Return air openings in sensitive private offices, and in the meeting rooms should have an acoustically lined sheet metal elbow (boot) that has 1" thick duct lining on all interior surfaces. The elbow should extend a minimum distance of 20" from the inside corner. Refer to appended schematic detail for transfer air.
4. The open return air openings in non-sensitive offices with normal privacy requirements may have an acoustically tested and approved wrapped, flexible boot such as Flexaboot® by Build Right Products, LLC. See the following website for information.

<http://flexaboot.com>

Refer to appended schematic detail for transfer air.

SOUND MASKING

A sound masking system is recommended if sensitive meetings and discussions should not be overheard in the open work area. A sound masking system should only be installed in the open reception/lounge area. Refer to Appendix E for guidelines and also see data sheets for recommended electronic sound systems that may be specified for this project. The following layout shows the recommended layout for the loudspeakers. There should be a minimum of 8 loudspeakers installed. These should be installed so they cannot be seen, and pointed up toward the exposed deck.



MECHANICAL AND PLUMBING NOISE CONTROL

Noise and vibration control comments are pending review of the MEP design documents.

All rotating or vibrating equipment should be vibration isolated. All new and existing mechanical equipment should be located remotely from acoustically sensitive spaces and/or enclosed in an insulated enclosure with solid gypsum board constructions providing noise control.

Vibration isolation mounts and sleeves are recommended at all active plumbing pipes.

Refer to appended mechanical noise control guidelines (Appendix B and C) for general strategies to maintain low ambient sound levels due to operation of mechanical and plumbing systems.

ELEVATOR

Noise and vibration control requirements are not included in this review. Noise from the elevator machine room is a potential concern. The elevator is currently out of order.

∞ End of Document ∞

ACOUSTIC PARTITION DETAILS

ACOUSTIC PARTITIONS - GENERAL NOTES:

1. Install multiple layers of GWB with staggered panel joints offset by minimum of 18".
2. Caulk and tape all joints and gaps in outer layers of GWB including all perimeter edges. Use acoustical caulking or approved non-hardening caulk.
3. Install electrical, AV, and teledata outlets with steel junction boxes.
4. Avoid back to back outlet configurations. Offset wall outlets on opposite sides of wall by at least 2 stud cavities, or at least 36" vertical.
5. Active piping, ductwork, or conduit connected to vibrating equipment shall not be rigidly supported or have contact with partition. Coordinate with trades installing these systems to maintain physical separation between these systems and acoustically rated partitions.
6. Stud size and spacing affects the sound rating of partitions. Partitions installed with alternate stud sizes and/or configurations (deviating from those indicated in acoustic details) may have a different STC rating. Alternate stud configurations must be reviewed and approved for acoustic performance. STC ratings are based on metal stud construction with a 20" - 24" spacing.
7. Seal all gaps and joints in acoustically rated GWB constructions with acoustic caulking applied in conformance to ASTM C919.
8. GWB wall constructions should have 1/4" gap at bottom. Fill gap with continuous bead of approved non-hardening caulking, both sides and tape/finish as required.

PROJECT:
College of Marin
Building 11 Renovation

CLIENT:
brick.

SOUND RATED PARTITION NOTES

Notes

SCALE: NTS

ENG: TS

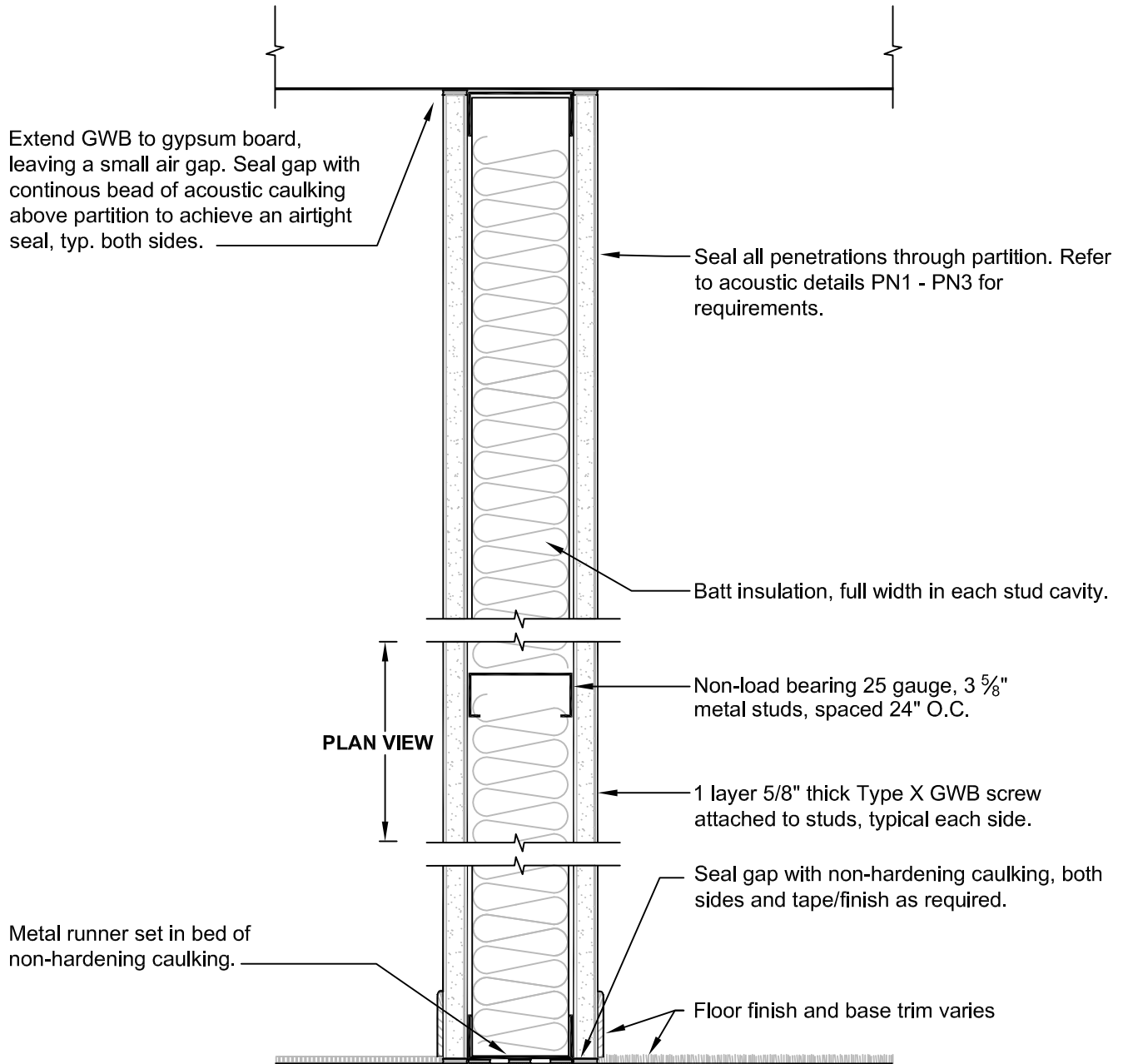
PHASE: Construction Documents Phase

TITLE:

N1

ISSUE DATE: March 7, 2017

Design Information Only - Not For Construction



TYPE A1

STC 46

Ref. STC Test NRC: TL-93-352

1. STC performance is estimated and/or determined by laboratory tests with partitions installed under ideal conditions. Laboratory tests and estimated ratings are provided for comparison and do not guarantee the installed performance of interior constructions.

PROJECT:
College of Marin
Building 11 Renovation

SOUND RATED PARTITION TYPES

Typical Sound Isolation Detail

TITLE:

A1

CLIENT:
brick.

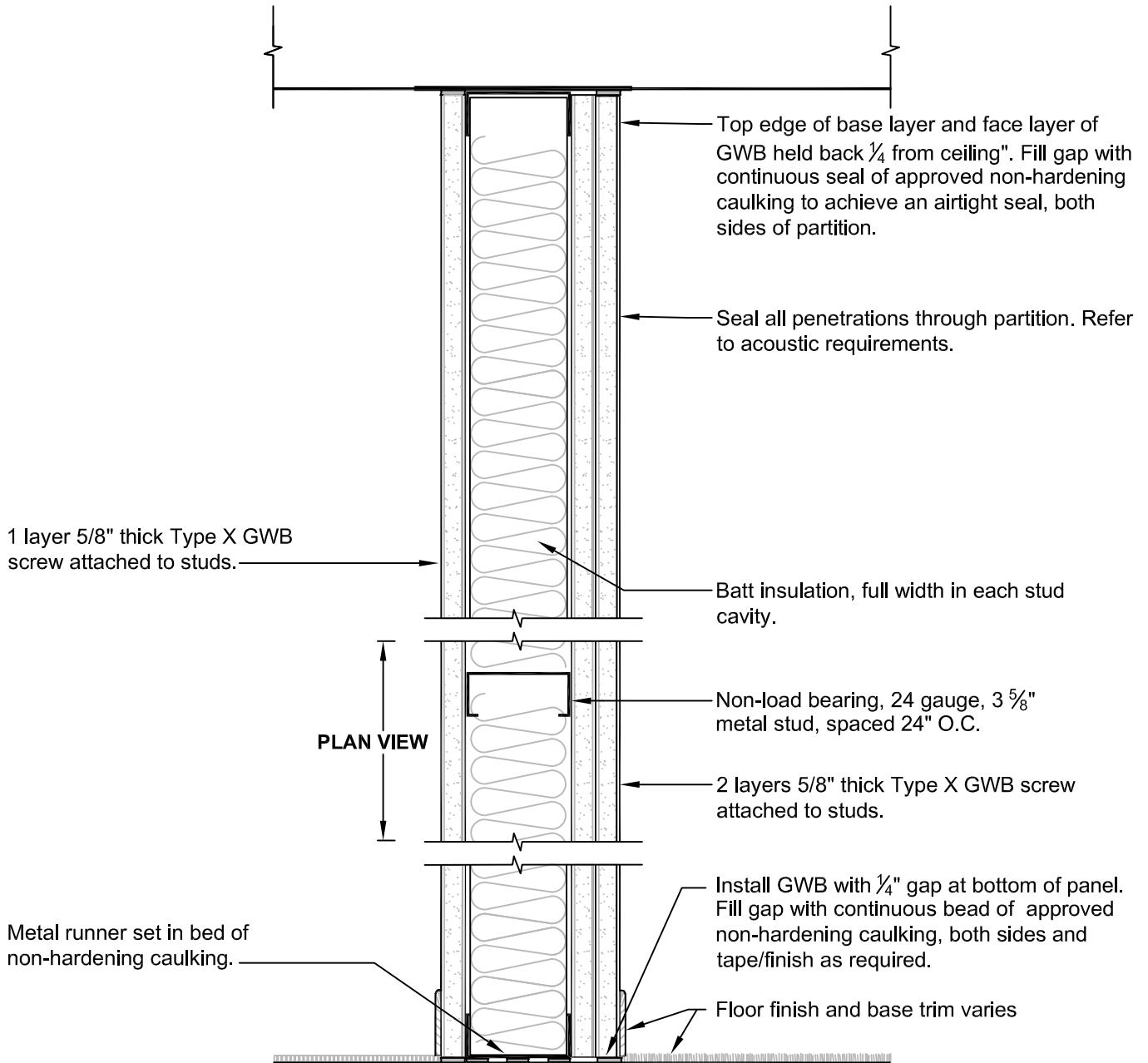
SCALE: NTS

ENG: TS

PHASE: Construction Documents Phase

ISSUE DATE: March 7, 2017

Design Information Only - Not For Construction



TYPE A2

STC 52

Ref. STC Test NRC: TL-92-420

1. STC performance is estimated and/or determined by laboratory tests with partitions installed under ideal conditions. Laboratory tests and estimated ratings are provided for comparison and do not guarantee the installed performance of interior constructions.

PROJECT:
College of Marin
Building 11 Renovation

SOUND RATED PARTITION TYPES

Typical Sound Isolation Detail

TITLE:

A2

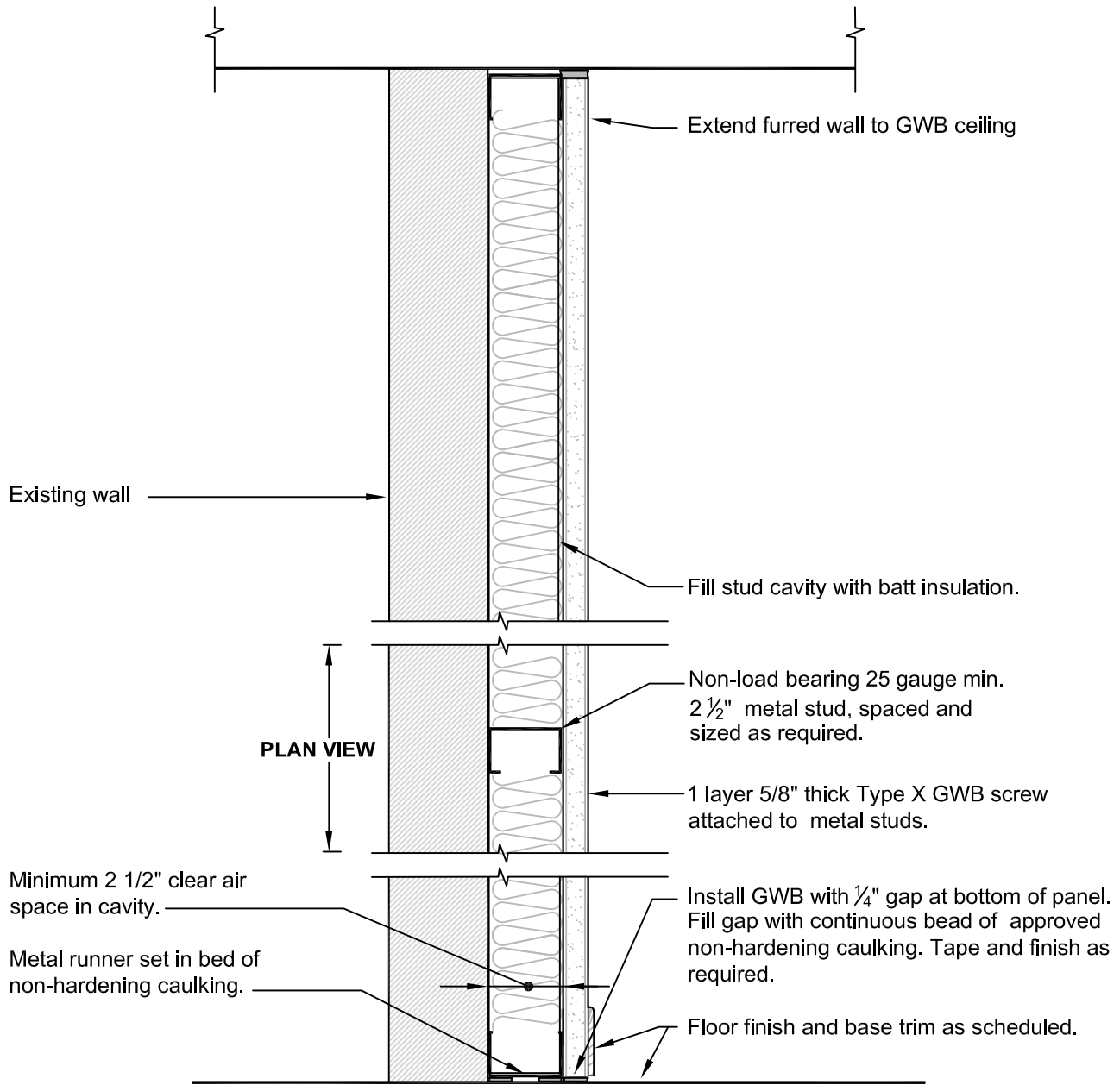
CLIENT:
brick.

SCALE: NTS

ENG: TS

PHASE: Construction Documents Phase

ISSUE DATE: March 7, 2017



TYPE A3

Existing wall with additional furred wall

PROJECT:
College of Marin
Building 11 Renovation

SOUND RATED PARTITION TYPES
Typical Sound Isolation Detail

TITLE:

A3

CLIENT:
brick.

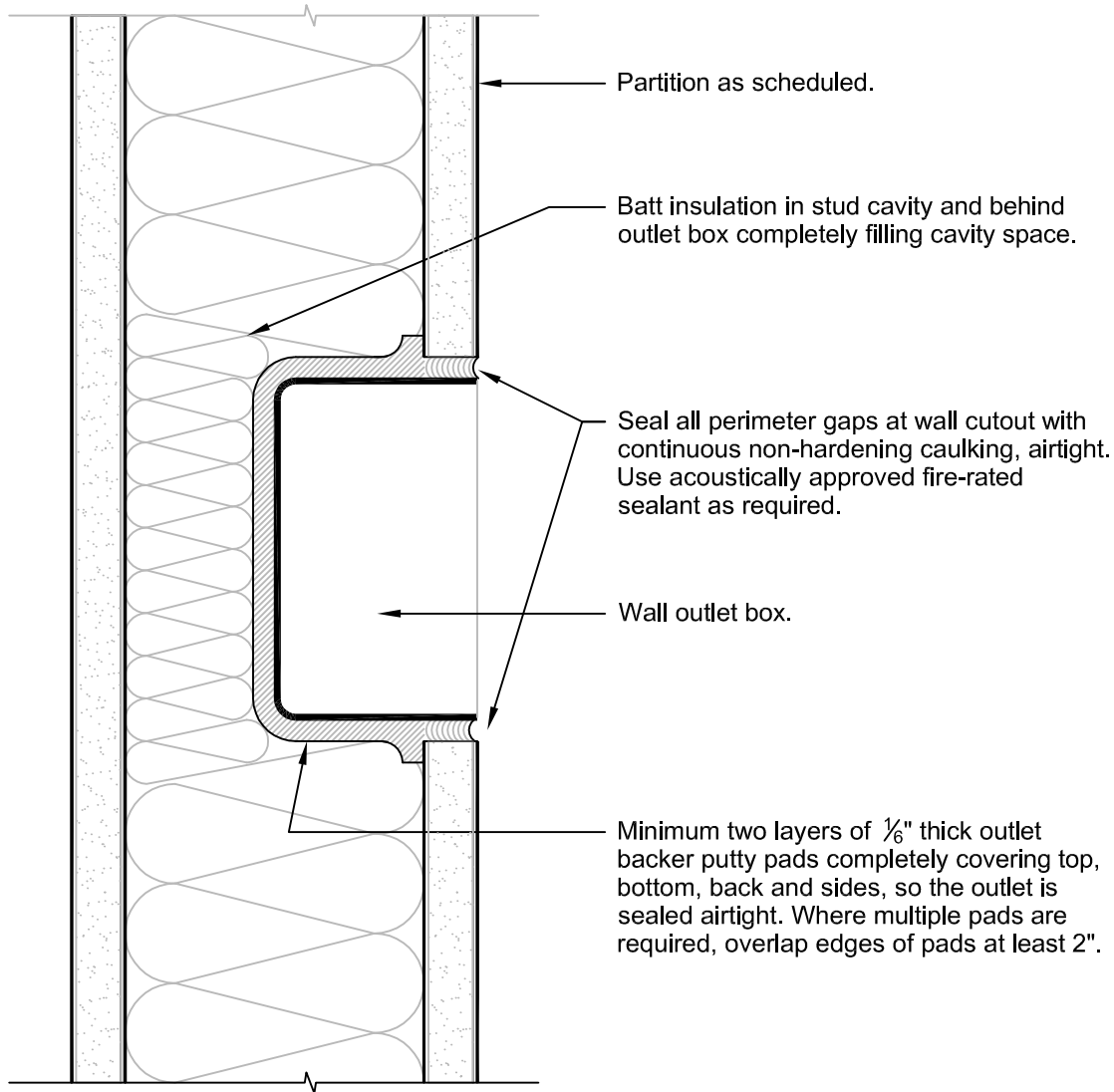
SCALE: NTS

ENG: TS

PHASE: Construction Documents Phase

ISSUE DATE: March 7, 2017

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NOTES

1. All outlets, including data and telephone outlets in acoustically rated partitions to be installed in steel junction boxes.
2. Do not locate outlets on opposite sides of partitions sharing the same stud cavity. Provide a minimum of 24" offset between outlets on opposite sides of wall. Outlets on opposite sides of STC 55 or higher partition should be offset by at least two studs or 36" vertical distance.
3. For fire rated walls use acoustically approved fire rated outlet box pads.

PROJECT:
College of Marin
Building 11 Renovation

CLIENT:
brick.

OUTLET BOX INSTALLATION

Typical Sound Isolation Detail

SCALE: NTS

ENG: TS

PHASE: Construction Documents Phase

TITLE:

PN1

ISSUE DATE: March 7, 2017

Design Information Only - Not For Construction

Insulated hollow metal door frame filled with minimum 6 lb density insulation.

Seal airtight between frame and wall with continuous non-hardening resilient sealant, both sides.

Note: Precision alignment is key to the acoustic performance. Door installer to confirm that the door can be installed with $\frac{1}{16}$ " compression of acoustic seals and that the recommended width of the gap at door bottom is maintained to $\pm\frac{1}{16}$ ".

Acoustical door gasketing such as Type 188 by Zero International or Pemko Type S88. Apply continuous at door head and jambs.

Minimum 1-3/4" thick solid-core wood or insulated hollow metal door, minimum 4 lb/sf. Vision lites minimum $\frac{1}{2}$ " thick glazing sealed airtight with perimeter gaskets.

Maximum $\frac{1}{4}$ " gap under door.

Carpet in both rooms.

Carpeted Floor

Metal or solid wood threshold, as required for ADA compliance, bedded in acoustic sealant with a neoprene compression door stop. Zero International Type 565, or equal by Pemko.

Door installed so perimeter seals on all 4 sides are compressed when door is closed.

Hard finish floor

Hard Floor Finish

Maximum $\frac{1}{2}$ " gap under door.

Where no threshold installed, specify an automatic door bottom such as Type 367 (surface) or Type 360 (mortised) by Zero International, or equal by Pemko.

Hard finish floor

Hard Floor Finish Floor (Alternate)

DOOR TYPE DR1

Note:
Not a rated system. Acoustic performance depends on door panel rating and installation.

PROJECT:
College of Marin
Building 11 Renovation

INTERIOR DOOR REQUIREMENTS

TITLE:

DR1

CLIENT:
brick.

Typical Sound Isolation Detail

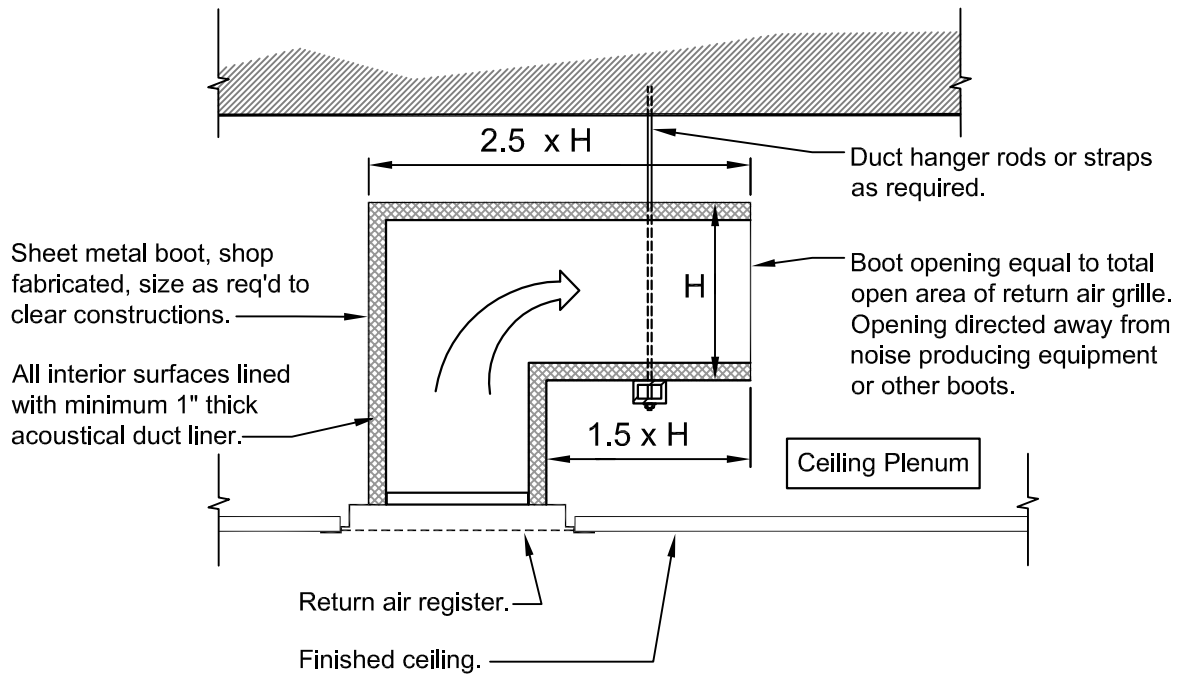
SCALE: NTS

ENG: TS

PHASE: Construction Documents Phase

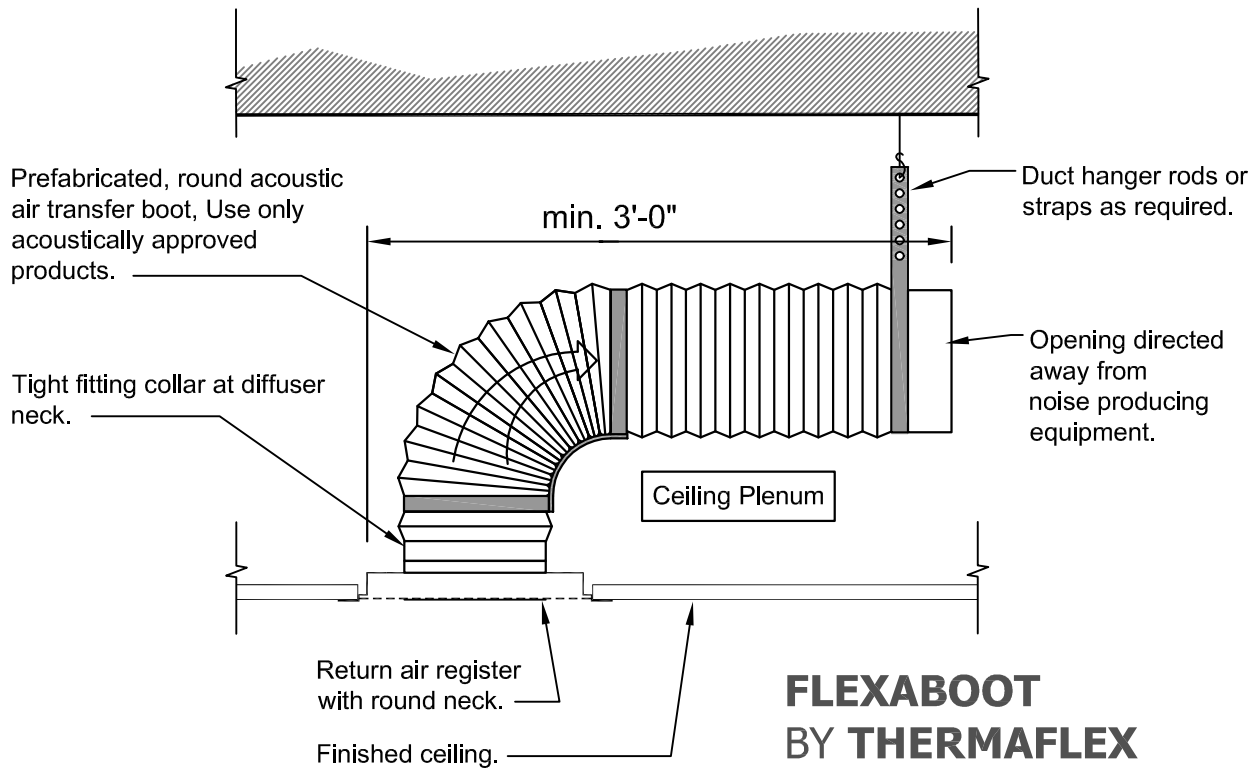
ISSUE DATE: March 7, 2017

Design Information Only - Not For Construction



Section View Section View

not to scale



Section View

not to scale

FLEXABOOT
BY THERMAFLEX
 1-800-459-4822
www.wereflexible.com

PROJECT:
 College of Marin
 Building 11 Renovation

CLIENT:
 brick.

Return Air Boot Detail at Meeting Rooms
 Typical Sound Isolation Detail

SCALE: NTS

ENG: TS

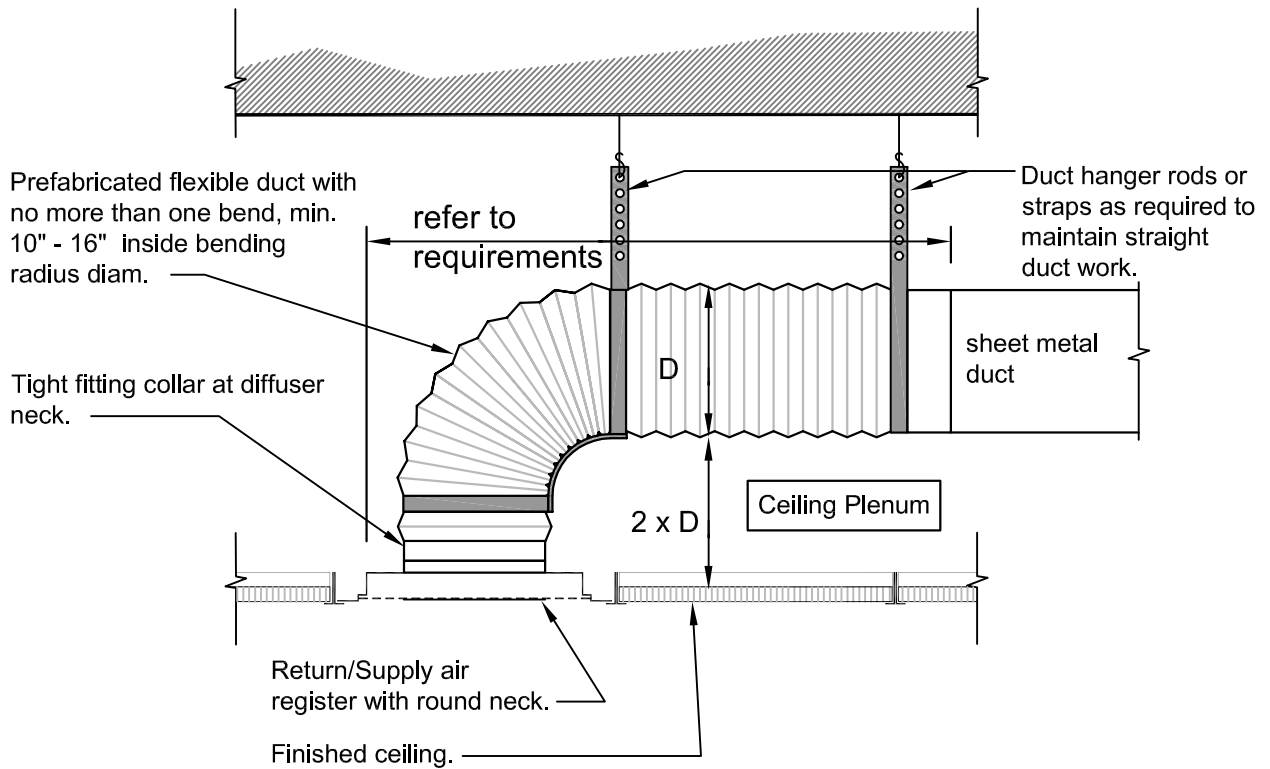
PHASE: Construction Documents Phase

TITLE:

RA1

ISSUE DATE: March 7, 2017

Design Information Only - Not For Construction



Typical Flex Duct Connection

not to scale

PROJECT:
College of Marin
Building 11 Renovation

Flexible Duct Connection

Typical Mechanical Detail

TITLE:

M1

CLIENT:
brick.

SCALE: NTS

ENG: TS

PHASE: Construction Documents Phase

ISSUE DATE: March 7, 2017



ACOUSTIC ARTS AND ENGINEERING

College of Marin Bldg 11 Renovation (Project No. 1) VRF Units Exterior Noise Control

March 10, 2017

Report No. 3, revision 1

Tim Schmidt
tschmidt@acousticae.com

Summary

This report outlines revised noise control recommendations for four VRF heat recovery units to be located near the Building 11 at the College of Marin Indian Valley campus in Novato, California.

There will be 3 units located on a slab on grade just to the north east of Building 11.

Without noise control measures the VRF units operating together, are expected to generate the following noise levels around the site:

Building 11	55 - 59 dBA
Building 9	48 - 52 dBA
Outdoor deck	48 dBA
Pedestrian walkway	47 dBA

The VRF units should be enclosed with a solid barrier wall to reduce noise levels transmitted to the most sensitive receivers which include the outdoor pedestrian walkways, the deck, and the meeting rooms in Building 11. The meeting rooms have operable windows.

The barrier should be solid and sized to achieve as close as possible to the recommended outdoor noise criteria (Refer to OPR).

Fig 1 below shows the proposed VRF locations:

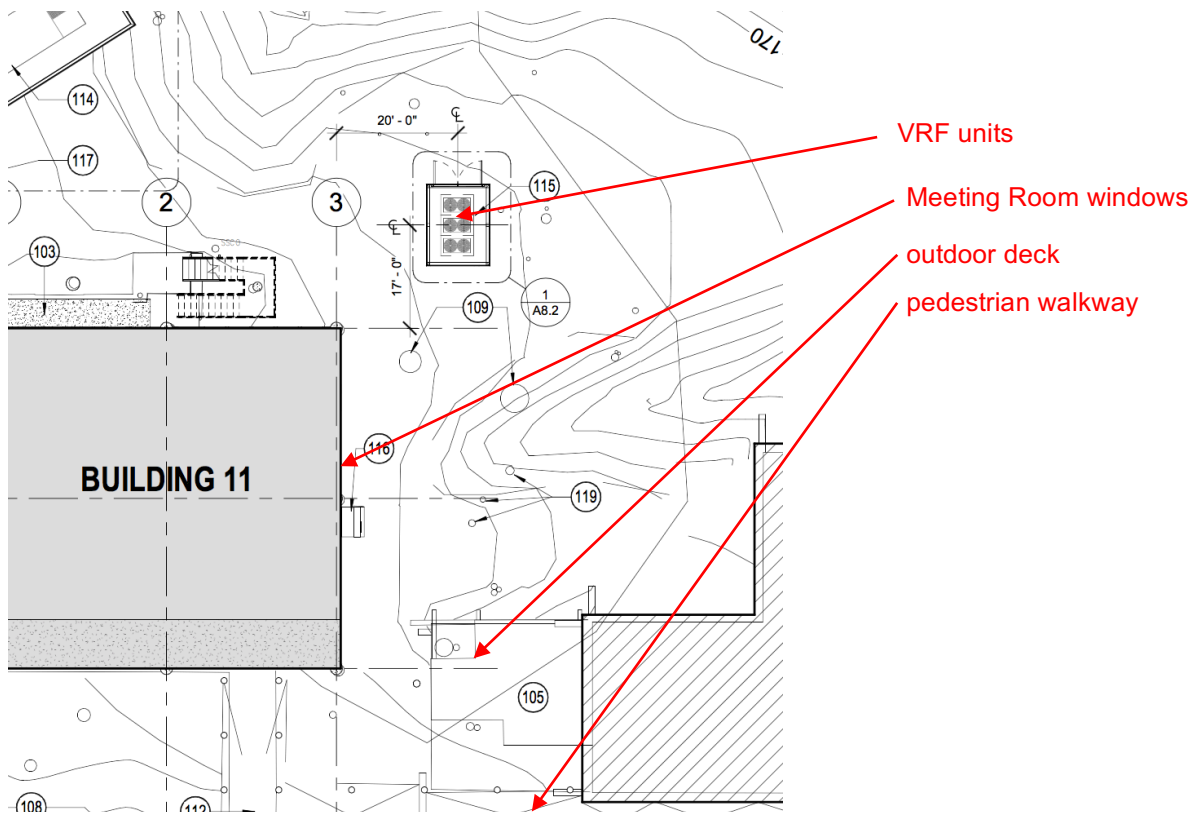


FIG 1: Proposed VRF locations and surrounding receivers

Recommended Noise Control Measures

A solid acoustical enclosure is recommended with at least two completely solid sides around the VRF units to mitigate the noise emissions to acceptable levels around the site. The priority is to reduce VRF noise at the pedestrian walkways and outdoor deck located directly to the south of the equipment, as well as sensitive upper floor meeting rooms in Building 11 and offices in Building 9.

With a barrier design as recommended below the upper floor offices in Building 9 and the meeting rooms in Building 11 will be shielded from direct equipment noise.

Due to the shorter distance to the equipment and direct line of sight into the enclosure, the north east corner office in Building 11 will be exposed to exterior noise levels greater than 50 dBA. This is the worst case condition. Note that the noise barrier would need to extend as high as 13 ft in order to provide shielding at this 2nd floor corner office.

With the recommended measures outlined below the upper floor Meeting Room in Building 11 will be exposed to exterior noise levels below 45 dBA. Interior noise levels with the windows slightly open would be below 39 dBA.

In general; upper floor windows in the adjacent buildings will have insulated glazing. With all windows closed, the interior noise levels in all offices facing the equipment will be well below 45 dBA.

The required noise reduction can be achieved with an acoustic enclosure with the following characteristics:

1. Install a continuous solid barrier around 2 sides of the VRF equipment pad with no gaps or holes in the solid section. Extend partially on one side per the following below schematic plan layout.

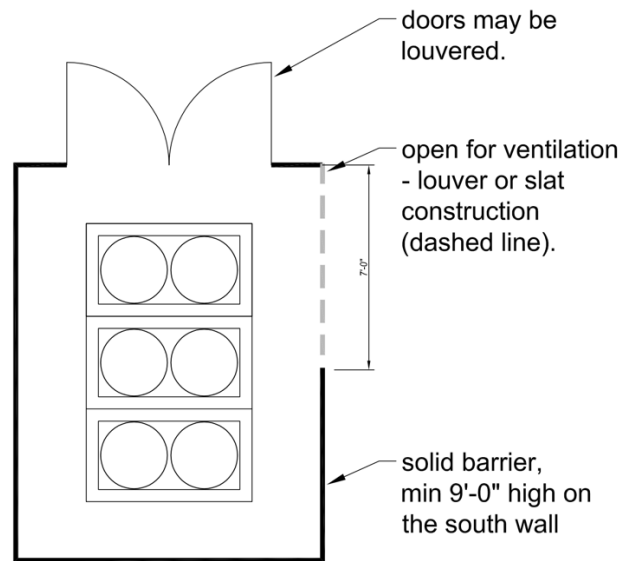


FIG 2: Proposed VRF enclosure – plan layout

2. The barrier should be no less than 9 ft high at the side facing building 11, assuming that the top of the VRF units are no higher than 5'-0" above the slab, and no less than 4ft below the highest part of the barrier per the following schematic detail:

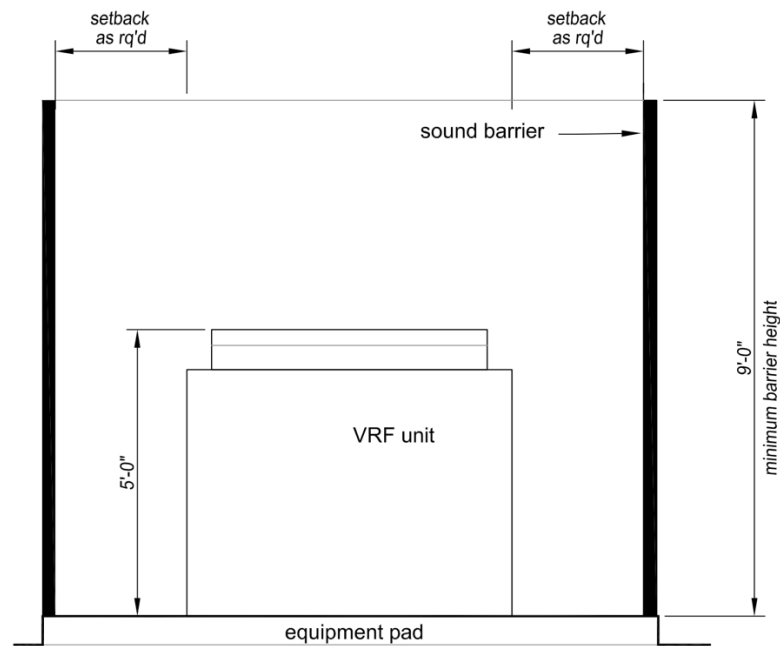


FIG 3: Proposed VRF enclosure – section (facing south)

3. The solid barrier elements can be a single membrane and should have a surface density no less than 2.2 lbs/ft^2 .

A solid construction such as marine grade plywood may be used and should be at least $3/4$ " thick. Alternatively; a solid, minimum 16 Ga sheet metal barrier may be installed. The exterior of the enclosure may be finished per aesthetic preference. I understand that the enclosure should be a consistent height. Therefore the enclosure should be 9 ft tall all around.

4. Ventilation and access will be required. An acoustically rated louver is not required. Open slats are acceptable on 1 side of the enclosure per Fig 2. The minimum louver area should be confirmed by the mechanical engineer. The louver may extend to the top of the barrier. Noise emitted from the VRF units to the parking area will be sufficiently reduced due to distance. The parking area does not require protection from the VRF equipment.
5. The access doors may be louvered for most of the door panel area for ventilation.

≈ End of Document ≈

APPENDIX A

College of Marin – Building 11 Renovation, Project #1
Acoustic Design Guidelines

Fabric Wrapped Panel Information

March 10, 2017

Appendix A - Fabric Wrapped Acoustic Panel Information

The following outlines general information and includes contact information for product representatives for high performance acoustic wall panels and fabric:

Acoustical fabrics for high performance wall panels:

Guilford of Maine Textiles:

Guilford of Maine Type: FR701 or equal

Guilford of Maine
5300 Corporate Grove Drive SE
Suite 200
Grand Rapids, MI 49512
phone 800 544 0200
fax 616 554 2255
e-mail:
guilfordsales@interfacefabrics.com

Knoll Textiles

“Transparent series” of textiles

http://www.knoll.com/products/textileCatProducts.jsp?cat_id=116

Local representative:

KnollTextiles
317 montgomery St.
San Francisco, CA 94104
415-837-2108 phone
415-623-3401 fax

Decoustics

<http://www.decoustics.com>

Type: **AP Panel**
NRC 0.85 – NRC 1.0 (thickness ranges)

Fabric Options:

<http://www.decoustics.com/products/finishes/Fabric>

Local Representative:

Mike Dorner
The Finish Line
2344 Fairglen Dr.
San Jose, CA 95125

Phone: 650-233-1360

Email: <http://www.finishlinereps.com>

Appendix A - Fabric Wrapped Acoustic Panel Information

Conwed / Wall Technology

<http://conweddesignscape.com/products/wall-panels/>

Type: **A100 panel**
 NRC 0.85 – NRC 1.0 (thickness ranges)

Fabric Options:

Guilford, Knoll, Maharam, Carnegie and DesignTex are available.

Available Sizes:

Available thicknesses are 1/2", 3/4", 1", 1-1/2", 2", 3", and 4". Widths are up to 48" and lengths to 12'. Thickness of 1" and 2" are available in 60" x 120". Custom sizes are readily available.

Local Representative:

Mike Dorner
The Finish Line
2344 Fairglen Dr.
San Jose, CA 95125

Phone: 650-233-1360

Email: finline@ix.netcom.com

Lamvin

<http://www.lamvin.com>

Type: **Sonic Acoustical panels**
Type: **Sonic Tackable High Impact Panels**

 NRC 0.85 – NRC 1.0 (thickness ranges)

Fabric Options:

Guilford of Main

Lamvin, Inc.

4675 North Avenue Oceanside,
CA 92056

Phone: 800-446-6329, or 760-806-6400

APPENDIX B

College of Marin – Building 11 Renovation Project
Project No. 1

Low Pressure HVAC Systems
Acoustic Requirements and Performance Criteria

March 10, 2017

GENERAL

- Building services noise and vibration control is a critical aspect to designing work environments. The following noise and vibration control strategies are for guidance in the selection and layout low pressure HVAC equipment, attachments, ductwork, dampers, and register. The noise control design for the outdoor VRF units is provided separately.
- Where noisy equipment or ductwork is located near sensitive spaces such as meeting rooms or offices, or where ducts pass through acoustically rated constructions these areas require specific review and analysis. Additional review is recommended during installation.
- To achieve the recommended interior background noise criteria, the HVAC systems must include necessary noise control measures such as minimum lengths of lined sheet metal ductwork, lined elbows, turning vanes, etc. Sound attenuators may be necessary where limited clearances do not allow for these types of systems. Including noise control elements will generally increase the system pressure across the building mechanical system.

STANDARDS

ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

ARI Standards for measurement of noise of mechanical equipment: ARI 260, 270, 370, 575, 880 & 885, or current versions.

AMCA Standards for measurement of noise of mechanical equipment: AMCA 300 & 330 or current versions.

ASTM E-477 – Standard Method for Acoustical Performance of Duct Liner and prefabricated silencers.

NOISE CRITERIA

Excessive background noise due to operation of the building systems can interfere with speech intelligibility and can be disruptive to occupants, and reduce productivity. Rotating machinery (fans), pumps, compressors, and/or aerodynamic conditions in ducts, terminal units, or at dampers or diffusers can generate significant noise. This noise can be transmitted to occupied spaces through ductwork to room registers, through interior constructions, or as structure-born noise transmitted through building structure, piping, ducts and/or conduits, or other building systems.

HVAC Systems Noise and Vibration Control

Noise and vibration control systems add to the project cost, so a realistic approach is required when specifying noise criteria. The noise criteria recommended for this project are based on Industry accepted performance standards for offices, meeting rooms, and teleconferencing spaces where these standards are aligned with the needs of the client.

The following recommended limits for background sound levels from HVAC, electrical, and plumbing systems are based on *2011 ASHRAE Handbook - HVAC Applications* design guidelines.

Table B1: Background Noise Criteria:

Room Description	Background Sound Level LAeq	Noise Criteria NC
Stair/corridors	40	35
Private Office	35	30
Meeting Rooms	35	30
Reception / Lounge	40	35
Toilets/File Room	40	35
Kitchenette	40	35

Table Notes:

1. NC criteria apply with the room unoccupied, 1m above floor level, and 1m from any vertical surface.
2. Audible noise due to HVAC, plumbing, or electrical sources should have no noticeable vibration induced noise content, rumble, audible tones, or impulsive characteristics. Tonal noise should be at least 5 pts below the recommended levels in Table C1.
3. Noise levels apply to all MEP equipment at full design loads, and operating normally and together.

DOCUMENTATION

The following additional information must be provided as part of the drawings, specifications, or as supplementary documents and submittals.

- Terminal unit selections and schedule
- Air volume for end devices should be noted on drawings
- AHRI 260 sound data for all new fan units including discharge, inlet and radiated sound power levels
- Sound data for VRF unit casing radiated noise.
- Air velocities at main shafts and main trunks
- Lengths of flexible ductwork, either on the drawings or as a general note
- Indicated where lining is used, clearly indicate if dimensions are sheet metal or clear inside areas
- Plan layouts for all ductwork including cross-sectional dimensions at each section indicated cfm in each section can be determined. Indicate where the air velocities exceed the specifications.
- All fan equipment: sound power levels for inlet, outlet, and casing radiated noise as well as product data sheets.

NOISE AND VIBRATION CONTROL - GUIDELINES

General

- Avoid locating noise generating mechanical equipment over noise sensitive rooms such as meeting rooms. The FCUs on level one are generally located above the offices. These are in a plenum and separated from the room by the ceiling. However, it is preferable to locate FCUs in the corridor wherever possible.

Vibration

- All new fan equipment will require noise control systems and vibration isolation to protect adjacent from noise, and to avoid re-entry noise and structure-borne noise. All service connections (duct, piping and conduit) to fan units should be flexible.
- Typical terminal units located in the ceiling should be mounted on vibration isolators with a minimum 0.35 inches of deflection.
- Fractional horsepower equipment would require minimum vibration isolation, typically neoprene pads sized to provide static deflections in the range of 0.05 to 0.2 inches, depending on equipment location and rpm.

HVAC Systems Noise and Vibration Control

- Provide vibration isolation for all high capacity circulation pumps, chillers, fans, and all other rotating machinery by means of neoprene, rubber or steel spring isolators by the vibration specification and schedule, based on ASHRAE 2011 Applications Handbook, Chapter 48 (or most current version). Follow these guidelines for selecting vibration isolators including Table 47.
- Locate exhaust fans above non-sensitive spaces and incorporate vibration isolation mounts per ASHREA guidelines.

Ductwork

- Use balanced geometry for duct branches, duct tees, and transitions to minimize air turbulence and achieve low levels of regenerated noise.
- Provide for return air ducts. If return air is via the open space include acoustic air transfer ducts in the design. Transfer ducts should be made of acoustically lined sheet metal with min. 1" thick duct lining.
- Provide acoustical lining downstream of dampers as necessary to meet the room NC Rating.

Flex Duct

- Install acoustic flex duct in accordance with SMACNA 1993, Chapter 10.
- Install lengths of acoustic flex duct consistent with meeting the background noise criteria for the space.
- Limit the length of acoustic flex ducts as follows:

For NC 40 or greater spaces:	not to exceed 9 ft
For NC 35 spaces:	not to exceed 7 ft
For NC 30 spaces:	not to exceed 5 ft

Ducted Air Velocities

Duct air velocities should be designed to not exceed the values listed in the following tables. Allocate space early in the design stage for locating large duct mains where needed.

The following are recommended air flow velocity limits as a guideline for ductwork serving occupied spaces (based on NC criterion of space served):

Table B2: Maximum Air Velocities

Recommended Maximum Duct Air Velocities ¹		
Noise Criteria (NC/RC)	Maximum Air Velocity (fpm)	
	Rectangular Duct	Round Duct
Main Ductwork above Acoustic Ceiling ^{2,3}		
40	1,888	3,250
35	1,750	3,000
30	1,475	2,500
Branch Ductwork above Acoustic Ceiling ²		
40	1,510	2,600
35	1,400	2,400
30	1,106	1,875
Final Ductwork/Flex Ducts above Acoustic Ceilings ²		
40	944	1,625
35	875	1,500
30	590	1,000

Notes:

¹ These recommended velocities assume good flow conditions through the ductwork with low pressure drop or turbulence across dampers, fittings, and elbows.

Table B3: Maximum Air Velocities

Recommended Maximum Air Velocities At Neck of Air Registers Based on “Free Opening” Airflow ¹			
Location	Noise Criteria (NC)	Max. Air Velocity (fpm)	
		Supply Air	Return Air
Meeting Room	NC 30	425	500
Private Office	NC 35	500	600
Circulation, Open Office	NC 40	560	675

Diffusers, Grilles and Registers

- The selection of high velocity air devices should be restricted to general use areas and circulation corridors.
- Ductwork connecting to a supply air device should be straight (i.e., no offsets or fittings) for at least three duct diameters and the same size as the inlet collar.
- Balancing dampers should not be located within three equivalent duct diameters of the diffusers. Otherwise, ductwork downstream of dampers may need acoustical lining.
- Select diffusers, registers and grilles for an NC rating that is at least 5 points below the recommended NC of the room. Sound from multiple diffusers are additive and therefore the maximum allowable NC rating must be lower than the rating for the space.

↻ End of Document ↻

APPENDIX C

College of Marin – Building 11 Renovation Project (Project #1)
Acoustic Design Guidelines

Plumbing Systems Noise and Vibration Control

March 10, 2017

GENERAL

Plumbing and hydronic noise, particularly that attributable to the supply system, can be a cause of annoyance and complaints in office spaces. Equipment selection, piping fluid velocities, location of chases, and selection and proper installation of vibration isolation mounts ultimately contribute to the noise levels from operation of plumbing systems.

The plumbing system design submission should conform to guidelines included in the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) HVAC Application, Chapter 48, 2015 or most current version and shall include quiet equipment and noise control treatments as necessary to meet the background noise criteria for all occupied spaces.

These guidelines aim to minimize noise from plumbing fixtures, pumps and other plumbing equipment and systems.

The following outlines the general requirements for noise control:

1. Install resilient piping attachments to vibration isolate all active pipes including supply pipes, waste pipes, drains, heating and chilled water pipes, and condensing water lines.
2. Isolate all supply piping from the building walls and structure using foam rubber wrapping or resilient clamps and hangers. Enclose major piping in GWB or sheet lagging over a layer of insulation. Carefully seal around the entire pipe.
3. All active piping throughout the project should be vibration isolated routed through occupied areas.
4. General vibration isolation of the piping systems shall be achieved by means of vibration isolation clamps, or neoprene sleeves and oversize clamps. Hard plastic clips are not acceptable.
5. Resilient piping attachments such as Trisolator or Acousto-Plumb should be used at typical active water piping and waste lines. These systems may also be used at primary hydronic piping systems, condensing water lines for air conditioning units in server rooms, or all cooling systems that include onboard compressors as recommended approved by manufacturer. Plumbing systems serving toilet rooms, and mechanical equipment should be resiliently isolated from all framing as well as from other building services.
6. Resilient piping attachments and/or flexible connections shall be used to isolate all non-active pipes or conduit attached to vibrating equipment that generates audible noise or equipment that requires vibration isolation.

Plumbing Systems Noise and Vibration Control

7. The following pipes do not require vibration isolation:
 - a. fire sprinkler pipes
 - b. gas lines
 - c. conduit
 - d. low pressure and low flow pipes serving radiant panels and floor systems.
 - e. active piping located away from occupied spaces.
 - f. non active piping or conduit that is not attached to vibrating equipment.
8. All installations of supply piping, waste piping, or drains should be resiliently isolated at all connections to the building structure and/or wall and ceiling framing members.
9. Seal all duct and piping penetrations through partitions airtight with sheet metal angles and/or sleeves, acoustical caulk and backer rod as needed.
10. Resiliently isolate active pipes at all supports per the following methods.
 - a. Metal and strap hangers should be fitted with neoprene isolating material between the strap and pipe, such as HoldRite isolation liners #270 and #271 or 1/8" thick, 40-durometer rubber collars.
 - b. Riser clamps for supply and waste lines should be isolated from structure (deck) using Mason Super W neoprene waffle pads or Holdrite #274 pads, or approved equal under a load bearing metal plate, or with the Hubbard HoldRite Silencer Model #276 isolation system. Ensure that the holes are sized and located as required to avoid contact with vertical pipes.
 - c. Where double stud walls are used, ensure that all plumbing systems are on one side of the partition with no contact with the other side.
 - d. Pipes passing through plates, studs, walls etc. shall have holes 1/2" minimum larger than the pipes' OD (i.e., 1/4" minimum clearance all around), making sure that the pipe remains mechanically isolated after construction. Center pipes within the holes at all penetrations and avoid contact with another system, electrical conduit, or boxes. Any contact caused by misalignment of piping will require correction.

Plumbing Systems Noise and Vibration Control

- e. Trades installing wall finishes should keep tiles/wall finishes away from pipe stub outs and penetrations and must caulk gaps with acoustical sealant.
 - f. Fire rated acoustical caulking should be used to seal pipe penetrations through fire rated walls and floor plates.
 - g. Pipe penetrations through acoustical partitions must be properly sealed. Include acoustic penetration details in design documents.
11. Reduce the potential for flow noise intruding into sensitive spaces per the following methods:
- a. Limit the pressure of the supply water as much as possible and employ trapped-air water hammer arrestors for water supply pipes serving flush or solenoid valve fixtures to reduce water hammer noise.
 - b. Where pipes are routed across or near occupied rooms size pipes for maximum flow velocities in the range of 4 feet per second (FPS) in 1/2-inch to 1-inch diameter, 6 FPS in 1-1/4" to 3" diameter branch sizes. For pipes 4 inch diameter and larger, maximum allowable flow rate is 8 to 10 FPS.
 - c. Limit pressure at fixtures to 55 psig to reduce noise generation in general areas.
 - d. Limit pressure at fixtures to 40 psig to reduce noise generation near noise sensitive spaces (<NC 35)
 - e. Install air chambers or shock-absorbing devices to prevent water hammer in lines subject to abrupt shut-off.
 - f. Quiet models of faucets and diverter valves should be specified.
12. Typically, toilets are not a concern if located remote from occupied spaces. To avoid excessive noise within toilet rooms, specify quiet devices such as quiet-type, flush valves and taps with full-ported nozzles and non-splash aerators.
13. Plumbing systems should meet the NC criteria for spaces as recommended. Where active main supply pipes are routed above sensitive occupied spaces avoid potential for flow noise per the following guidelines:
- a. NC30 and lower: Gypsum board enclosure or insulation layer with 2 layers of mass loaded vinyl.

Plumbing Systems Noise and Vibration Control

- b. NC30 - 40: where active piping is above a low CAC ceiling, wrap in fiberglass and a mass loaded vinyl barrier material.
 - c. NC40 - 45: Wrap in fiberglass and a mass loaded vinyl barrier material OR, where above a continuous ceiling, no mitigation required.
 - d. NC45 and higher: no mitigation required for single pipes. Large diameter pipes and high flow piping installation should be reviewed by an acoustical consultant.
14. Non-insulated piping routed through the service corridor should be vibration isolated using neoprene isolation mounts selected for a minimum 0.4" deflection such as a model RH Vibration Isolation Hanger by Kinetics™ or equal by Mason Industries. This includes pipe risers at shaft. Refer to manufacturer for guidelines for vibration isolation of pipe risers.

CIRCULATION PUMPS

Circulation pumps should be mounted using neoprene pads sized to provide static deflection of at least 0.25 inches. Pumps should be isolated from piping by the use of flexible connectors. Flexible connectors should be protected from strain beyond their design limits. Twin sphere neoprene rubber flex connectors are preferred and alternately braided steel hose connectors 6 or more diameters in length installed at right angles to the primary vibration axis of the equipment.

Rigidly pipe in-line pumps and install spring and neoprene vibration isolation hangers supporting the pump and associated piping for at least 3 duct hangers on either side.

APPENDIX D

College of Marin – Building 11 Renovation Project
Project No. 1

Emergency Backup Generator
Acoustic Requirements and Performance Criteria

March 10, 2017

GENERAL

The noise impact from the emergency generator is limited to the operation of surrounding campus buildings. In general, the generator will not be operated during the typical hours of operation and would not conflict with campus operations unless there is a power outage. The buildings in proximity to the generator are not always occupied. It is assumed that the generator testing can be scheduled during times when these buildings are unoccupied.

During a power outage the generator will be used while the buildings are occupied. A noise control system should be considered for these occasional power outage events. In this case the generator would be operational when the buildings are occupied. However, the noise performance should be considered in the context of non-typical circumstances.

It is noted that the local ambient sound levels around the generator are very low and should be considered in the selection and specification of the generator as well as the selection of the sound barrier enclosure, etc,

The noise control strategies outlined below include guidelines and preliminary design recommendations. The layout, the genset equipment, attachments, enclosure materials, etc. must be confirmed.

STANDARDS

ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

ARI Standards for measurement of noise of mechanical equipment: ARI 260, 270, 370, 575, 880 & 885, or current versions.

AMCA Standards for measurement of noise of mechanical equipment: AMCA 300 & 330 or current versions.

MUNICIPAL REQUIREMENTS

Occasional testing (short term noise) from the generator will not conflict with the goals and policies in the Noise Element of the General Plan for the City of Novato, or the noise control goals of the campus. The generator will be tested at times when the buildings are not occupied.

NOISE CRITERIA

For purposes of the sound barrier design, the typical low ambient sound levels are relevant.

It is reasonable to expect that the daytime ambient levels are generally below 45 dBA. The noise emissions from the generator should comply with the following criteria:

- a) 35 dBA Leq 1 hour inside occupied spaces with the windows closed.
- b) 55 dBA Leq 1 hour at the closest exterior walkway.

RECOMMENDATIONS

The exact dimensions of the sound barrier are pending final selection of the generator equipment.

The following outlines the acoustic requirements for the genset and the sound barrier.

- 1 Provide all available noise control supplied by the manufacturer including a noise control housing, and include a level 2 noise enclosure and high performance exhaust muffler.
- 2 Install a minimum 11 – 13 ft high sound barrier which has no openings or gaps. The barrier should be located and should include doors as necessary for maintenance, operations, general access, and ventilation. The exact height may vary depending on the sight lines and this may depend on the final plan layout.
- 3 The sound barrier should be well above the height of the Genset housing and should be extended higher where otherwise there is a direct view of the equipment from surrounding buildings. The barrier should be designed to shield outdoor walkways, decks, and upper floor windows from the generator.
- 4 Locate the generator a minimum distance from the noise barrier wall so this equipment is at least 4 ft away from any vertical surface.
- 5 The top of the generator housing should be no less than 2 ft below the top of the sound barrier.
- 6 The exhaust side of the generator will have the highest noise levels. This end of the generator should be oriented away from Building 11 and away from the walkways (toward the creek).

HVAC Systems Noise and Vibration Control

- 7 The barrier wall should be comprised of a metal frame construction (metal studs and bracing as required) with min. 3/4" thick sheathing and exterior cladding as required for weather on both sides. The inside cavity of the wall should be filled with batt insulation throughout. There should be no openings in the barrier. Drainage requirements must be confirmed and an acoustically treated drainage design is required.
- 8 The barrier wall should be at least 4" thick, and should be fully insulated. There should be no gaps or holes in the surface of the barrier.
- 9 The side of the sound barrier closest to Building 11 should be 13 ft high.
- 10 The end of the sound barrier facing the roadway should be minimum 13 ft high
- 11 The other 2 sides of the sound barrier should be minimum 11 ft high.
- 12 Access doors should be solid, insulated metal doors with full perimeter compression seals.
- 13 The generator will need to be ventilated and exhausted. The requirements for the air flow are pending. There will be a large louver at the back end of the enclosure and there may be side louvers. Avoid any louvers that are facing the project or other buildings. Make provisions for 6" deep acoustic louvers.
- 14 The interior surface of the barrier should include sound absorptive materials on at least 3 sides. The barrier panels may include surface mounted panels or be constructed of a modular panel system that has a sound isolating and sound absorptive element. Separate surface mounted acoustic panels should be exterior rated and should cover at least 20% of each interior vertical surface. The absorptive panels should be as high up as possible to be most effective for controlling noise.

An exterior grade sound absorptive panel such as the Empire Panel Type M90 or equal can be used on the interior surfaces. See the following link for information for the Empire Panel system:

<http://www.empireacoustical.com/m90/>

- 15 In plan the generator enclosure (barrier wall) must be set back from the generator (+ housing) with sufficient clearance around the generator and enclosure. I understand that the exhaust side of the generator in the horizontal configuration needs a minimum

HVAC Systems Noise and Vibration Control

of 10 ft to any surface. The other sides need 5 ft. I also assume that there needs to be full access from the road and there will be other systems, panels, structural bracing, and acoustic panels inside the enclosure. This must be coordinated to achieve the access clearance.

- 16 An alternative, but potentially more costly approach is to specify a turn-key sound barrier system such as a modular sound barrier system by Kinetics Noise Control or similar by Noise Barriers LLC. This type of barrier includes integral modular sound isolating panel with a sound absorbing surface. The modular systems are exterior grade and may be rated > STC 25 and NRC > 0.95. The barriers must be designed for wind loads, seismic, and other structural requirements and a structural engineer must provide guidance and stamped design documents for the enclosure design.

Refer to Kinetics Noise Control web site for more information:

<http://www.kineticsnoise.com>

http://www.kineticsnoise.com/industrial/sound_barrier_walls.html

Refer to Noise Barrier's web site for more information:

<http://www.noisebarriers.com>

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APPENDIX E

College of Marin – Building 11 Renovation Project
Project No. 1

Sound Masking
Design Guidelines and Performance Criteria

March 10, 2017

Sound Masking Guidelines

INTRODUCTION

General background ambient sound is beneficial in open plan office environments and private offices where activity noise and speech can be distracting. A continuous neutral ambient sound effectively masks low levels of speech and other noise sources, but this type of ambient sound is not intrusive or distracting. The preferred type of ambient sound is continuous, diffuse, and spectrally balanced. The sound should be relatively neutral (non-tonal) with a maximum overall sound level of around 45 dBA. Ambient sound levels should be consistent over time, and over a large coverage area, and should be maintained throughout the work areas and along circulation paths.

Typical open office background sound is a mix of ventilation system (HVAC) noise, distant traffic sound transmitted through exterior windows, and general office activity and computer equipment noise. In a large open office this sound becomes more blended and more continuous. An effective masking sound should not be perceived as loud, and should be an appropriate element of the work environment.

In smaller offices, or where there are fewer noise sources, the specific sources become more perceptible and may be more distracting. In other words; the combined sound is not blended. In these environments an electronic sound masking system can be installed to ensure a continuous and conditioned ambient sound. This becomes more relevant where the HVAC systems are quiet, where there is no exterior traffic noise, and particularly where acoustic privacy is important or where occupants require freedom from distraction. Sound masking systems have been found to improve focus and productivity.

Note that sound masking is effective for reducing speech intrusion from sources that are distant from a listener. Because masking sound should not be too loud, no louder than 45 dBA at work stations these systems cannot ensure speech privacy between adjacent work stations. However, in conjunction with solid acoustic barriers and control of room reverberation, a well-designed sound masking system will reduce the distraction from low levels of intrusive speech and other distant noise sources.

Due to the layout and the proximity of the reception to surrounding office and meeting rooms, an electronic sound masking system is recommended for this project, in conjunction with acoustical seals at doors and sound isolating constructions that separate the offices and meeting rooms.

This is generally considered a cost effective solution to improve the speech privacy. However, square foot costs go down as the masking area increases. For this project, the size of the open office is not favorable with respect to reducing costs.

Sound Masking Guidelines

PERFORMANCE

An artificial sound masking system shall provide a continuous background ambient sound that is tuned/balanced for the acoustics of the space, and evenly covers the office with a non-intrusive masking sound that is at least 45 dBA. Note that this system effectively masks indirect and distant speech at normal speech frequencies (between 300 Hz and 4000 Hz.).

Lencore and Logison are commonly specified sound masking manufacturers. See the following websites for more information:

<http://www.logison.com/support/downloads>

<http://www.lencore.com>

The masking system design will vary according to the coverage patterns of the loudspeakers and the conditions. A detailed layout should be developed by a sound masking system designer. The installed sound masking systems should allow for adjustable level control at each loudspeaker, and should achieve a specific and balanced spectrum of continuous sound per third octave band sound levels presented in Table 1 (below).

A preliminary layout is provided showing a total of 8 loudspeakers located around the perimeter offices, with 2 loudspeakers per side. The loudspeakers should be installed pointed up and set back from the edge of the Reception so that the loudspeakers cannot be seen, and so there is no direct sound.

An appropriate system design process should include a review the final conditions to determine the requirements and optimal loudspeaker placements.

Sound masking should not be installed inside the private offices, or meeting rooms.

The following sound levels are the maximum recommended levels that should be used in the reception/lounge. A sound masking system should allow for fine adjustments of sound level and ultimately should be set according to preference.

TABLE E1: Maximum Sound Masking Spectrum for Open Plan Work Areas +/- 2 dB

Octave Band Center Frequency – Hz													
50	63	80	100	125	160	200	250	315	400	500	630	800	1k
48	48	48	47	46	45	44	43	42	41	39	38	36	34
Octave Band Center Frequency – Hz													
1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k	45 dBA			
32	30	28	25	23	20	17	15	-	-				

APPENDIX F

College of Marin Building 11 Renovation Project
Schematic Design Phase

Operable Partitions
Acoustic Requirements and Design Guidelines

March 10, 2017

Operable Partition Guidelines

Operable partitions for sensitive uses should be designed/installed per ASTM E557 - 00(2006) e1, Standard Guide for The Installation of Operable Partitions (or current version). This standard provides general guidelines for the preparation for, application and installation of operable partitions and the surrounding constructions in which the partition system will be installed.

Design issues related to operable walls should be considered early in the design process due to the impact on structural, mechanical, and architectural systems. The following summarizes basic requirements for achieving as close as possible to the rated performance of high performance operable partitions:

PLENUM CLOSURE

1. Overhead structure must be designed to carry weight of the operable walls. The structural beam requirements should be confirmed with structural engineer. Note that that long spans supporting operable partitions can require very deep beams. The structural systems must be coordinated with mechanical and other systems, and acoustically treated to avoid sound flanking over the operable partition.
2. A sealed closure must be provided above the operable partition to ensure that the acoustic separation is not compromised. Avoid air transfer ducts, or other systems routed across this closure as much as possible. An acoustical review of the manufacturer's closure details are particularly important where ducts or other systems are routed above the operable wall. Air transfer between closed plenum conditions, if needed, should be through acoustically lined 'Z-trap' duct configurations.
3. The acoustical closure above the operable partition should be comprised of least 2 layers of 5/8 "Type X GWB on each side and filled with R30 insulation inside the cavity. All joints should be sealed with acoustic sealant.

END CONDITIONS

4. End conditions must terminate at the receiving wall along the entire surface and withstand the pressure of the wall; typically requiring blocking within the wall. The finish details of the closure wall should be a rigid flush finish with no voids or reveals at base boards, ceiling, etc.
5. Storage pocket closure conditions must maintain acoustical separation. The constructions should be coordinated with the operable wall requirements, the vendor, and all shop drawings reviewed by the acoustical consultant.

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ACOUSTIC PRODUCT DATA SHEETS



Spectra[®] Classic[™]

THE MOST ADVANCED SELF-CONTAINED
SOUND MASKING AND PAGING SYSTEM
IN THE INDUSTRY

A Sound Solution

The leading choice of innovators and companies throughout the world, **Lencore's Spectra® Classic™** is the most advanced self-contained sound masking and paging system in the industry. The **Spectra Classic** system uniquely addresses speech privacy, masking, paging and audio requirements of today's facilities.

Each system successfully masks intrusive speech, creates privacy and delivers intelligible paging and audio solutions to ensure intended audiences are well informed and comfortable in their environment.

Spectra Classic's superior sound quality, unmatched speaker design and built-in sound frequency controls is unrivaled by market competitors. The system's design flexibility allows users to adjust the volume of paging and

audio separately from the masking volume. These features enable **Spectra Classic** to provide three systems (masking, paging and audio) for the price of one.

What makes **Spectra Classic** the superior sound solution is its ease of installation, simplified tuning controls, flexible paging and audio options and the renowned sound that is unmatched in the masking industry for comfort.

Increasing Office Productivity

Whether for collaborative or individual spaces, **Lencore's Spectra Classic** technology was developed to make the environment comfortable and productive. By creating a positive, uniform field of ambient background sound in applications such as office spaces, conference rooms, healthcare, government facilities, private work areas and more, **Spectra Classic** minimizes the level of audible distraction to allow employees to interact as well as think.

A designed space where distraction is the norm is unproductive. Sound masking is proven, and can be quantified, to provide speech privacy. A comfortable work environment, however, produces productivity. From the comfort of the sound to the ability to customize in small areas, **Lencore's Spectra Classic** is the only system that delivers the unique features necessary to achieve a productive workplace and quickly generate a return on investment.

Our Advantage is Our Sound

Lencore offers the highest quality speakers in the sound masking industry with the widest dispersion that perfectly reproduces the finest masking sound. Our broadband frequency outperforms competitive systems to deliver more privacy and greater comfort. By far the simplest masking system to install and deploy, **Spectra Classic**

offers in-plenum and direct fired speakers to suit all ceiling applications and types.

Lencore also offers specialty products to accommodate a variety of site conditions and requirements.



Spectra Classic sound masking units are typically installed above the ceiling tile in the plenum. The units are placed in a grid pattern in order to maximize sound masking coverage for better sound quality, distribution and uniformity.



Achieving Speech Privacy & Comfort

A quality sound masking system must simultaneously provide both privacy and comfort throughout any facility. For privacy, there are a variety of industry tests, parameters and measurements for securing speech unintelligibility. Most notably, ASTM E-1130* is the primary test to determine speech privacy. Lencore's Spectra Classic system meets ASTM E-1130 standards while also providing acoustical comfort within any facility.

Measurements for comfort, previously considered subjective, are now defined and measured by the following five qualities: audio distribution range, uniformity of sound throughout a space, wraparound of generated sound, target decibel (dB) level and the achieved privacy measurements. All Lencore systems rate the highest for each metric for comfort. No other manufacturer comes close.

*Standard Test Method for Objective Measurement of Speech Privacy in Open Plan Spaces Using Articulation Index

Spectra Classic Features

- Superior sound quality and uniformity that provides speech privacy and comfort
- Award-Winning Broadband Sound
- Meets ASTM Standards for Speech Privacy
- Complete System Customization
- Energy Efficient and Low Voltage
- UL Listing for Plenum Use
- Over 50% Recycled Content
- Central Volume Controls and Central Timers available

Spectra Classic Advantages

- E-Sound® and IndePage® Technologies
- SPEC™ Diagnostic Software Tool
- Simple to Install, Tune and Use
- Quantifiable ROI
- 10-Year Full Warranty
- Manufactured in the USA

Specifications

Each **Lencore Spectra Classic Main (LM6)** Sound Masking unit consists of:

- An individual, non-coherent, pseudo-random masking sound generator (CMOS programmed micro controller circuit)
- Audio amplifiers capable of outputting to two additional secondary sound masking units
- Loudspeaker
- Masking volume and contour controls
- A separate paging volume control

Each main unit also consists of an AC to DC power supply, powered by a 16-18 VAC transformer. Additional central volume controls and central programmable timer options including acclimation features are also available.



Paging and Audio Systems

Lencore's Spectra Classic sound masking system has the ability to incorporate a high quality paging and audio system. With simple wiring and equipment additions, Spectra Classic can handle your paging, music and audio needs. Paging capabilities include: all call paging, zone paging, security paging and emergency paging. Using IndePage Technology, Spectra Classic delivers a superior sound quality and crystal clear paging options that are completely non-directional, uniform and surpass conventional paging systems.

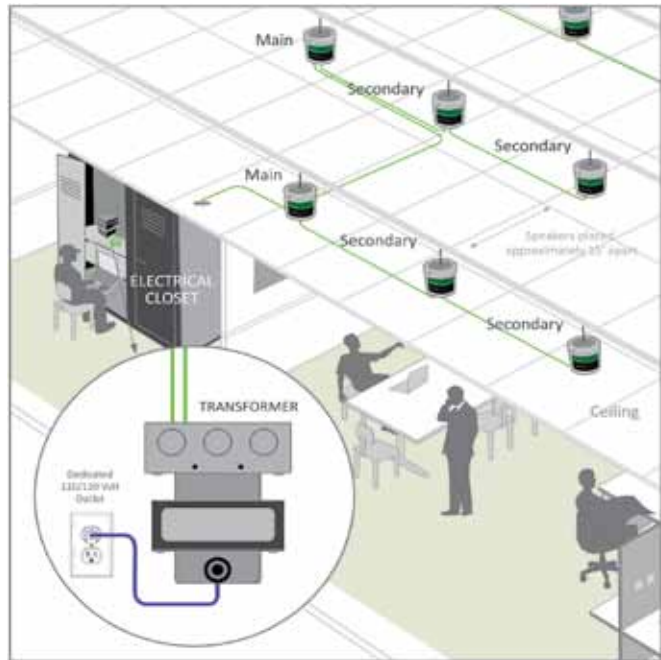
One of the most unique qualities of the **Spectra Classic** paging system is the ability to adjust the page and music volume separately from the masking volume at the speaker level.

What is Quiet?

Is it the library? Is it the beach?

Traditional reasoning suggests that a library would be the most productive place to work. After all, libraries are recognized as study areas for students all around the globe. However, many find a library difficult to work in as each sound, whether a whisper or the tap of a pen, becomes intrusive and breaks a person's concentration. Research has shown that it takes the average individual twenty minutes to resume their level of performance on an activity prior to being distracted.

The beach, on the other hand, is filled with activity and noise. However, it is a place that is restful and feels quiet. The ocean waves produce a pleasant, random, broadband sound which raises the ambient background level. At the beach you recognize that there is activity around you but you are not distracted by the noise because of the sound generated from the ocean. Sound masking



Spectra Classic is unparalleled in its ability to create speech privacy and is the only system that comes pre-rated to meet the Acoustical Comfort Metric Unit (ACMU).

“takes you to the beach” by providing that same random, broadband sound within your space.

Quiet is privacy and comfort. To achieve quiet you need:

- Speech masked by the ambient background sound
- A full broadband sound
- Random sound with no noticeable wraparound
- Uniform coverage



Why Sound Masking?

Acoustics affect critical aspects of a workplace environment, from productivity in office settings to the performance quality in theaters and auditoriums. Intrusive noise is a common complaint and noise from overheard speech is a top concern for today's facilities.

Modern trends in workspace design are moving people out of private offices and into open areas with smaller workstations and lower partition heights. The higher concentration of people in the same work area combined with telephone

How Sound Masking Works

Similar to furniture or lighting, acoustics play a key role in the office environment. Sound masking, when properly designed, dynamically improves comfort and collaboration in the workspace.

Sound masking works by introducing a unique, broadband sound complimentary to the speech spectrum that effectively covers indirect speech levels. This scientifically engineered sound is amplified through individual speakers installed above or in the ceiling throughout the space to create a uniform field of sound that ensures temporal and spatial uniformity. The sound masking system "fills" the plenum

conversations and discussions between colleagues can create a disruptive environment.

Today's design trends are creating less efficient acoustical spaces that are affecting employee performance. Distractions create stress and lower productivity. By achieving smart acoustics in a space with both comfort and privacy, collaborative communication can easily coexist with independent work. Sound masking helps decrease intrusive noise, promote collaboration and encourage creativity while delivering acoustical comfort throughout any environment.

and filters down into the space below, without phasing, to gently raise the background sound level. This rise in sound level covers, or masks, unwanted office noise. As a result, noise from overheard speech becomes less intelligible.

Spectra Classic delivers innovative and flexible solutions to provide acoustical comfort, speech privacy and create an environment that supports both concentration and communication. **Spectra Classic** offers a variety of speaker options and design layouts to fit varying site conditions and applications.

Improving the Acoustic Performance in Your Space

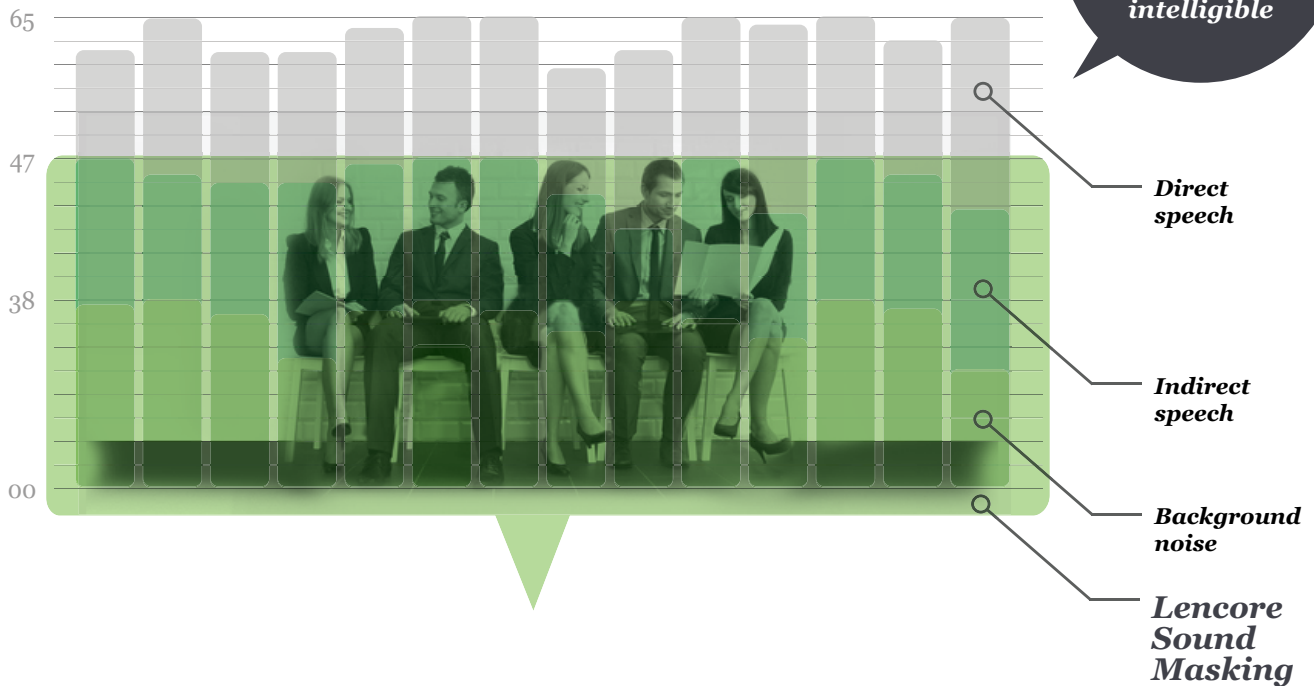
Reducing real estate related costs is a driving force to shift to open floor plans with fewer assigned workstations and individual spaces. This trend produces an environment with more direct and indirect speech.

Lencore sound masking is a proven element that when added to these environments create speech privacy and acoustical comfort. Masking is designed to introduce a gentle noise that covers indirect speech and some background noises - producing a more productive space. The diagram below visually demonstrates the concept in more detail.




Background noise & indirect speech is no longer intelligible

Decibel level (dB)



By achieving smart acoustics in a space with both comfort and privacy, collaborative communication can easily coexist with independent work.

- AT&T
- Bank of America Corp.
- Boeing
- Caterpillar
- Chevron
- Cisco Systems
- Coca-Cola
- General Electric
- General Motors
- Google
- Johnson & Johnson
- Kraft Foods
- Lockheed Martin
- Lowe's
- Microsoft
- Morgan Stanley
- Oracle
- PepsiCo
- Pfizer
- Procter & Gamble
- Sprint Nextel
- State Farm Insurance Cos.
- Sunoco
- UnitedHealth Group
- Walgreens
- Walt Disney

At Lencore we believe that PEOPLE MATTER. Our systems transform environments that change people's lives by providing more privacy, greater comfort and improved safety. Our advancements in sound quality, audio distribution, speaker design and software networking solutions have established Lencore as an industry leader.

Founded in 1990, Lencore has installed sound masking, paging, audio and mass notification systems for thousands of companies in over hundreds of millions of square feet across the United States and around the world.

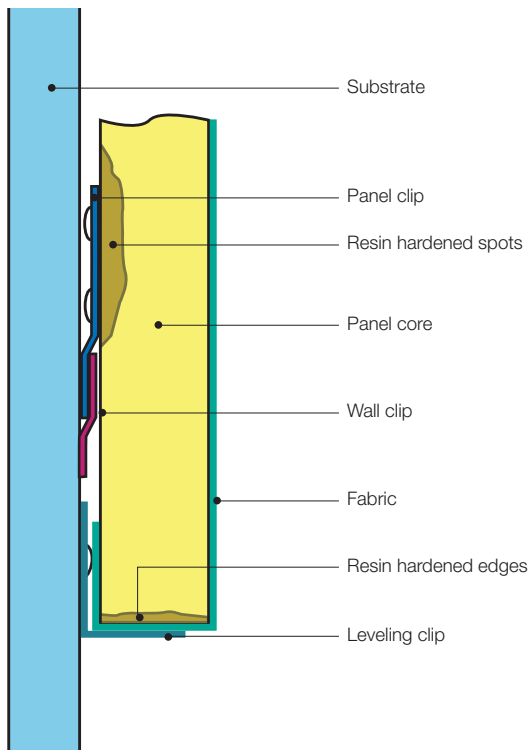
As the premier manufacturer of global solutions for speech privacy and emergency communication systems, Lencore does not believe in one size fits all solutions. We offer clients the choice of networked, in-plenum, direct fired, centralized, decentralized and remote masking, paging and audio systems.

With the most advanced technology and by offering more choices with proven results, Lencore is in the position to meet the challenges and demands that affect your facility.

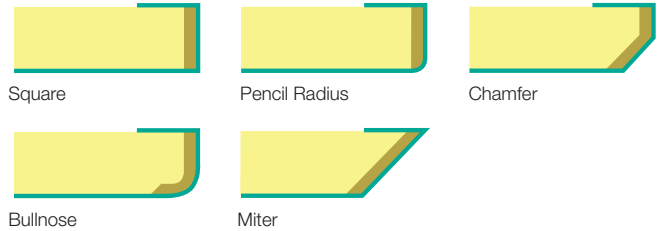
Lencore
One Crossways Park Drive West
Woodbury, NY 11797

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info@lencore.com
www.lencore.com

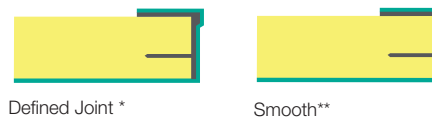
 @lencore1



Resined Edges



Metal Edges



*Available in 1" (25mm), 1-1/2" (38mm) and 2" (50mm)

** Available in 1" (25mm) thickness

DESIGN AND SPECIFICATIONS

Description

An Acoustical Panel (AP) is a general purpose wall panel consisting of a medium density core with a fabric finish. Panels are recommended for use where they are unlikely to be subjected to abuse or impact. For these types of areas see Decoustics' High Impact Resistant panels.

Panels are supplied complete with factory installed clips for different types of mounting e.g. mechanical, adhesive, magnetic, and hook and loop fastenings.

Panels

All Decoustics panels are custom fabricated and offered in a variety of sizes, shapes, thicknesses and finishes.

Decoustics panels can be finished with fabric from almost any manufacturer. Prior to use, Decoustics will test all fabric for suitability.

Design Considerations

When using speakers in ceiling or wall panels, it is recommended the speaker grille be visibly mounted at the face of the panel. Speaker function creates air movement and any fabric covering the speaker will experience premature soiling.

Maintenance

Refer to appropriate Decoustics "Cleaning and Maintenance Instructions" for any specific finish.

Standards, Tests and Approvals

Surface Burning Characteristics (ASTM E-84): All panel components have a Flame Spread rating of less than 25.

Note: Building code requirements may necessitate composite panel testing based on specified finish.

A panel comprised of "Class A" (Flame Spread of 25 or less) components does not necessarily produce a composite panel meeting the "Class A" requirement. Decoustics has a considerable number of composite panel tests on file.

Decoustics Acoustical Wall Panel (AP)

Performance Data

FINISH	EDGE OPTIONS	SIZES	CONSTRUCTION	THICKNESS	NRC	WEIGHT
Fabric	Resin: - square - bevelled - radiused - stepped Concealed Extruded Aluminum: - square - bevelled	Fabric: up to 48" x 120" (1220mm x 3050mm). Finish width must be sufficient to cover panel, panel thickness, and wrap a minimum of 1" (25mm) on the back side.	Acoustical Panel consists of a 6 to 7 pcf (96 to 112 kg/m ³) medium density core with a fabric finish. Fabric corners are fully tailored (no exposed darting).	3/4" (19mm)	0.70	0.74 psf (3.61 kg/m ²)
				1" (25mm)	0.85	0.88 psf (4.30 kg/m ²)
				1-1/2" (38mm)	0.95	1.19 psf (5.81 kg/m ²)
				2" (50mm)	1.10	1.51 psf (7.37 kg/m ²)
* Butt joint is available in 1" and 2" thick panels, defined joint is available in 1", 1-1/2" and 2" thick panels, bevelled is available for 1" thick panel.						

Note: The information provided in this Data Sheet is accurate to the best of our knowledge at the time of printing. However, we reserve the right to make changes when necessary without further notification. Suggested applications may need to be modified to conform with local building codes and conditions. We cannot accept responsibility for products that are not used, or installed, to our specifications. Please refer to our website for most current data.

Note: Only handle panels wearing clean, lightweight, white gloves during installation. Follow manufacturer's printed instructions for installation as well as field cutting of panels.

Mounting Methods

Mount panels to walls using mechanical fastening, adhesive, magnetic fastening or hook and loop fastening.

Mechanically mount only for panels located above head height (includes slide and engage z-clips, wall clips and/or track).

Use adhesive and mechanical fastening to secure "loop" to wall i.e. stapled with splayed-outward legs.

Consult with fastener manufacturer to determine correct fastener to use for specific substrates, particularly plaster or gypsum board.

Note: It is not always possible to secure panels or mounting hardware to a substrate support such as a steel stud.

Follow manufacturer's printed instructions for installation as well as for field cutting of panels.

Acoustical Data (ASTM C423: Type F5 Mounting as per ASTM E795).

FINISH	PANEL THICKNESS	FREQUENCY (Hz)						NRC	SAA
		125	250	500	1000	2000	4000		
Fabric	3/4" (19mm)	0.03	0.20	0.52	0.90	1.09	1.03	0.70	0.66
Fabric	1" (25mm)	0.35	0.41	0.84	1.09	1.09	1.02	0.85	0.84
Fabric	1-1/2" (38mm)	0.16	0.58	1.02	1.19	1.10	1.05	0.95	0.95
Fabric	2" (50mm)	0.19	0.87	1.20	1.19	1.08	1.03	1.10	1.05

Acoustic testing was performed on a panel finished with an acoustically transparent fabric. See finishes, fabrics for additional acoustical performance data.



Decoustics
 61 Royal Group Crescent
 Woodbridge, Ontario L4H 1X9 Canada
www.Decoustics.com
 Phone: 905-652-5200
 Toll Free: 800-387-3809
 © 07/15 Decoustics
 Code No. CTC-DC-0715-3000-3





Tackable High-Impact Acoustical Wall & Ceiling Panels

Acoustical Core:

6-7lb. density, rigid fiberglass

DATA SHEET No. 1A

Facing:

10-20 lb density, molded fiberglass 1/8" thick

Edges:

Chemically hardened edges to reinforce panel perimeter against warping and damage (aluminum edge available).

Finish:

Acoustically transparent 100% woven polyester, 66 inches wide, 2-ply, 16 ounce fabric. Fabric is bonded directly to the panel face with all edges wrapped a minimum of 1-1/2 inches to the back of panel to ensure a flat, wrinkle-free surface with tailored corners. Specified and other fabrics and perforated vinyls are available.

Size and Thickness:

Thickness	5/8", 7/8", 1-1/8", 1-5/8", 2-1/8" (custom thickness available)
Width	Up to 48"
Height	Up to 120"

Edge Details Available



Bevel



Radius



Mitered



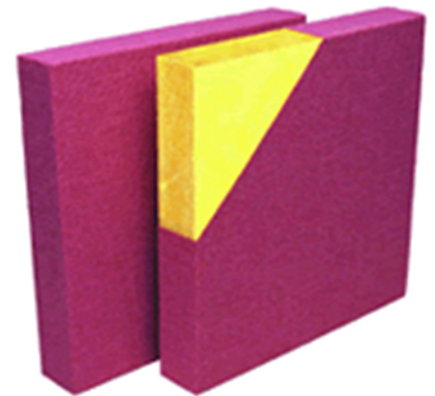
Pencil Radius



Tegular



Square



NRC 0.85 to 0.95 on 1"
NRC 1.00 to 1.10 on 2"

Fire test:

ASTM E 84

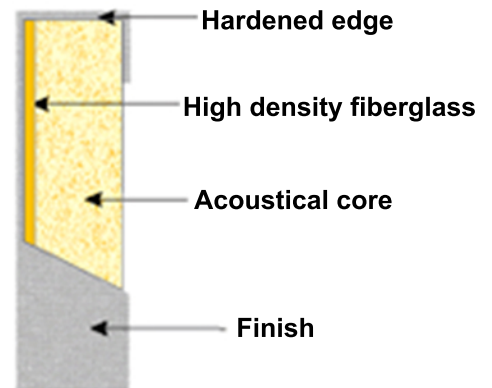
Class I (or A) flame spread rating (tunnel test)

UBC Standard 8-2

(corner burn test)

Mountings available:

- Velcro
- Adhesive
- Impaling clip
- Concealed spline
- Mechanical "Z" clip
- Rotofast clip

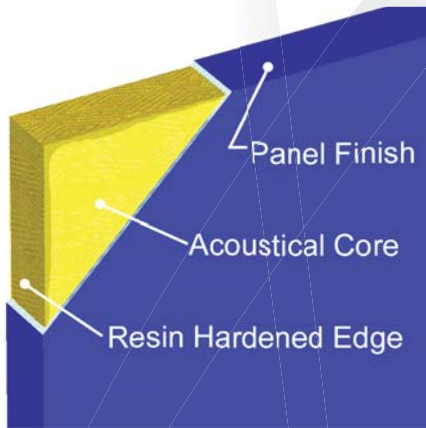




Wall Technology

CDC Corporation
An Owens Corning Company

A100 SERIES ACOUSTICAL PANELS



APPLICATION

Wall Technology's A100 Series panel is an economical, all purpose acoustical wall and ceiling panel designed for use where sound absorption and value are the main criteria. This series panel is suitable for auditoriums, theatres, offices and libraries; anywhere noise control is needed and critical lighting and high abuse resistance are not factors.

CONSTRUCTION

The core construction is a dimensionally stable 6-7 PCF fiberglass board with chemically hardened edge protection. Finishes are completely adhered to the face of the panel and returned to the back for a full finished edge. All corners are fully tailored.

SIZE AVAILABILITY

Available thicknesses are 1/2", 3/4", 1", 1-1/2", 2", 3", and 4". Widths are up to 48", and lengths to 12'. 1" and 2" are available in 60" x 120". Custom size is our standard!

EDGE DETAIL

All edges are resin hardened, unless otherwise specified. Available choices include: square, radius, bevel, and radius corners.

FINISHES

A wide variety of fabrics are available from all major brands, including Guilford, Maharam, Knoll, Carnegie, and Designtex. A comprehensive selection of vinyl coverings is available from Webcore, Designtex and Maharam. A USDA-approved Tedlar encapsulation can be provided for areas where sanitation and clean-ability are mandatory.

MOUNTING

Standard mountings include spot and perimeter adhesive, Z-clip, concealed splines, impaling clips, hook & loop, and magnetic fasteners. Wall Bar to Wall Bar is recommended for ceilings.

EXCELLENT ACOUSTICAL PERFORMANCE

A100 Acoustical Wall and Ceiling Panels provide excellent acoustical performance for auditoriums, theaters, offices, libraries, and classrooms; virtually anywhere sound absorption is required!

ACOUSTICAL UL LISTING

A100 fabric wrapped panels have been tested per ASTM C423, Type A mounting by Underwriters Laboratories for your assurance of acoustical performance:

Thickness	NRC
3/4"	.70
1"	.80
1 1/2"	.95
2"	1.05
3"	1.15



Noise Reduction Coefficient

R-VALUE

The R-Value is resistivity to heat or cold, and is an important factor in choosing a finish.

Thickness	R-Value
1"	4.1
1-1/2"	6.2
2"	8.3
3"	12.5
4"	16.6

FIRE PERFORMANCE

All components have been tested according to ASTM E 84* and have a **Class I/A rating**.



RECYCLED CONTENT

A100 Series panels utilize an Owens Corning fiberglass board core that is eligible to bear the Green Cross label for recycled content. The board is certified on average to contain at least 40% recycled glass, with 10% post-consumer and 30% pre-consumer content.

And for your LEED® project, our acoustical panels can help you qualify for recycled content points under the Materials and Resources section.

3-YEAR

3-YEAR WALLS AND CEILINGS

A100 Series Acoustical panels have a limited 3-year warranty starting from date of purchase. The panels are warranted to be free from defects in material and workmanship.

See product warranty for details and limitations.

*The ASTM E 84 standard should be used to measure and describe the properties of materials, products or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment, which takes into account all of the factors, which are pertinent to an assessment of the fire hazard of a particular end use. Values are reported to the nearest 5 rating.

A100 SERIES ACOUSTICAL PANELS— SPECIFICATIONS

PART 1 GENERAL

- 1.1 Work in this section shall be subject to drawings, general conditions, schedules, addenda and other contract documents.
- 1.2 The extent of the acoustical panels is shown on the drawings and in the schedules.
- 1.3 Submit _____ (select quantity) samples of each type of acoustical panel as shown on the drawings and in schedules and include appropriate technical information including test data and maintenance instructions. Submit _____ (select quantity) fabric selector cards from manufacturer's standard finishes, or designer specified finishes.
- 1.4 Acoustical panels shall be installed according to manufacturer's recommendations and instructions.
- 1.5 Installation of acoustical panels shall not begin until all wet work (plastering, concrete, etc.) is completed and dry. Building shall be properly enclosed and under standard occupancy conditions (temperature of 60-85°F and not more than 70% relative humidity) before installation begins.
- 1.6 The contractor shall be responsible for the examination and acceptance of all surfaces and conditions prior to the acoustical panel installation.
- 1.7 Substitutions or changes will only be permitted by prior approval by the architect.

PART 2 MATERIALS

- 2.1 Acoustical wall panels shall be Wall Technology Type: A100 Series Acoustical Wall and Ceiling Panels as manufactured by Wall Technology, Inc. / 800 Gustafson Road / Ladysmith, WI 54848. Phone (800) 359-3312 / Fax (800) 359-0106.
- 2.2 Acoustical Panels shall be constructed of a composite core construction of dimensionally stable rigid fiberglass of 6-7 pcf density. Thickness (choose one) 1/2", 3/4", 1", 1-1/2", 2", 3", 4" or custom _____ (specify).
- 2.3 Sizes: _____ width and _____ high or as shown on drawings. Standard maximum size is 48" wide x 120" high (nominal). Custom or larger sizes available; consult manufacturer. Panels are to be manufactured according to field dimensions supplied by the installing contractor. Standard tolerances are $\pm 1/16$ " in width and length.

- 2.4 Edge profile shall be: Square, radius, full bevel, half-bevel, miter, or custom _____ (specify). Corner detail shall be: Square, radius or custom _____ (specify). Edge treatment shall be: resin hardened, aluminum or high-pressure laminate (with square edge only), wood (all profiles available) or custom _____ (specify).
- 2.5 Panel finish shall be _____ (specify finish manufacturer, pattern, color and specifier). Finish shall be applied directly over the face and edges of the panel and returned to the back of the panel to provide a full finished edge. All corners are fully tailored.
- 2.6 Mounting shall be: Adhesive / Resin, Adhesive No Resin, Impaling / Adhesive, Lay-in, Magnet, Rotofast (some limitations), Spline, VELCRO® Panel Clip to Wall Bar, Panel Clip to Double Wall Clip, Wall Bar to Wall Bar (strongly recommended for ceilings), Aluminum Z-Clips, Panel Clips / VELCRO® or custom _____ (specify). Leveling angles are supplied if appropriate. Adhesive, miscellaneous fasteners, (i.e. nails, screws, etc.) and standard continuous wall leveling angle are to be supplied by the contractor.
- 2.7 Acoustical Performance – panels shall have a minimum NRC of _____ (please specify) in accordance with ASTM C-423 (Type "A" Mounting).
- 2.8 Flammability – All panel components shall have a Class "A" fire rating in accordance with ASTM E-84.
- 2.9 R-Value is _____. (Calculated using the R-factor of 4.16 per inch of thickness.)

Thank you for choosing Wall Technology for your acoustical needs.

The information provided above is correct to the best of our knowledge at time of printing. We reserve the right to make changes without prior notification.

DISCLAIMER OF LIABILITY

Technical information contained herein is furnished without charge or obligation and is given and accepted at recipient's sole risk. Because conditions of use may vary and are beyond our control, Owens Corning makes no representation about, and is not responsible or liable for the accuracy or reliability of data associated with particular uses of any product described herein. Nothing contained in this bulletin shall be considered a recommendation.



CDC CORPORATION

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Ladysmith, Wisconsin 54848

1-800-359-3312

www.walltechnology.com

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PANEL FABRIC

FR 701®
STYLE 2100



538 SILVER PAPIER



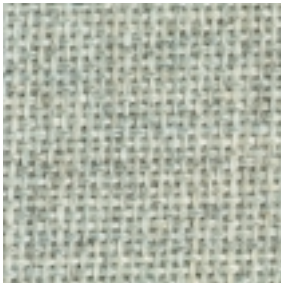
130 WHEAT



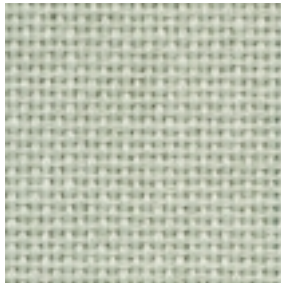
460 BUFF



748 BONE



394 OPAL



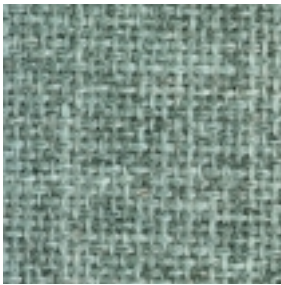
481 PEARL



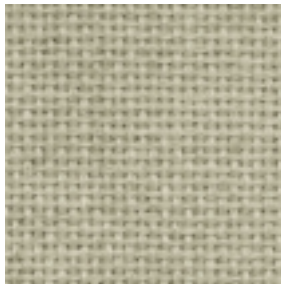
404 APRICOT NEUTRAL



747 STRAW



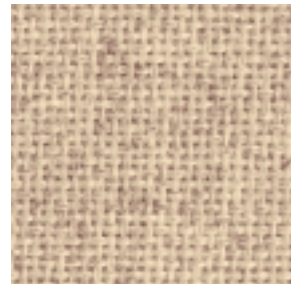
238 GREY MIX



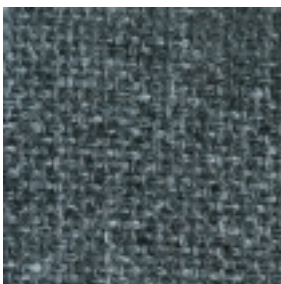
758 DESERT SAND



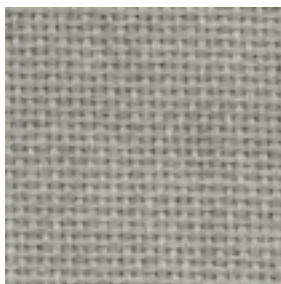
751 TERRA



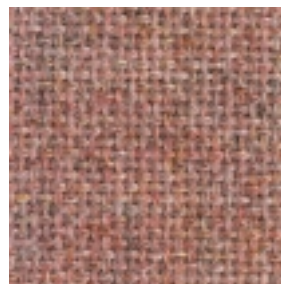
403 VANILLA NEUTRAL



298 MEDIUM GREY



750 CEMENT MIX



422 CINNABAR



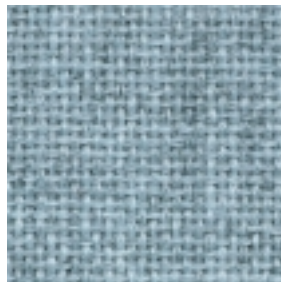
423 PUMICE



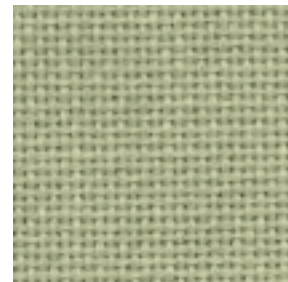
380 QUARTZ



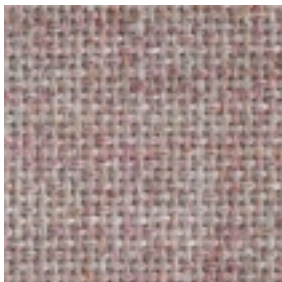
406 SILVER NEUTRAL



539 BLEU PAPIER



749 DUNE



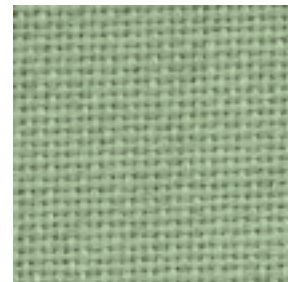
400 CHERRY NEUTRAL



405 LAVENDER NEUTRAL



401 BLUE NEUTRAL



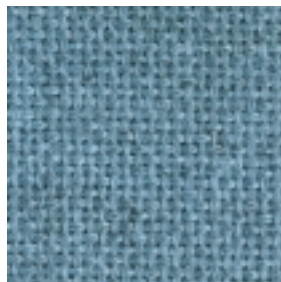
757 STREAM



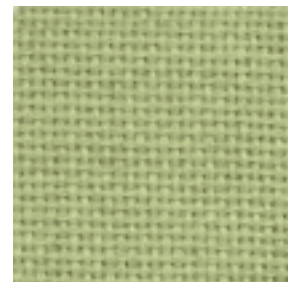
390 ROSE QUARTZ



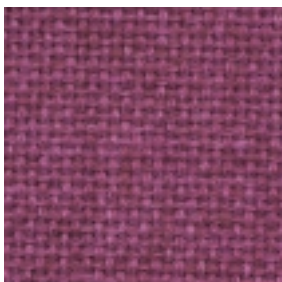
752 LILAC



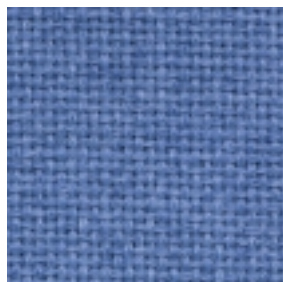
175 CRYSTAL BLUE



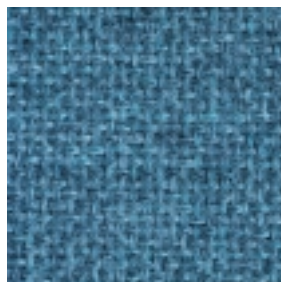
755 LEAF



475 SIENNA



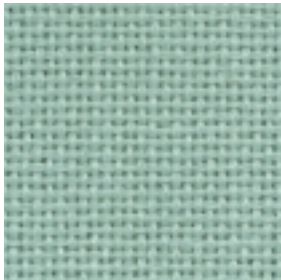
753 VIOLET



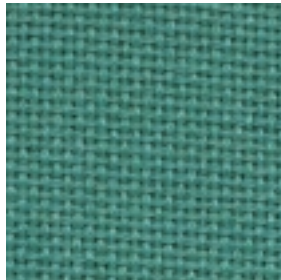
150 WEDGEWOOD



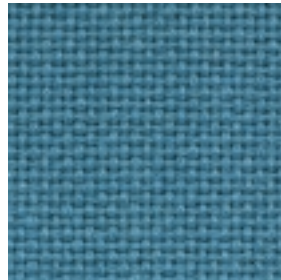
754 LIGHT MOSS



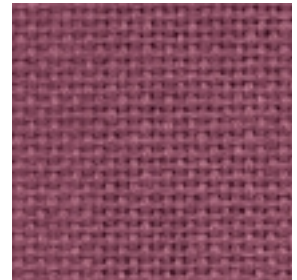
468 EUCALYPTUS



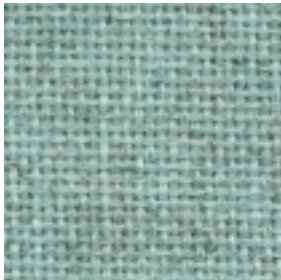
549 CHROME GREEN



486 BAYBERRY



545 BRONZE



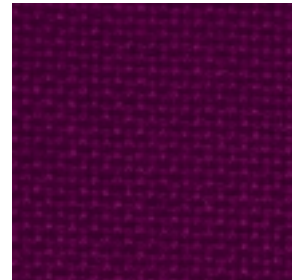
561 VERTE PAPIER



381 AQUAMARINE



424 AMETHYST



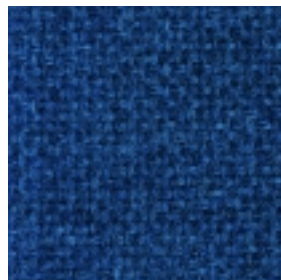
556 DEEP BURGUNDY



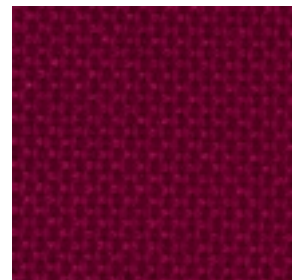
402 GREEN NEUTRAL



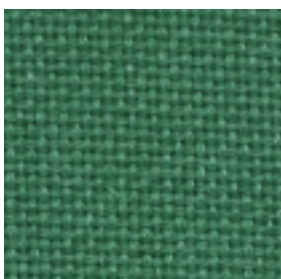
756 LAKE



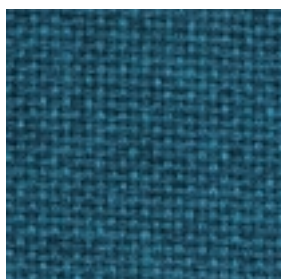
153 BALTIC



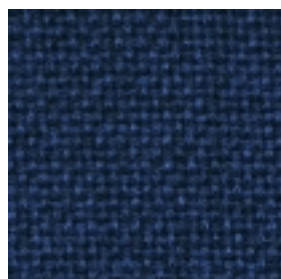
418 CLARET ACCENT



467 BLUE SPRUCE



470 ULTRAMARINE



553 BLUE PLUM



408 BLACK

SPECIFICATIONS

FR 701®

PATTERN	2100
CONTENTS	100% Terratex™ Polyester
WEIGHT	16.0 ± 0.5 Oz./Lin. Yd.
WIDTH	66" Useable
REPEAT	None

CLEANING CODE

W-S	Fabric may be cleaned with mild, water-free solvents or water-based cleaning agents or foam.
-----	--

PERFORMANCE

TENSILE (ASTM D 5034)	150 Lbs. Min. - Warp and Fill
TEAR (ASTM D 2261)	30 Lbs. Min. - Warp and Fill
MOISTURE REGAIN (ASTM D 2654)	0.5% Max.
COLORFASTNESS TO LIGHT (AATCC 16E)	40 Hrs.
COLORFASTNESS TO CROCKING (AATCC 8)	Class 4 Min. - Dry, Class 4 Min. - Wet

FLAMMABILITY

ASTM E-84	Class 1 or A
NFPA-701 LARGE SCALE - 1989	Passes
STATE OF CA. TECH. BULLETIN 117 SEC. E (CS-191-53)	Passes

TERRATEX® IS A REGISTERED TRADEMARK OF INTERFACE INTERIOR FABRICS, INC. AND DESIGNATES FABRICS THAT ARE MADE FROM 100% RECYCLED MATERIAL USING INCREASINGLY SUSTAINABLE MANUFACTURING PRACTICES TO PRODUCE A HIGH QUALITY PRODUCT THAT IS RECYCLABLE AT THE END OF ITS USEFUL LIFE.

®  FR 701® IS INCLUDED IN THE UNDERWRITERS LABORATORY PANEL FABRIC RECOGNITION PROGRAM. ADDITIONAL TESTING OF THE U.L. RECOGNIZED COMPONENT FABRIC IS NOT REQUIRED ON APPROVED PANELS FROM PARTICIPATING MANUFACTURERS.

COLORS MAY VARY SLIGHTLY BETWEEN DYE LOTS.

APPLICATION TESTING OF THIS PRODUCT IS RECOMMENDED.

FR701® IS A REGISTERED TRADEMARK OF GUILFORD OF MAINE.

THIS SAMPLE IS REPRESENTATIVE OF THE FINISHED COLOR TO BE SUPPLIED AND MAY NOT INDICATE AN EXACT MATCH. WHILE EVERY EFFORT IS MADE TO MATCH THIS COLOR TO A MASTER SAMPLE, SOME VARIATION MAY OCCUR. WE DO NOT RECOMMEND THAT YOU SPECIFY FROM THIS CARD AND CANNOT BE RESPONSIBLE FOR VARIATIONS IN SHADE BETWEEN THIS PRINTED CARD AND ACTUAL FABRIC.

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CANADA
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AN INTERFACE COMPANY





lightweight

When considering air distribution for new or retrofit applications, the noise criteria (NC) factor is always considered for supply air outlets but often overlooked for return air outlets. Most HVAC applications include an open plenum design for the return air. The return device is located in the ceiling and the return air is exhausted into the plenum space above the ceiling. This can allow sound transfer to occur between different rooms in a building through the ceiling return air system.

The additional noise is a problem that must be addressed in buildings such as medical offices, schools, and executive offices where privacy is a major concern. To address this issue, Titus offers an acoustical return sound boot that is inexpensive, lightweight, and easy to install. The FlexaBoot assembly consists of a 5' piece of acoustical flex duct, a FlexRight elbow, and all necessary hardware for installation.

easy to install

inexpensive

FLEXABOOT

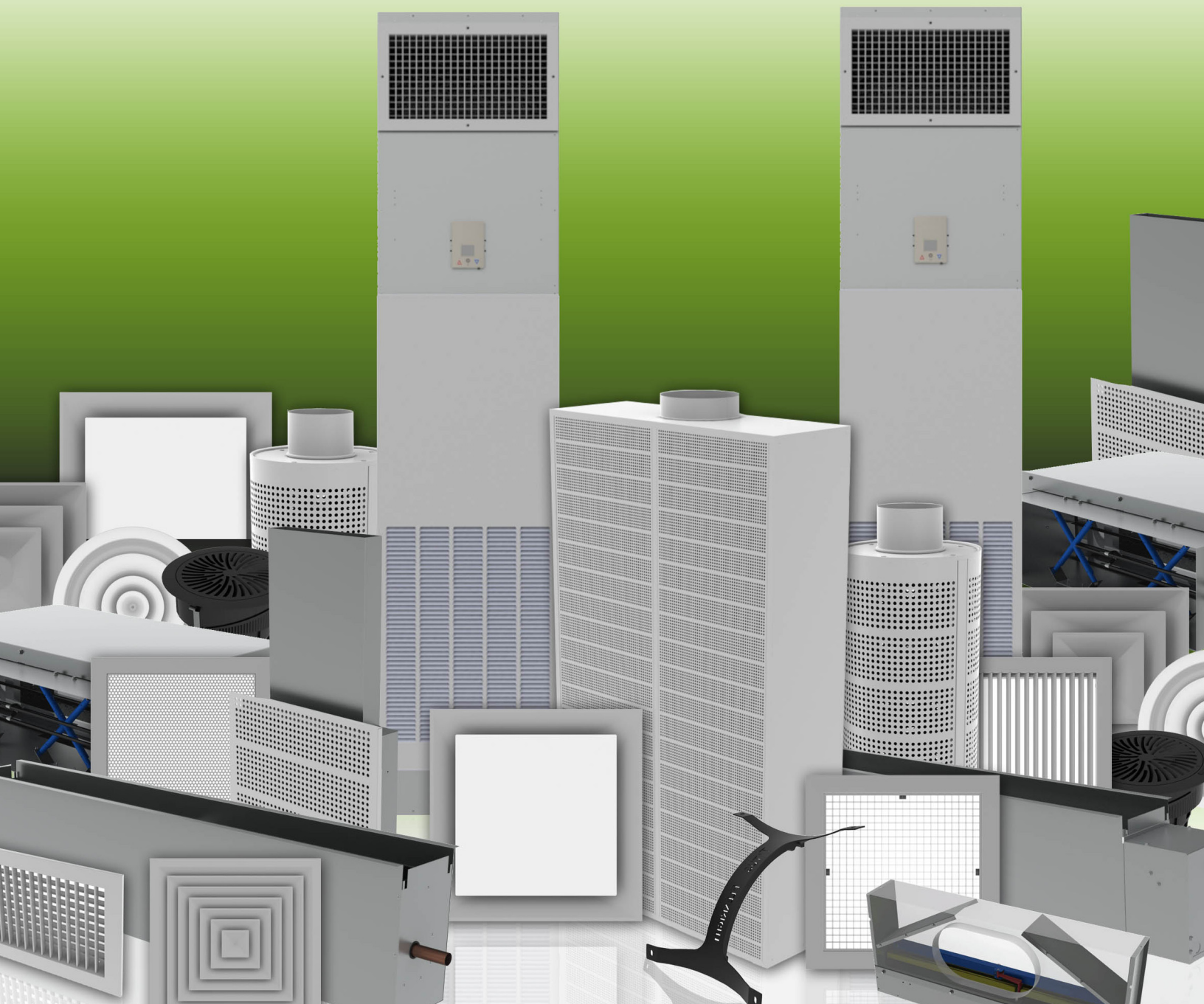
The Acoustical Return Boot Solution from Titus

- Acoustically tested assembly
- Eliminates sound transfer in open plenum ceilings
- Low cost option to standard metal return boots
- Lightweight – easy to handle
- Can easily be transported and installed by one person





Titus, The Leader in Air Management has an HVAC solution for any application. Whether it is a ceiling installation or an underfloor application, Titus has the products to meet your needs. Contact your local Titus Representative for more information.



SHEETROCK® Brand Acoustical Sealant



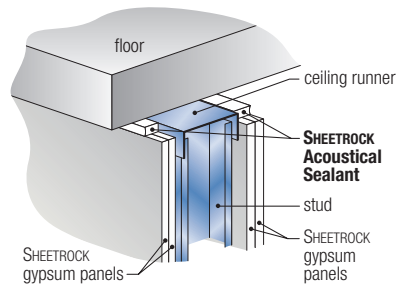
Makes promised ratings a reality

- Excellent sound-flanking material (supports high STC ratings)
- Superior performance as a fire caulk in UL-classified joint systems
- Ideal for use in smoke and/or sound assemblies
- Meets ASTM C834 specifications for latex sealants
- Grade -18°C (0°F) low temperature flexibility, strong bond
- Low VOC

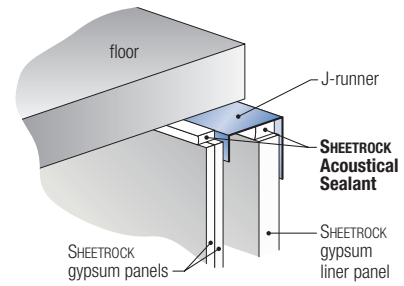
Description

USG SHEETROCK® Brand Acoustical Sealant is an acrylic, latex-based sound caulk for use as a joint sealant in fire-rated partitions, smoke barriers and sound-rated assemblies.

HW-D-0262 – Conventional Wall



HW-D-0603 – Shaft Wall



UL Systems	Joint Systems	Conventional Wall – BW-S-0013, BW-S-0016, BW-S-0022, BW-S-0026, HW-D-0001, HW-D-0002, HW-D-0262, HW-D-0372, HW-D-0372, HW-D-0504, HW-D-05406, HW-D-0513, HW-D-0518, HW-D-0525, HW-D-0577, HW-D-0584, HW-D-0603, HW-D-0609, HW-D-0610, HW-D-0611, HW-D-0612, HW-D-0613, HW-D-0626, HW-D-0627, HW-D-0628, HW-S-0009, HW-S-0010, HW-D-0032, HW-S-0035, HW-S-0089, HW-S-0094, HW-S-0096, HW-S-0097, HW-S-0098, HW-S-0099, HW-S-0100, HW-S-0101, WW-S-0058, WW-S-0062
		Shaft Wall – HW-D-0603, HW-D-0609, HW-D-0610, HW-D-0611, HW-D-0612, HW-D-0613, BW-S-0016
	Through-Penetration Firestop Systems	C-AJ-1020 and W-L-1064

Advantages

- Versatile** Easily applied on vertical and horizontal surfaces without sagging, even overhead.
- Sound-tested** As an integral component to maintain high STC/MTC ratings in partitions.
- Surface burning characteristics** Classified by UL with a flame spread of 0 and a smoke developed of 0.
- For use in fire-resistant, sound and smoke partitions** Acceptable for use at the perimeter of most wood- and steel-stud wall assemblies.
- Remains flexible** Dries tough but stays resilient to “give” with movement.
- High adhesion** Bonds tenaciously to a variety of surfaces.
- Attractive appearance** Product is non-staining.
- Easy to dispense** Good working properties ensure fast, efficient application with hand-gun equipment.
- Excellent physical properties** Won’t sag on vertical surfaces; good open time; long shelf life.
- Easy cleanup** Latex-based for cleanup with soap and water before drying.
- Classified by UL** as a material for use as a Fill, Void, or Cavity in fire-resistant joint, and through-penetration firestop systems.

Limitations

1. Not to be applied to moist areas where frost or condensation is present or in direct contact with water.
2. Protect container from freezing and extreme heat.
3. Maintain 55°F (13°C) minimum temperature within the building during and after installation.
4. Product should be stored at a temperature neither below 41°F (5°C) nor exceeding 80°F (26.7°C).
5. Not to be used in applications where the surrounding materials (partitions, floors, penetrations, etc.) will exceed sustained temperatures of 125°F.
6. Not for use around CPVC or PVC pipes; consult with pipe manufacturers for compatibility.
7. Not intended to be painted.
8. Do not apply USG SHEETROCK Brand Acoustical Sealant in areas where abuse or abrasion of the sealant is likely.
9. There may be discoloration of sealant when in contact with certain types of metal such as copper.

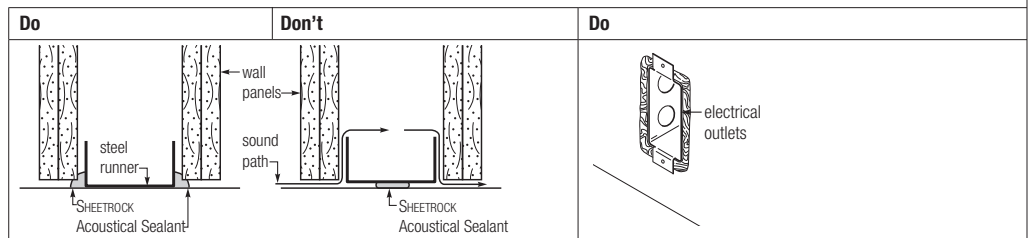
Directions **Preparation** Before handling, read material safety data sheet and product label for safe usage and health information. Installation of SHEETROCK® Brand Acoustical Sealant should not begin until building is enclosed and building temperatures are maintained at 55°F (13°C) minimum. Provide adequate ventilation to carry off excess moisture to insure adequate drying. The performance and adhesion of sealants will be only as good as the surface of which it is applied. Surfaces of the opening and any penetration items to be caulked must be clean, dry, free of dust, debris, and moisture to insure proper adhesion.

Application SHEETROCK Brand Acoustical Sealant shall be applied in accordance with ASTM C919 using conventional caulking equipment. In joint and firestop systems apply the SHEETROCK Brand Acoustical Sealant to minimum thickness specified in the individual fire-rated system.

In shaftwall applications, the maximum separation between bottom of floor and top of liner panel is 1". Max separation between bottom of floor and top of gypsum board sheets at time of installation of joint system is 5/8". The joint system is designed to accommodate a maximum 25 percent compression or extension from its installed width on the finished side of the wall.

For all other joints, the sealant application should be specified by a design professional who should give consideration to using a backer rod or bond tape where the gap exceeds 5/8". In joints too shallow to take backer rod, use a bond breaker tape to prevent three-sided adhesion.

In acoustical applications, apply 1/4" min. bead of sealant to seal perimeter of partition. Apply continuous bead of SHEETROCK Brand Acoustical Sealant around all openings and partition intersections. In penetration applications which are not covered in an individual fire rated system, the thickness of the sealant applied within the opening should be no less than 1/4" and no greater than 5/8" flush with the top surface of the floor or sides of the wall. (Except above the liner panels in shaftwall applications.)



Product Data

Testing and classification: Meets ASTM C834 Standard Specification for Latex-Based Sealing compounds tested in accordance with ASTM C731, ASTM C732, ASTM C733, ASTM C734, ASTM C736, ASTM D217, ASTM D2202, ASTM D2203, and ASTM D2377. Also tested in accordance with ASTM E84 (surface burning characteristics), ASTM E90 (sound tests) and ASTM E1966 (fire resistant joint systems). ASTM E814 (Through firestop penetrations).

Surface burning characteristics: 0/0 (flame spread/smoke developed)

Color: Off-white

Solids: 73% ± 3%

Weight: 12.0–12.8 lb./gal. (in container)

pH: 8.5–9.25

VOC: <15 g/l

Shelf life: 1 year (in original, unopened container) under good storage practices. NOTE: see #4 under Limitations

Coverage (approximate): 85 linear ft. of 1/4" bead/29 oz. ctdg.; 37 linear ft. of 3/8" bead/29 oz. ctdg.; 22 linear ft. of 1/2" bead/29 oz. ctdg.; 11 linear ft. of 5/8" bead/29 oz. ctdg.

Packaging: 29 oz. (850 ml) cartridge; 5 gal. (18.9 L) pail

Good Design Practices

1 Inspections Periodic inspection of rated barriers is recommended to make sure that any new openings, modifications of previously installed seals, or areas exhibiting physical damage have been properly sealed or repaired.

2 Sound Tests Sound tests are conducted under laboratory conditions per ASTM procedures. Comparable field performance depends upon careful attention to details and workmanship. SHEETROCK Brand Acoustical Sealant should be used to seal all assemblies used for sound control and all assembly cutouts, such as those for electrical boxes. Back-to-back penetrations of the diaphragm, flanking paths, door and borrowed-light openings should be avoided.

3 Metal Door and Borrowed-Light Frames Apply a continuous bead of SHEETROCK Brand Acoustical Sealant inside door frame throat just before inserting facing panel into frame. Do not terminate gypsum panel against trim return.

4 Additional Information See publications in USG Architectural Reference Library; SA100, *Construction Selector*; SA927, *Gypsum Panels and Accessories* (for information on system components); SA727, *USG Fire Stop Systems*; SA926, *USG Shaft Wall Systems Catalog*; and usgdesignstudio.com/sealant-fire-tests.asp

Submittal Approvals:	Job Name		Date
	Contractor		

<p>WARNING! Avoid exposure to fumes. Inhalation of vapor may cause headache, nausea, or irritation of nose, throat, and lungs. Use in a well-ventilated area. Wear a NIOSH/MSHA-approved respirator in poorly ventilated areas. Avoid contact with eyes and skin. Wear safety glasses or goggles for eye protection. If eye contact occurs, immediately flush thoroughly with water for 15 minutes. If irritation persists, consult physician. Prolonged or</p>	<p>repeated contact with skin can cause irritation. Wear waterproof gloves and protective work clothing for skin protection. If skin contact occurs, wash thoroughly with soap and water. If irritation persists, consult physician. Do not ingest. If ingested, consult physician immediately. Product safety information: 800 507.8899 or usg.com. KEEP OUT OF REACH OF CHILDREN.</p>	<p>Trademarks The following trademarks used herein are owned by United States Gypsum Company or a related company: SHEETROCK, USG, USG in stylized letters and the red and maroon design elements on the pail and cartridge.</p> <p>Note Products described here may not be available in all geographic markets. Consult your U.S. Gypsum Company sales office or representative for information.</p>	<p>Notice We shall not be liable for incidental and consequential damages, directly or indirectly sustained, nor for any loss caused by application of these goods not in accordance with current printed instructions or for other than the intended use. Our liability is expressly limited to replacement of defective goods. Any claim shall be deemed waived unless made in writing to us within thirty (30) days from date it was or reasonably should have been discovered.</p>	<p>Safety First! Follow good safety and industrial hygiene practices during handling and installation of all products and systems. Take necessary precautions and wear the appropriate personal protective equipment as needed. Read material safety data sheets and related literature on products before specification and/or installation.</p>
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ECOCORE PANELS

RECYCLED CONTENT
TACKABLE PROPERTIES
HIGH IMPACT SURFACE

Panel Composition:

100% Polyester (60% PET-Recycled Fiber, 40% PET-Virgin Fiber). Chemically hardened edges.

Sizes:

Custom sizes available up to 48" X 120". Custom shape and design options also available.

Finishes:

Select from Vertical Interior Solutions approved panel fabrics. C.O.M. accepted after approval of suitability.

Mounting Methods:

Adhesive & Finish Nail, Z-Clips, Edge Clips, Hook & Loop

Fire Rating:

All panel components meet or exceed Class "A" requirements as determined by ASTM E-84 Tunnel Test.

Warranty:

All products are warranted against workmanship and manufacturing defects for two (2) years from date of purchase.

Ecocore is a High Impact Resilient core produced from 100% Polyester material that can be used in place of traditional cores commonly utilized in Acoustical and Tackable panel systems.

Ecocore contains 60% Post Consumer recycled content which may contribute to LEED points.



Benefits

- Formaldehyde Free
- No Binding Agents
- Consistent Color
- Does Not Promote Mildew
- Tackable
- Dust Free
- No Odor
- Extremely Resilient

Edge Detail:



Bevel



Square

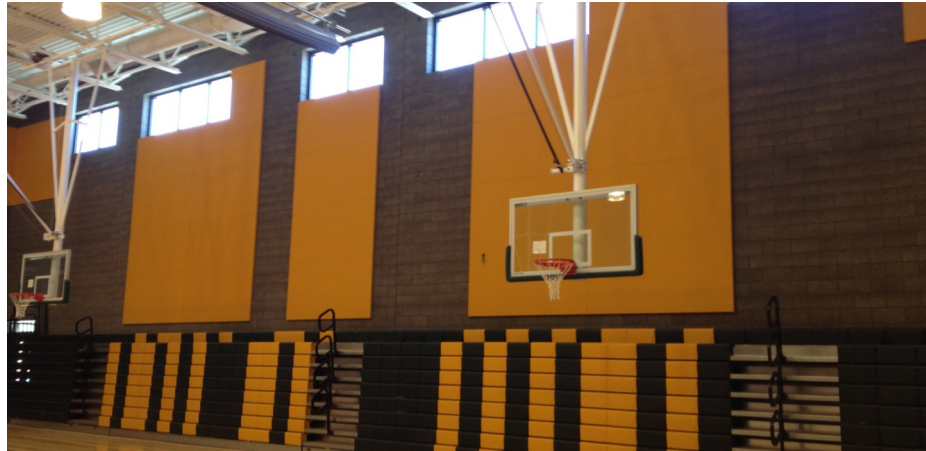
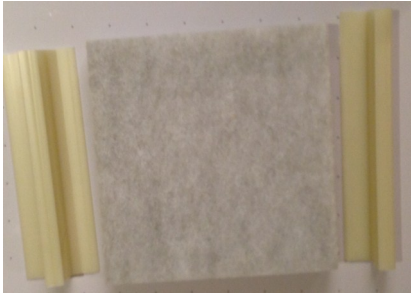


Mitre

Product #	Thickness	Absorption Coefficients				NRC
		250 Hz	500 Hz	1000 Hz	2000 Hz	
ECO-050	1/2"	0.10	0.26	0.65	0.88	0.45
ECO-100	1"	0.28	0.66	1.02	1.03	0.75
ECO-150	1 1/2"	0.61	0.82	1.04	1.00	0.85

F-SORB™

ACOUSTICAL CORE SYSTEM



F-SORB™

System Thicknesses:

- 1/2 " system
- 1 " system
- 2 " system

F-SORB™ acoustical core is installed with mechanical fasteners into the substrate and between stretched fabric track systems

F-SORB™ acoustical core comes in light grey, tan or white. The light grey color is standard unless specified otherwise

Noise Reduction Coefficients:

NRC 1/2 " Thick	0.55
NRC 1 " Thick	0.75
NRC 2 " Thick	0.90

- **F-SORB™** is an environmentally friendly, polyester acoustical panel developed for building interiors and exteriors for acoustics.
- **F-SORB™** is a 70% post-consumer polyester-fiber, Class A fire –rated sound absorption product for walls, ceiling and duct applications.
- **F-SORB™** is 100% recyclable.
- **F-SORB™** Polyester fiber resists mold, mildew and bacteria.
- **F-SORB™** is acoustically identical to fiberglass in performance.
- **F-SORB™** is hypoallergenic, dust-free and formaldehyde-free.
- **F-SORB™** is easy to handle and simple to apply.
- Great for offices, schools, movie theaters, churches and studio installations.
- **F-SORB™** acoustical core has a 6 LB face that is tackable and impact resistant.
- NO VOC 's. Does not use binders or chemicals. No risk of skin irritation or respiratory problems.
- Standard acoustical core panel color is Light Grey. Tan and White are available.

Standard Panel Specs:

1/2 " acoustical core is 6 LB Density

1 " acoustical core is a 6 LB Density face on a 4 LB core

2 " acoustical core is a 5 LB Density

Standard Sheet size is 4 ' x 8 '

www.f-sorb.com

15115 NE 90th Street, Suite 4A, Redmond, WA 98052 PH 425-881-1124 FAX 425-881-1114

F-SORB™

ACOUSTICAL CORE SYSTEM

Flexibility in Acoustical Applications and Installation:

- ◆ F-SORB works well in Stretched Fabric Systems.
- ◆ It provides a tackable surface in most applications.
- ◆ Conforms to a wide variety of acoustical applications.
- ◆ Versatility to fit any layout design.
- ◆ Rebounds to impact.
- ◆ Can be used without fabric facings in exposed applications.



Key Features:

Acoustical Absorption: Noise absorbed based on mounting type.

NRC: 1/2 " NRC 0.70 - 0.80	1 " NRC 0.90 - 1.00			E TYPE MOUNTING
1/2 " NRC 0.50 - 0.60	1 " NRC 0.70 - 0.80	2 " NRC 0.85 - 0.95		A TYPE MOUNTING
1/2 " NRC 0.55 - 0.65	1 " NRC 0.75 - 0.85	2 " NRC 0.90 - 1.00		B TYPE MOUNTING
				1 " FURRING

Standard Colors available:

F-SORB™ Light Grey

F-SORB™ Tan

F-SORB™ White

Custom Colors Available:



www.f-sorb.com

15115 NE 90th Street, Suite 4A, Redmond, WA 98052 PH 425-881-1124 FAX 425-881-1114



EMPIRE

ACOUSTICAL SYSTEMS

WORLDWIDE ACOUSTICAL PRODUCTS & SERVICE

Colorado Location:

36744 Constitution Drive

Trinidad, CO 81082

PH: (719) 846-2300

FAX: (719) 846-7466

Email: empireacoustical@rmi.net

Texas Location:

1106 South Mays, #240

Round Rock, TX 78664

PH: (512) 828-3138

FAX: (512) 233-1757

Email: johnnie@mckeowninternational.com

Web:

www.empireacoustical.com

Celebrating 20 years of custom engineering, fabrication, and installation of



- ***ACOUSTICAL ENCLOSURES***
- ***NOISE BARRIERS***
- ***SOUND ABSORPTIVE WALL MOUNTINGS***

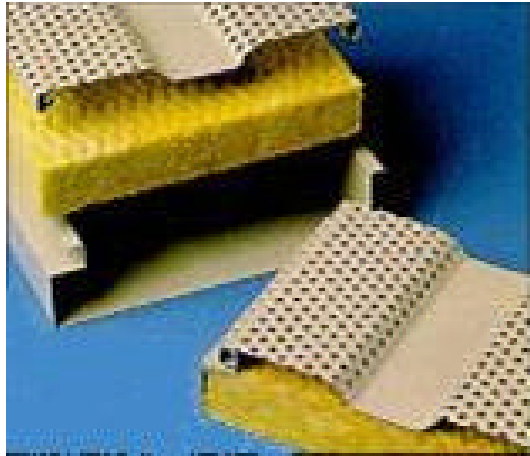


Our cost – effective, light weight metal panels are designed to meet your specific noise control problems.

Maintaining the highest acoustical properties available, our systems are engineered for easy installation and no maintenance.

PRODUCTS


Empire Acoustical Systems noise control products are fabricated from galvanized steel or similar metals and have two basic applications.



The Silent Screen panel is engineered for noise enclosures and barrier walls where structural integrity, sound absorption and transmission loss are of major concern.



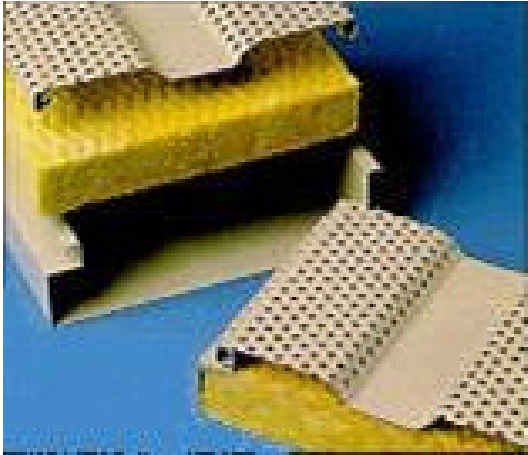
The M-90 panel is used on walls for sound absorption applications.



ADVANTAGES OF THE EMPIRE ACOUSTICAL SYSTEMS ACOUSTICAL PANEL

- Engineered products to meet clients' specific acoustical requirements
- Fabricated from quality materials as specified by ASTM standards
- Cost effective designs
- Addresses difficult applications for harsh working environments
- Ease of installation
- Maintenance free and easy to remove
- Aesthetically pleasing

SILENT SCREEN PANELS



- Designed to provide sound absorption and sound transmission loss
- Consists of individual sections, 12 inches wide
- Mounts horizontally on top of one another or
- Mounts vertically side by side
- Each section contains a 2 - 4 inches deep 16 gauge - 22 gauge tray
- Tray filled with 6 pound density mineral wool, covered with 22 gauge perforated face panel

Sounds striking the perforated side will pass through the perforations and be absorbed by the acoustical material, and some will be reflected back to the source of the noise.

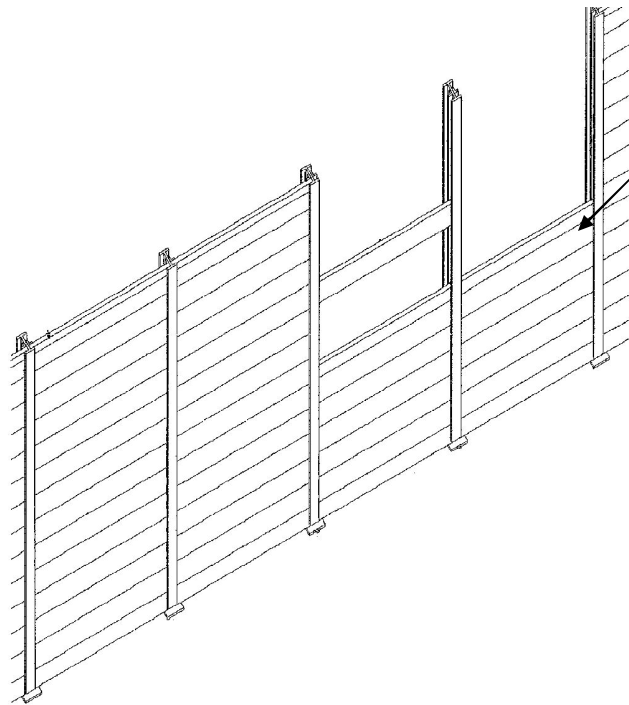
The remaining sound which is transmitted through the barrier, is substantially reduced.

The standard **Silent Screen Panel** has a sound absorptive value of NRC 1.05 and STC of 35.

SILENT SCREEN PANELS

TYPICAL WALL ASSEMBLY

Fabricated from 22 and 16 gauge sheet steel - Installed horizontally or vertically - Typical l y 12 inches wide and 2 3/4 inches thick

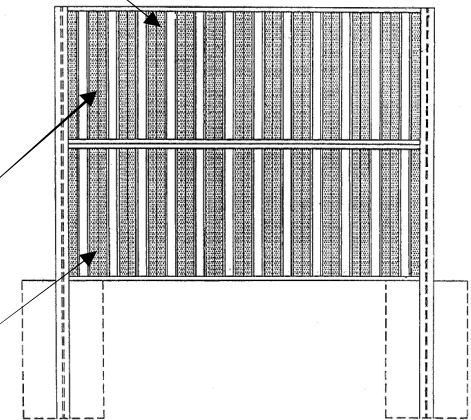


FACE PANEL – Cold – formed steel galvanized in accordance with ASTM A-653, Class G-90. May be galvanized or pre-coated for aesthetic appeal.

BACK TRAY – Cold – formed steel galvanized in accordance with ASTM A-653, Class G-90 with a 12 inch width. May be galvanized or pre-coated for aesthetic appeal.

PERFORATION – Cold-formed steel with 3/16 inch diameter perforations in a 3/8 inch staggered pattern.

ACOUSTICAL INSULATION – Mineral rock wool – 2 inches thick with a 6 pounds per cubic foot density conforming to Federal Specification HH-1-558B and ASTM E-136.



M-90 ABSORPTIVE PANEL



- Designed for wall-mounting indoor and outdoor applications
- Consists of 24 inch wide panel sections
- Available in 2– 4 inch thicknesses
- Available in lengths up to 12 feet
- Absorptive material is 6 pound density mineral wool

M-90 panels are sound absorptive backless panels that fit on an existing wall or barrier structure.

The **M-90** panels are fabricated from galvanized sheet steel with a 22 gauge thickness and are nested with Z or J channel clips horizontally attached to the existing walls.

The standard **M-90 Absorptive Panel** has a sound absorptive value of NRC 1.10

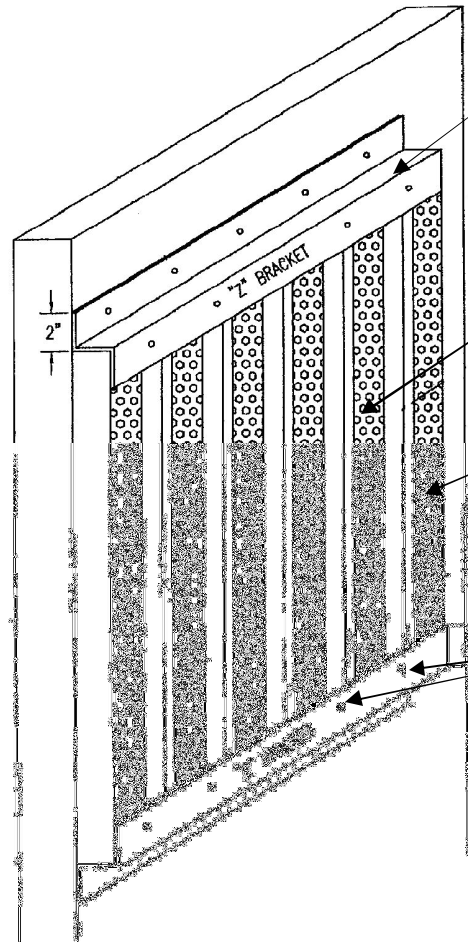
M-90 ABSORPTIVE PANEL WALL MOUNTING DETAIL

PANELS – Sheet steel ,
galvanized in accordance with
ASTM A-653, Class G-90

PANELS - Installed vertically
to follow contour of wall

PANEL WIDTH – Typical ly 24
inches wide

PANEL LENGTH – Typical ly up
to 12 feet long



Z BRACKET – Cold-formed steel
galvanized in accordance with
ASTM A-653, Class G-90, with two
2 inch legs and 2-5/8 inch deep.
May be galvanized and then pre-
coated for aesthetic appeal .

PERFORATION – Cold – formed
steel with 3/16 inch diameter
perforations in a 3/8 inch
staggered pattern.

ACOUSTICAL INSULATION –
Mineral rock wool – 2 inches
thick with a 6 pounds per cubic
foot density conforming to
Federal Specification HH-1-
558B and ASTM E-136.

ANCHOR BOLTS – Typical ly
galvanized, self-drilling,
hexagon washer head screw.
May be stainless steel or col-
or coated to match panels.

VISTA PANEL



- Designed for applications where visibility is required for safety or monitoring purposes
- Abrasive and ultraviolet resistant
- Available in 22 gauge – 16 gauge cold formed steel
- Minimum cover width of 12 inches
- Perforated face panel interlocks to the back tray without fasteners
- Polycarbonate panel minimum 3/16 inch thick

VISTA panels are easily combined with mineral wool filled panels or double wall panels to solve a wide variety of sight and sound problems.

The standard **VISTA** Absorptive Panel has a noise reduction coefficient value of NRC 1.05 or greater.

VISTA PANEL

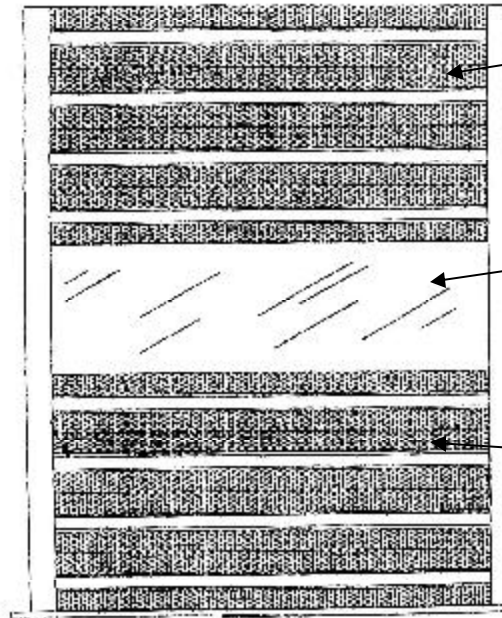
TYPICAL DETAILS

PANELS – Cold-formed steel galvanized in accordance to ASTM A-653, Class G-90.

PANELS – Minimum cover width of 12 inches

PANELS – Thickness of 22 to 16 gauge

BOLTS AND FASTENERS – Shall conform to ASTM A-307 and galvanized per ASTM A-164 or stainless steel as required.

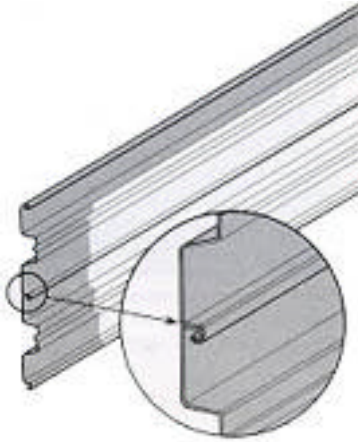


PERFORATED FACE PANEL – Roll-formed ASTM A-446 perforated steel panel with 3/16 inch diameter perforations on a 3/8 inch staggered pattern.

POLYCARBONATE PANEL – Monolithic and laminated made of high impact, ultraviolet light resistant sheets. Minimum 3/16 inch thick.

ACOUSTICAL INSULATION – Mineral rock wool – 2 inches thick with a 6 pounds per cubic foot density conforming to Federal Specification HH-1-558B and ASTM E-136.

ANGLE-LOK REFLECTIVE PANEL



- Designed to provide sound transmission loss only
- Interlocking sections, typically 12 inches wide
- Horizontal or vertical mounting
- 18 gauge sheet steel
- 22 gauge galvanized flashing and caps
- Intermediate girths available

ANGLE-LOK Reflective Panels provide a lightweight, aesthetically pleasing noise wall and acoustical barrier.

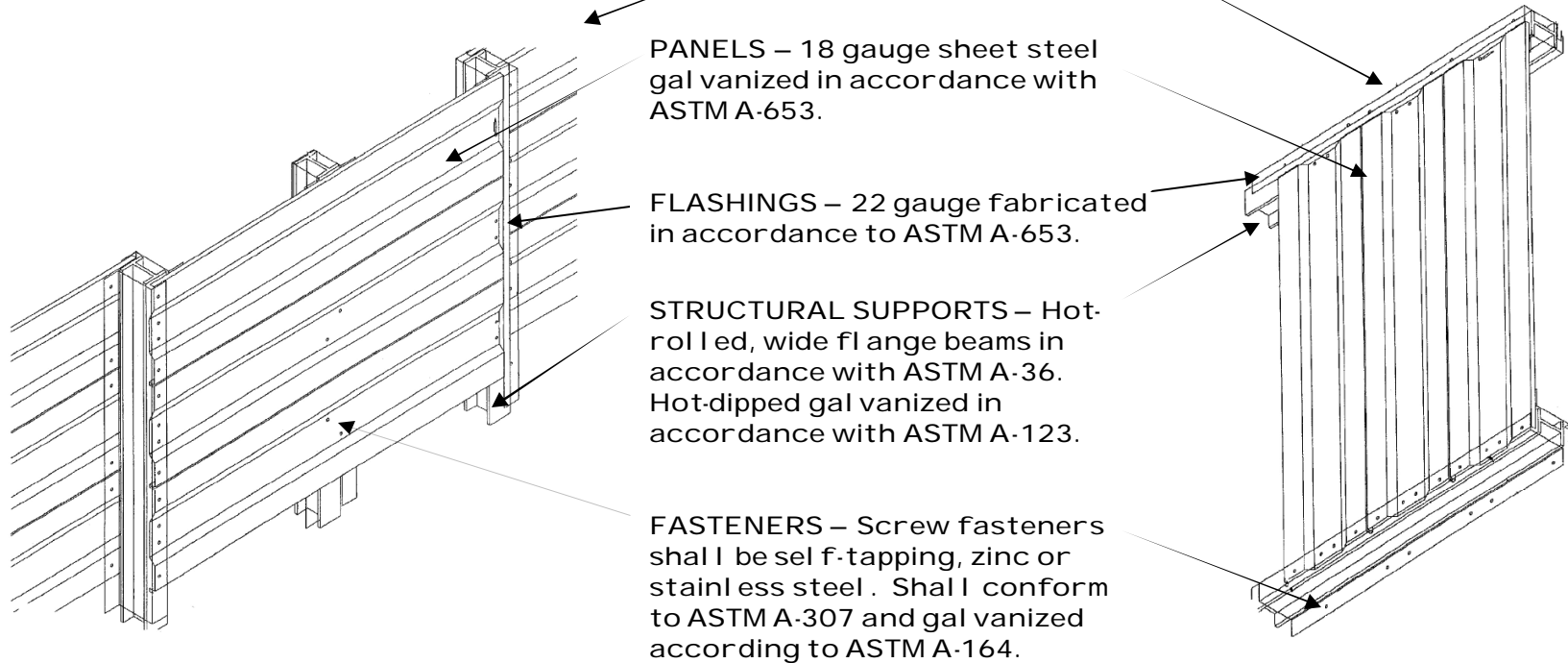
The standard **ANGLE-LOK Reflective** Panel has a sound transmission class value of at least STC 22.

ANGLE-LOK REFLECTIVE PANEL

TYPICAL DETAILS

Panels are a minimum of 12 inches wide and are designed to interlock with adjacent panels.

Panels are suited for either horizontal or vertical mounting.



APPLICATIONS

- Transportation Noise Control
- Temporary Construction Noise Walls
- Airport & Mass Transit Noise Control
- Industrial Applications
- Utility Noise Control
- Commercial and Residential Applications



APPLICATIONS

Transportation Noise Control



- **SILENT SCREEN** – Used where both sound absorption and transmission loss are essential
- **ANGLE-LOK** – Used where non-absorptive sound barriers are not required
- **M-90** – Used where an existing reflective wall needs modification to reduce reflective noise levels

APPLICATIONS

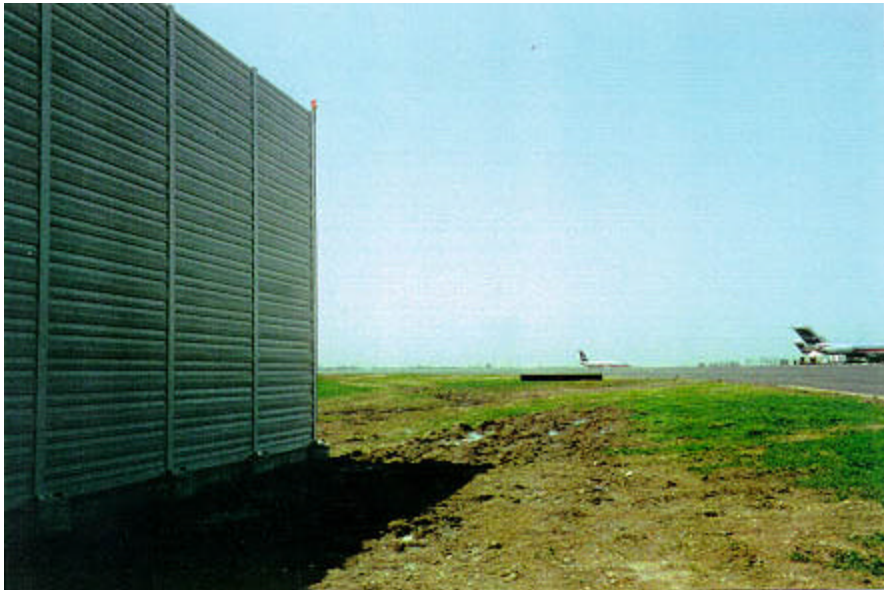
Temporary Construction Noise Walls



To comply with local community and regulatory agency mandated noise ordinance codes, Empire Acoustical Systems has the **SILENT SCREEN**, **VISTA SCREEN** and **M-90** panels to conform to these mandates.

APPLICATIONS

Airport & Mass Transit Noise Control



Empire Acoustical Systems has developed absorptive and reflective panels to solve most airport and mass transit systems noise problems.

Having worked closely with an engineering firm and the FAA, Empire Acoustical Systems has developed a series of acoustical noise control products specifically addressing noise generated from taxiing aircraft and airport mobile equipment.

These panels - the **BLAST BARRIER**, **VISTA PANEL** and the **M-90 PANEL** - are easy to install and readily dismantled.

APPLICATIONS

Industrial Applications



Rooftop



Utility Barrier

To comply with local, OSHA and EPA noise regulations standards, Empire Acoustical Systems offer the following products: **VISTA PANEL**, **SILENT SCREEN PANEL**, **M-90 PANEL**, Curtain Walls, and Reflective Screens which provide solutions to your industrial noise problems.

APPLICATIONS

Utility Noise Control Applications



Empire Acoustical Systems offers a unique noise abatement system to abate the noise problems that face power station and electrical utility engineers.

This system is relatively maintenance free, easy to install, and has a cellular fabricated panel that has a pleasing appearance.

APPLICATIONS

Commercial and Residential Applications



Not only does Empire Acoustical Systems noise control barriers and enclosures provide excellent sound absorption and reflective properties but that are also practical and aesthetically pleasing.

Our panels may be supplied in a galvanized finish, primed for field paint or factory powder coated. All ancillary items are supplied in matching colors.

TESTING RESULTS

Our products have been tested by Riverbank Acoustical Laboratories, who are accredited by the U.S. Department of Commerce, National Institute of Standards and Technology for ASTM sound absorption and sound transmission loss test procedures.

RIVERBANK ACOUSTICAL LABORATORIES

Overview of Acoustical Data

PRODUCT	TEST REPORT	STC RATING	NRC RATING
Empire "Silent Screen" 2.75" Thick Absorptive Panel 22 gauge Backtray	RAL-TL88-150' RAL-A87-370	26	1.00
Empire "Silent Screen" 2.75" Thick Absorptive Panel 18 gauge Backtray	RAL-TL91-239 RAL-A87-370	30	1.00
Empire "Silent Screen" 2.75" Thick Absorptive Panel 16 gauge Backtray	RAL-TL92-204 RAL-A95-63	35	1.05
Empire "M-90" Wall Absorptive Panel 22 gauge	RAL-A90-1	----	1.10
Empire "M-90" Wall Mounting 2.5" Thick 14 gauge Backer Panel	RAL-TL90-71 RAL-A90-1	37	1.10
Empire "Angle-Lok" Reflective Panel	RAL-TL98-127	22	----

TESTING RESULTS

M-90 PANEL

RIVERBANK ACOUSTICAL LABORATORIES

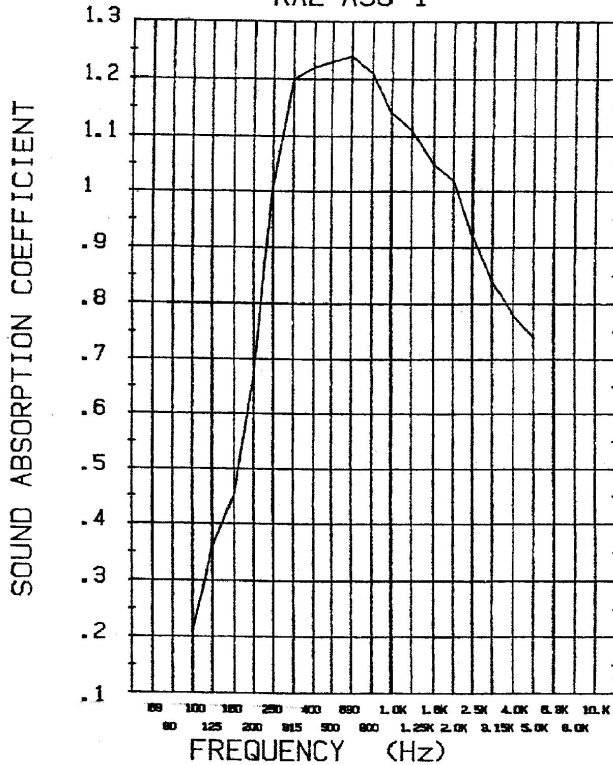
1512 BATAVIA AVENUE
NEVA, ILLINOIS 60134

OF
IIT RESEARCH INSTITUTE

708/232-0104
FOUNDED 1918 BY
WALLACE CLEMENT SABINE

REPORT

SOUND ABSORPTION REPORT RAL-A90-1



NRC = 1.1

THE RESULTS REPORTED ABOVE APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR MEASUREMENT. NO RESPONSIBILITY IS ASSUMED FOR PERFORMANCE OF ANY OTHER SPECIMEN.
ACCREDITED BY DEPARTMENT OF COMMERCE, NATIONAL VOLUNTARY LABORATORY
ACCREDITATION PROGRAM FOR SELECTED TEST METHODS FOR ACOUSTICS.

RIVERBANK ACOUSTICAL LABORATORIES

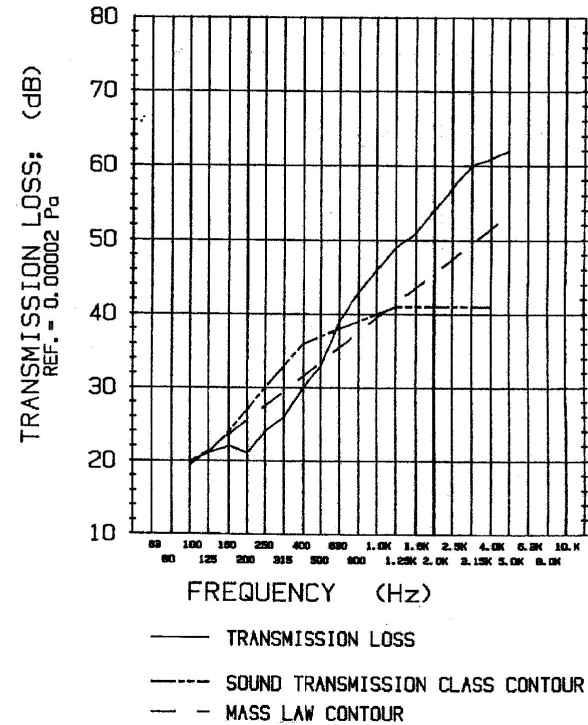
1512 BATAVIA AVENUE
GENEVA, ILLINOIS 60134

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IIT RESEARCH INSTITUTE

708/232-0104
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WALLACE CLEMENT SABINE

REPORT

TRANSMISSION LOSS REPORT RAL-TL90-71



THE RESULTS REPORTED ABOVE APPLY ONLY TO THE SPECIFIC SAMPLE SUBMITTED FOR MEASUREMENT. NO RESPONSIBILITY IS ASSUMED FOR PERFORMANCE OF ANY OTHER SPECIMEN.
ACCREDITED BY DEPARTMENT OF COMMERCE, NATIONAL VOLUNTARY LABORATORY
ACCREDITATION PROGRAM FOR SELECTED TEST METHODS FOR ACOUSTICS.
THE LABORATORY'S ACCREDITATION OR ANY OF ITS TEST REPORTS IN NO WAY CONSTITUTES
OR IMPLIES PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY NIST.





ACOUSTICAL SYSTEMS

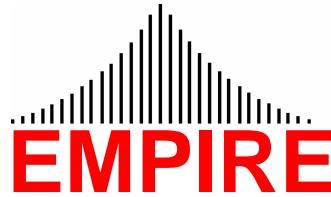
Here at Empire Acoustical Systems, we are committed to provide problem-solving products and technical assistance to maximize noise control in working and living environments.

We have serviced the noise control industry for over 20 years.

Our products are durable, virtually maintenance free, lightweight and easy to install.

All necessary trim pieces and hardware are included.

Spray painted graffiti is easily removed with common solvents (when using the Kynar paint system).



ACOUSTICAL SYSTEMS

Please contact one of our offices and our staff will assist you in meeting your noise control needs.

Colorado Location:

36744 Constitution Drive

Trinidad, CO 81082

PH: (719) 846-2300

FAX: (719) 846-7466

Email: empireacoustical@rmi.net

Texas Location:

1106 South Mays, #240

Round Rock, TX 78664

PH: (512) 828-3138

FAX: (512) 233-1757

Email: johnnie@mckeowninternational.com

Website: www.empireacoustical.com

WORLDWIDE ACOUSTICAL PRODUCTS & SERVICE

M90 ACOUSTICAL PANEL WALL MOUNTING DETAIL

NOTES:

- Z BRACKET=16 GAGE
STRUCTURAL QUALITY ASTM A-446 GALVANIZED
PANELS TO BE INSTALLED VERTICALLY TO
FOLLOW CONTOUR OF CONCRETE WALL
- NO SHIMS OR SEALING COMPOUND
HORIZONTAL ALIGNMENT $\pm 1/4"$ / 20 FEET
- FOR METAL TO METAL FASTENING ZINC PLATED
STRUCTURAL SELF DRILLING SCREWS WITH
WASHERS NO. 1/4" - 1/4" 3/8" HEX HEAD

SOUND ABSORBING MATERIAL SHALL BE A MINERAL WOOL
BATT INSTALLED IN THE CAVITY OF THE PANEL AND BE 2"
THICK. THE MINERAL WOOL SHALL BE A MINIMUM OF 6 LBS.
PER CUBIC FOOT DENSITY AND CONFORM WITH FEDERAL
SPECIFICATION HH-1-5588 AND ASTM STANDARDS C612 AND
E136.

NOT DRAWN TO SCALE

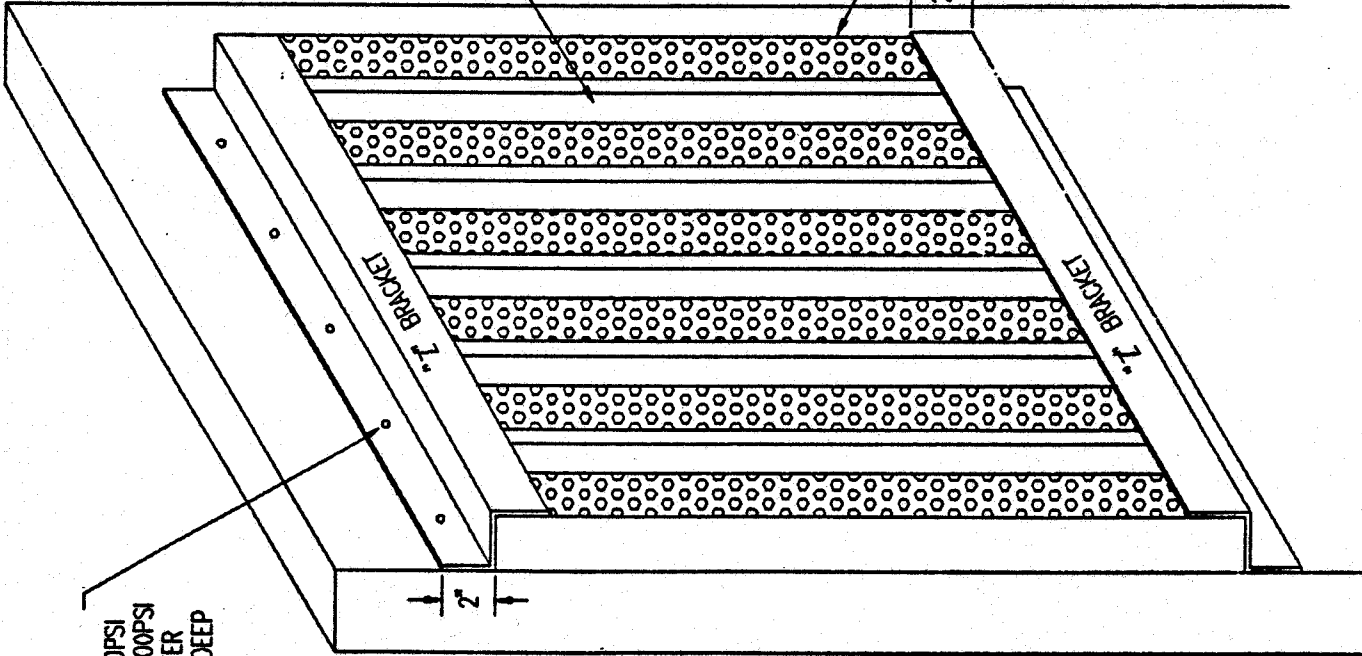
M-90 ACOUSTICAL PANEL
WALL MOUNTING DETAIL

dwg# m90113

G.L.R.

~~89-PANEL MOUNTING DETAIL~~
~~WALL MOUNTING DETAIL~~
~~WALL MOUNTING DETAIL~~
~~WALL MOUNTING DETAIL~~

EMPIRE
ACOUSTICAL SYSTEMS

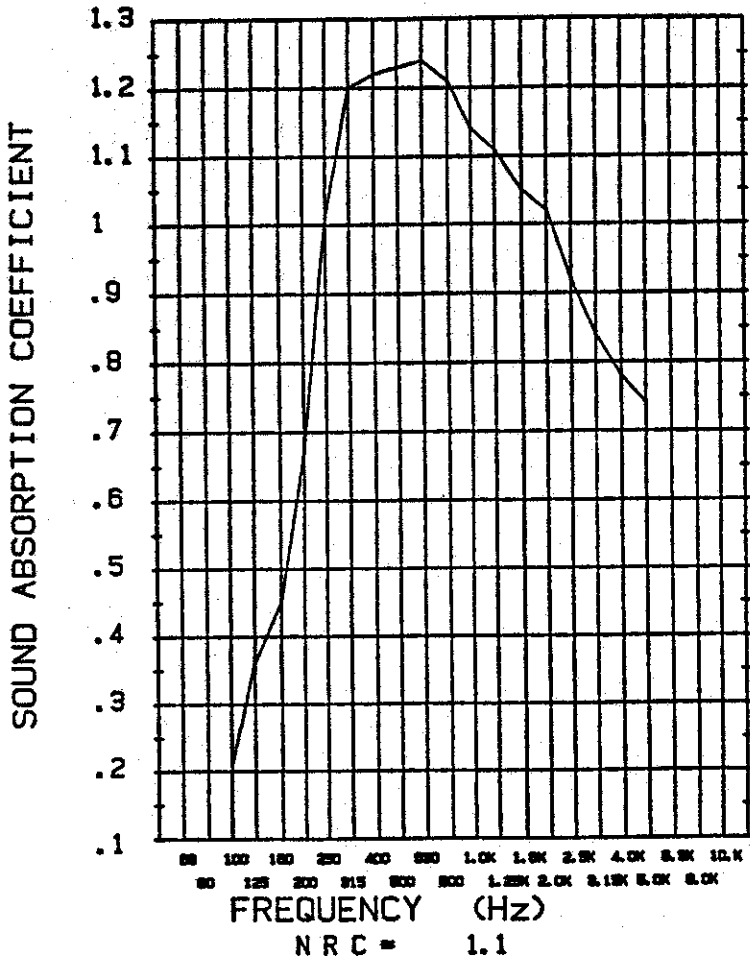


5/16" - SH5624 U.S. ANCHOR
BOLTS PULLOUT 1740 AT 3500PSI
CONCRETE SHEAR 1460 AT 3500PSI
CONCRETE BOLTS 1/4" DIAMETER
BOLT HOLES 5/16" X 2 1/4" DEEP
(DRILLED IN FIELD)

*PANEL WIDTH=24-30 INCHES
*PANEL LENGTH=UP TO 12 FEET

RIVERBANK ACOUSTICAL LABORATORIES EMPIRE ACOUSTICAL SYSTEMS

SOUND ABSORPTION REPORT RAL-A90-1



TEST RESULTS

1/3 Octave Center Frequency (Hz)	Absorption Coefficient	Total Absorption In Sabins	% Of Uncertainty With 95% Confidence Limit
100	0.21	14.96	0.79
** 125	0.36	25.93	0.71
160	0.45	32.26	0.79
200	0.67	48.21	0.60
** 250	1.01	72.51	0.41
315	1.20	86.75	0.35
400	1.22	87.65	0.51
** 500	1.23	88.40	0.56
630	1.24	88.96	0.60
800	1.21	86.76	0.54
** 1000	1.14	82.14	0.65
1250	1.11	79.66	0.55
1600	1.05	75.26	0.61
** 2000	1.02	73.74	0.64
2500	0.92	66.31	0.68
3150	0.84	60.14	0.55
** 4000	0.78	56.01	0.61
5000	0.74	53.26	0.63

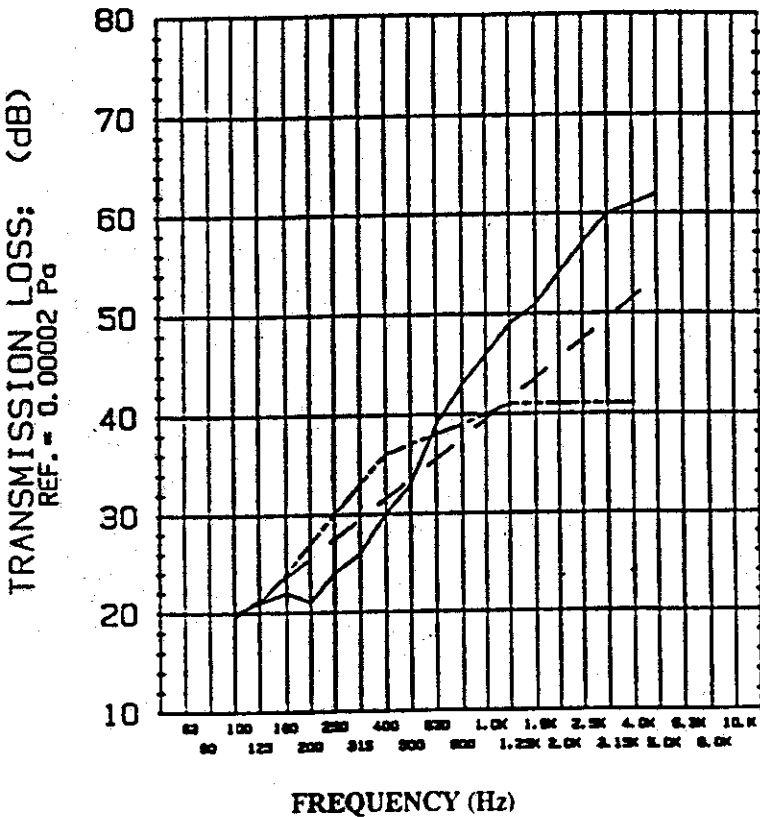
NRC = 1.10

DESCRIPTION OF THE SPECIMEN

The test specimen was designated by the manufacturer as M-90 panels with sound absorbing treatment. The overall dimensions of the specimen as measured were 2.44 m (96 in.) wide by 2.74 m (108 in.) long and 6.4 cm (2.5 in.) thick. The specimen consisted of four units. Each unit was 61.0 cm (24 in.) wide by 2.74 m (108 in.) long. The specimen was tested in the laboratory's 292 m³ (10,311 ft³) test chamber. The description of the specimen was as follows: The specimen consisted of four M-90 panels. Each panel was fabricated out of 0.76 mm (0.030 in.) thick, 22 ga minimum, painted steel. Each panel face had alternating perforated and unperforated segments that ran the entire length. Each of the five perforated segments were raised (fluted) nominally 15.9 mm (0.625 in.) and measured 7.6 cm (3 in.) wide on the two ends and 3.9 cm (3.5 in.) wide at the three intermediate locations. The combined perforated segments of each panel covered nominally 40.6 cm (16 in.) of each 61.0 cm (24 in.) wide face. The perforations were 4.8 mm (0.1875 in.) diameter holes spaced on 9.5 mm (0.375 in.) centers. The perforations represented a 17% open area. The four unperforated segments of each panel measured 5.1 cm (2 in.) wide. Each panel was fully lined with 61.0 cm (24 in.) wide sections of 6 pcf, 5.1 cm (2 in.) thick mineral fiber batt material, designated by the manufacturer as Delta Board. A visual inspection verified the description of the specimen. The weight of the specimen as measured was 72 kg (159 lbs) an average of 11 kg/m² (2.2 lbs/ft²). The area used in the calculations was 6.7 m² (72 ft²). The room temperature at the time of the test was 21°C (70°F) and 59% relative humidity.

RIVERBANK ACOUSTICAL LABORATORIES EMPIRE ACOUSTICAL SYSTEMS

Report RAL-TL90-71



Freq.	T.L.	C.L.	Def.
100	20	0.26	0
125	21	0.31	0
160	22	0.38	2
200	21	0.38	6
250	24	0.35	6
315	26	0.39	7
400	30	0.35	6
500	33	0.27	4
630	39	0.31	0
800	43	0.31	0
1000	46	0.29	0
1250	49	0.25	0
1600	51	0.23	0
2000	54	0.18	0
2500	57	0.13	0
3150	60	0.12	0
4000	61	0.12	0
5000	62	0.10	0

STC = 37

- Transmission Loss
- - - - - Sound Transmission Class Contour
- · - · - Mass Law Contour

ABBREVIATION INDEX

- Freq. = Frequency, Hertz, (cps)
- T.L. = Transmission Loss, dB
- C.L. = Uncertainty in dB, for a 95% confidence limit
- Def. = Deficiencies, dB < STC contour
- STC = Sound Transmission Class

DESCRIPTION OF THE SPECIMEN

The test specimen was designated by the manufacturer as M-90 panels with sound absorbing treatment and 18 Gauge backer plates. The overall dimensions of the specimen as measured were 1.22 m (48 in.) wide by 2.74 m (108 in.) high and 6.4 cm (2.5 in.) thick. The specimen consisted of two units. Each unit was 61.0 cm (24 in.) wide by 2.74 m (108 in.) long. The specimen was placed directly in the laboratory's 1.22 m (4 ft.) by 2.74 m (9 ft.) test opening and was sealed on the periphery (both sides) with a dense mastic. The description of the specimen was as follows: The specimen consisted of two M-90 panels. Each panel was fabricated out of 0.76 mm (0.030 in.) thick, 22 ga minimum, painted steel. Each panel face had alternating perforated and unperforated segments that ran the entire length. Each of the five perforated segments were raised (fluted) nominally 15.9 mm (0.625 in.) and measured 7.6 cm (3 in.) wide on the two ends and 3.9 cm (3.5 in.) wide at the three intermediate locations. The combined perforated segments of each panel covered nominally 40.6 cm (16 in.) diameter holes cm (24 in.) wide face. The perforations were 4.8 mm (0.1875 in.) diameter holes spaced on 9.5 mm (0.375 in.) centers. The perforations represented a 17% wide area. The four unperforated segments of each panel measured 5.1 cm (2 in.) wide. Each panel was fully lined with 61.0 cm (24 in.) wide sections of 6 pcf, 5.1 cm (2 in.) thick mineral fiber batt material, designated by the manufacturer as Delta Board. A sheet of 18 Gauge, nominal 1.2 mm (0.048 in.) thick steel was attached to the back of each panel with self-tapping sheet metal screws. A visual inspection verified the description of the specimen. The weight of the specimen as measured was 69 kg (152 lbs.) an average of 20 kg/m² (4.2 lbs/ft²). The transmission area used in the calculations was 3.4 m² (36 ft²). The room temperature at the time of the test was 21°C (70±2°F) and 54±3% relative humidity.



Your Networked Solution
for **Speech Privacy**
and **Noise Control**



SOUND MASKING

PAGING

MUSIC

Most Awarded

Over twenty awards for innovation, performance and ease of use, including:



www.logison.com

"The advantages of centralized, networked control of individual speakers, digital accuracy and ease of future reconfiguration or expansion ensure that this latest generation of sound masking technology will keep pace with the ever-changing workplace."

Manager of Facilities & General Services
Ericsson Canada Inc.

Patents granted in Canada, U.S., Australia, China, Europe.
Patents pending in Canada, U.S. and other jurisdictions.
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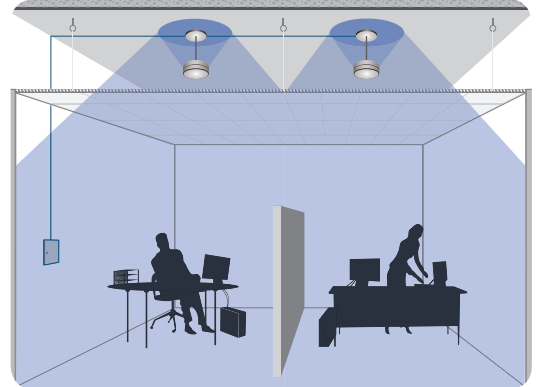
Poor acoustics is the *number one* cause of workplace dissatisfaction and the most significant factor affecting employee performance.

The LogiSon® Acoustic Network addresses this problem by distributing an engineered background sound throughout the workplace. The sound covers conversations and noise, while remaining comfortable and unobtrusive.

This technology is one of the smallest investments you'll make in your facility, but one that can greatly impact your bottom line.

➔ Benefits

- Noise control
- Speech privacy
- Improved productivity
- Lower project costs
- Facility flexibility
- Quick ROI



As the inventors of networked sound masking technology, we know that *flexibility* is the key to success.

Why is flexibility important? Because it's not enough to introduce just any sound into your space. It has to be the *right sound*, in the *right place*, at the *right time*.

The LogiSon Acoustic Network provides this superior level of acoustic control and puts it at your fingertips.

➔ Applications



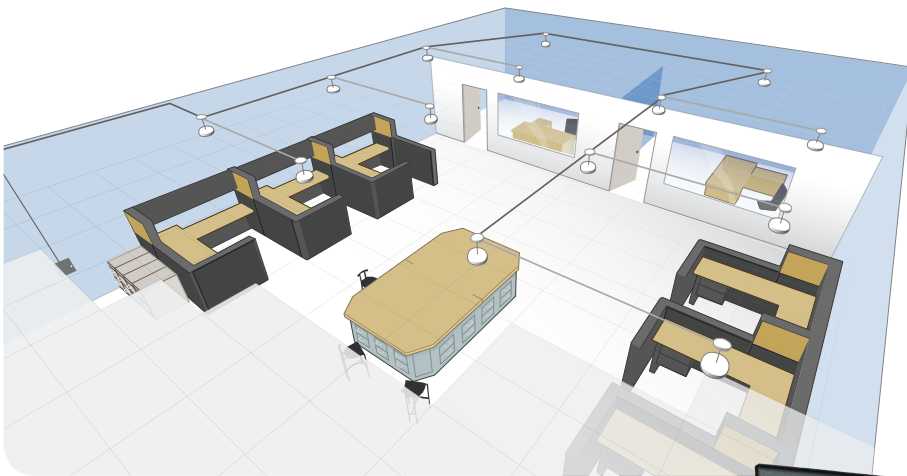
Banks
Call Centers
Commercial Offices



Courthouses
Dealerships
Healthcare Facilities
Hotels



Houses of Worship
Libraries
Military Facilities
Schools



Cable

Hub and Loudspeaker

The hubs and loudspeakers are typically installed above the ceiling tiles, but can also be used in hard or open ceilings. The control panel can be mounted on a wall or in an equipment closet. Wiring consists of a single low-voltage cable.

➔ One Solution

Smart engineering makes the LogiSon Acoustic Network the right solution for any project. Its *networked-decentralized* architecture is easily scaled to accommodate facilities of all sizes, from a single office to a multi-building campus.

A range of loudspeaker models is available to suit a variety of installation conditions, but the system's backbone is always the same high-performance LogiSon technology. Continuous enhancement since its launch keep it at the forefront of the sound masking industry.

➔ Complete

Also need paging or background music? Simply connect a source, such as your telephone system, to the control panel.

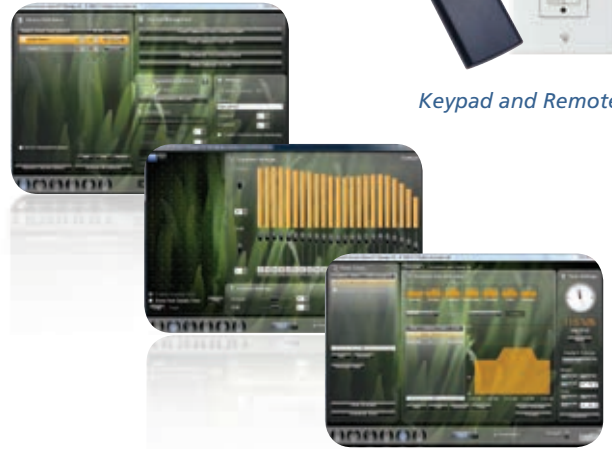
Independent sound masking and paging setup mean you never have to compromise. And because zoning is digital rather than hardwired, you can page whenever and wherever required.



Control Panel



Keypad and Remote



Acoustic Network Manager Software

Components meet UL, FCC, CE and RoHS standards and are approved for use in air-handling plenums.

➔ Effective

The LogiSon Acoustic Network is uniquely designed to provide the highest degree of control over the masking sound throughout your facility, ensuring you get the most from your investment.

Adjustment zones are 1 to 3 loudspeakers. Each offers precise volume control in 0.5 dB steps and third-octave equalization over the full masking spectrum, including the low frequencies essential for comfort.

After installation, TARGET Software accurately tunes the masking sound to the desired spectrum, maximizing speech privacy and noise control.

➔ Customized

A gradual ramp-up feature can be activated for retrofits. From that point, a sophisticated timer schedules the masking volume to match expected activity levels throughout the day, week or month, as well as on holidays.

Keypads, remotes and a robust software suite give occupants on-demand control of the sound masking and paging according to allowed access levels (e.g. in private offices and meeting rooms).

➔ Secure

Performance is monitored 24/7. If an issue occurs, the LogiSon Acoustic Network provides a warning signal and/or sends an email to specified recipients.

Its contemporary design also makes the LogiSon Acoustic Network the best choice for open ceilings.



Mark Trew © SHW Group

➔ Easy To Manage

The LogiSon Acoustic Network offers both hardware- and software-based control. You can manage the settings and zoning for a loudspeaker, a group of loudspeakers, or an entire campus from the control panel or your computer.

Changes can be made in minutes following renovations, moving furniture or personnel. The ease of future reconfiguration and low energy needs reduce lifecycle costs while ensuring peak performance and occupant satisfaction at all times.

These are just a few of the features our clients use every day to enhance the sound masking system's value and their acoustic comfort®.

➔ Proven Performance

The LogiSon Acoustic Network is installed in hundreds of millions of square feet worldwide for clients ranging in size from small business to Fortune 500, including:

A.C. Nielsen
Bank of New York
CB Richard Ellis
CIBC
Citibank
Cushman & Wakefield
Deloitte
Ernst & Young
GlaxoSmithKline
Hanesbrands
Hilton
IBM
Jones Lang LaSalle

Kraft
Microsoft
MillerCoors
Modesto Memorial
Nokia
Polo Ralph Lauren
Procter & Gamble
Royal Bank of Canada
Smith & Nephew
The Hartford
Tribeca Grand
US Navy
Wachovia-Wells Fargo

➔ Expert Support

We also provide a complete range of professional services and highly responsive technical support. Talk to your LogiSon Representative today.

📞 905-332-1730 or 1-866-LOGISON

✉ info@logison.com

🏠 www.logison.com



LOWRY'S INC. BOX PADS

Outlet Box Pads To Reduce Transmitted Air and Sound



BEFORE



AFTER



BEFORE



AFTER

BASIC USES:

Lowry's electrical box pads are used to seal the back side of electrical boxes, TV jack boxes and telephone outlet boxes to reduce air and sound transmission in shared walls.

LIMITATIONS:

- Do not use in areas subjected to constant heat above 200 degrees F
- Not to be used in areas requiring a fire rating.
- Do not expose to flame

PACKAGING:

144 -1/8" x 6" x 8" pads per case

COLOR:

Putty Gray only

APPLICATION METHODS:

Preparation:

- 1) Properly clean substrate removing dust or debris from the surface to be applied.
- 2) If surface is contaminated with oil or other residue, clean with a solvent wipe followed with a dry rag wipe.

Application:

- 1) After the box installation is completed, remove Lowry pad from carton and place the pad centered on the back of the box. Carefully mold and fold around conduit cable entering box.
- 2) Remove paper backing
- 3) Retrofit boxes will need to have the pad applied before the box is put in place. *Do not apply to the inside of the box.*

Note: After drywall or plaster is completed, it may be necessary to complete a perimeter seal with a gun able acoustical sealant between the dry wall and the box in order to create a true sound air barrier. The pad's function is to easily seal nail and knockout holes in boxes to prevent air transmission and sound transmission.

AVAILABILITY:

Immediately available from multiple Lowry's Inc. locations and most construction, plumbing and electrical supply distributors.

COMPOSITION:

Polybutene-butyl, inert fillers. (No asbestos)

TECHNICAL DATA	
SHELF LIFE	1 YEAR
SOLIDS	100%
SERVICE TEMP	-30 TO 200 F
ADHESION	GOOD TO METAL AND PLASTIC

LIMITED WARRANTY: We warranty our products to be free of defects and manufactured to meet published physical properties. We will provide, at no charge, product to replace any product proved to be defective when applied in accordance with our written instructions. All claims concerning product defects must be made within 12 months of shipment. Absence of such claims in writing during this period will constitute a waiver of all claims with respect of said product. This warranty is in lieu of any and all other warranties expressed or implied.

LOS ANGELES – 8501 Telfair Ave. Sun Valley, CA 91352 Phone: (800) 225-8231 (818) 768 4661 Fax: (818) 768-4130
ORANGE COUNTY – 1700 Barcelona Cir., Placentia, CA 92807 Phone: (800) 439-4546 (714) 777-1172 Fax: (714) 777-2099
BAY AREA – 23030 Kidder St. Hayward, CA 94545 Phone: (800) 252-2449 (510) 785-2404 Fax: (510) 785-2405
SACRAMENTO – 2641 Port Street West Sacramento, CA 95691 Phone: (866) 270-7333 (916) 372-7333 Fax: (916) 372-7305
SAN DIEGO – 7310 Convoy Ct, San Diego CA 92111 Phone (858) 430-1260 Fax: (858) 268-9662
PHOENIX – 3230 Roeser Road, Suite 3, Phoenix, AZ 85040 Phone: (602) 268-7901 Fax: (602) 268-7909
WEST VALLEY CITY – 2337 S. Decker Blvd. West Valley City, UT 84119 Phone: (801) 834-6900 Fax: (801) 834-6900

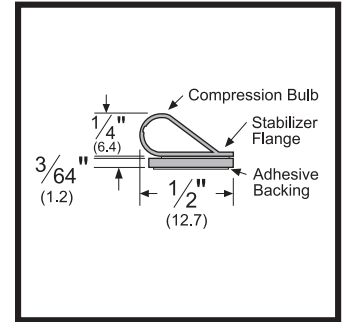


ASSA ABLOY

HSS2000xS88

SILICONSEAL™

Adhesive Gasketing - Tested and Classified for Fire and Smoke



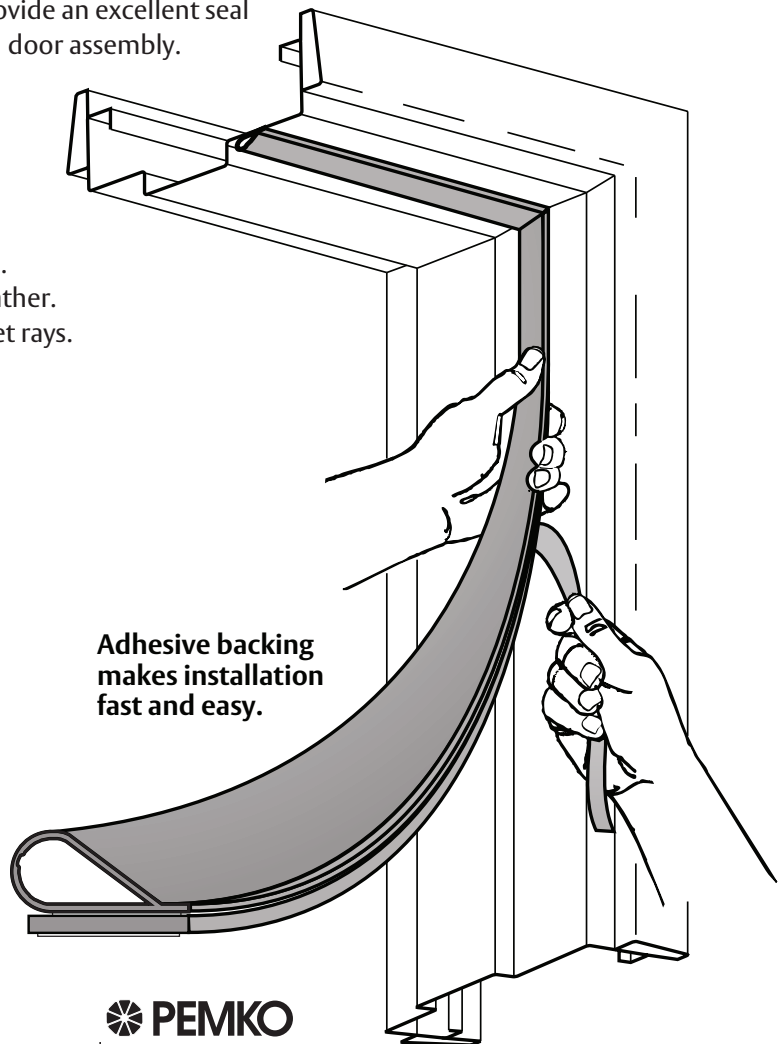
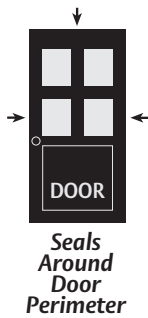
About Edge Seals:

Edge Seals are Category G materials that have demonstrated their ability to assist the door in meeting the positive pressure fire test requirements. Category G materials are necessary for use with Category B Door assemblies. Category G Edge Seals may also need a Category H Smoke Seal for a complete fire and smoke assembly.

About Fire & Smoke Combination Gasketing:

These combination fire and smoke gaskets provide an excellent seal against fire and smoke transfer around a rated door assembly. These products meet the requirements of Category G and H seals.

- Adhesive backed.
- High temperature silicone.
- Self-extinguishing and non-toxic.
- Longest-lasting commercial grade door seal.
- Seals against smoke, fire, air, sound and weather.
- Unaffected by sunlight, ozone and ultraviolet rays.
- Impervious to fungus and mildew.



Product / Available Finishes:

- HSS2000xS88BL Black Silicone/Graphite
- HSS2000xS88C Clear Silicone/Graphite
- HSS2000xS88D Dark Bronze Silicone/Graphite
- HSS2000xS88TAN Tan Silicone/Graphite
- HSS2000xS88W White Silicone/Graphite

Testing/Ratings:



Tools Required:



UNITED STATES:
 VENTURA, CA
 Ph: 800.283.9988
 Fax: 800.283.4050
 MEMPHIS, TN
 Ph: 800.824.3018
 Fax: 800.243.3656

CANADA:
 VANCOUVER, BC
 Ph: 877.535.7888
 Fax: 877.535.7444
 TORONTO, ON
 Ph: 866.243.9816
 Fax: 866.243.9817

www.pemko.com

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HSS2000xS88_WEBINS
Rev 1 - 07.01.07

Read Before Installation:



Read before installation! Failure to do so may result in improper adhesion.

Storage and shelf life: All adhesive gaskets have a limited shelf life. This product must be used within 6 months of purchase and must be stored between 50°F and 100°F.

Before installing: Thoroughly clean the frame with the enclosed cleansing towelette to remove grease, dust or cleanser build-up. Before installation, wait for frame surface to completely dry (evaporate). Some hospital environments have wax or anti-bacterial cleanser build-up. As an alternative or substitute cleanser, use isopropyl (rubbing) alcohol. Note: Mineral spirits or other petroleum based cleaning products should NOT be used.

Application temperature: If frames are too cold (below 50°F) or too hot (above 100°F) adhesion may be impaired.

When to install:

- Installation should take place after construction is completed, flooring is installed and final cleaning is completed.
- Paint on frame must be cured for at least 5-7 days. Paint cannot be wet under dry surface when gaskets are pressed on. Avoid quick-dry primers, which leave a powdery surface preventing sufficient adhesion. When applying to a wood frame, the surface must be non-porous and sealed. Follow standard industry guidelines on sealed wood frames and/or rough surface before applying. Note: Anti-bacterial, anti-fungal or silicone additives in paint may inhibit adhesion.

Application tips and warnings:

- Do NOT stretch material. Product can retract or shrink if stretched.
- Use very firm, perpendicular pressure when applying. Use wallpaper seam roller to reinforce adhesion after applying.
- Do not stretch material when using seam roller. Run roller with up and down motions.
- Double check adhesion after 2-3 hours before leaving job overnight.
- If gasket separates from frame, press again with firm pressure in place. If adhesive strip is exposed, airborne dust may impede adhesion. Replacement may be necessary.
- Application at header can be awkward due to overhead condition. Be sure to apply enough pressure.

NOTE: Adhesion takes delayed set. Immediate removal and resetting can be done if error occurs in initial placement. DO NOT reset after one hour. Full set is reached in 24 hours.

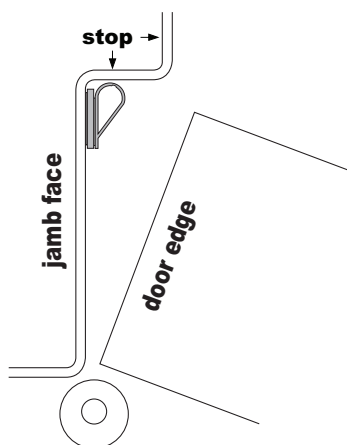
Installation Instructions:



1. Pre-cut the hinge jamb, strike jamb and header pieces to fit before installing. Do not install as one continuous piece - cut adhesive gasketing at a 45° angle at the corners where the top and sides meet.
2. Remove approximately 24" (61 cm) of backing from the adhesive gasketing strip. Be careful not to touch adhesive or drag the adhesive on ground.
3. Position the adhesive gasketing as illustrated on the lower left. DO NOT STRETCH MATERIAL. The use of a hand roller is highly recommended.
4. Remove the next 24" (61 cm) of paper backing and repeat (2.) until the entire length for a top or side is installed. If a pre-cut length overruns a top or side, stretching has occurred. Immediately remove and reset.
5. Once installed, apply firm pressure along the entire surface of the product to ensure proper adhesion to the frame!

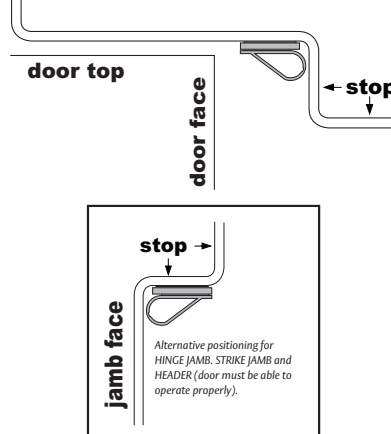
HINGE JAMB

Application is acceptable anywhere along jamb face (door must be able to operate properly).



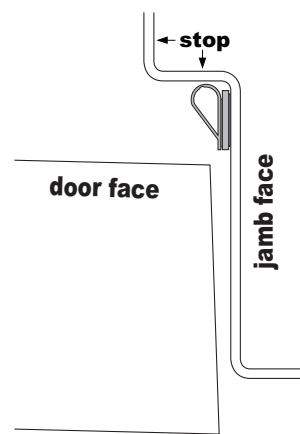
HEADER

Application is acceptable anywhere along jamb face (door must be able to operate properly).



STRIKE JAMB






Application is acceptable anywhere along jamb face (door must be able to operate properly).

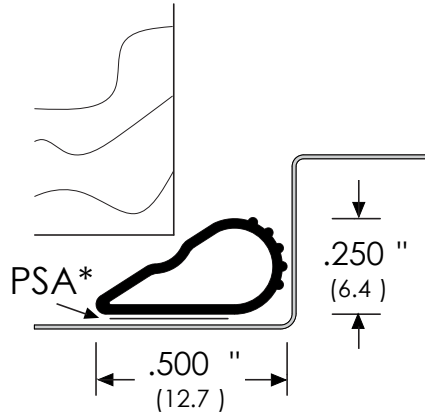


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Rev 1 - 07.01.07

FIRE AND SMOKE RATINGS

-  UL listed
-  ITS Warnock Hersey listed
-  10C Classified
-  Category G listed up to 20 minutes
-  Category H Classified under UL 1784, listed up to 180 minutes



- #188S-Bk
- #188S-Br
- #188S-CI
- #188S-Gy
- #188S-Wh

Legend:


- S = Silicone
- S-Bk = Silicone - Black
- S-Br = Silicone - Brown
- S-CI = Silicone - Clear
- S-Gy = Silicone - Gray
- S-Wh = Silicone - White

*  PSA Tape

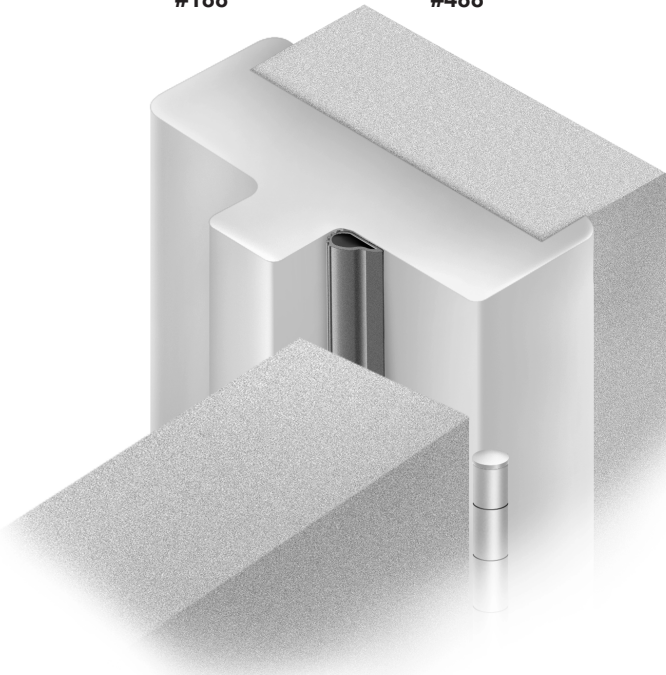
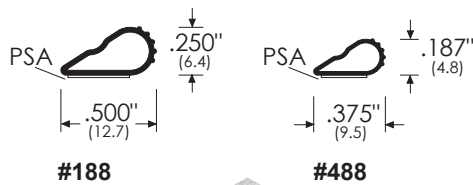
ANSI/ BHMA

#188S

R0E154

	415 Concord Avenue tel: 718.585.3230 Bronx, NY 10455 fax: 718.292.2243 email: zero@zerointernational.com web site: www.zerointernational.com	Part No: 188	
	Notes:	Part Description: Door Seal - Self Adhesive Also available in ZAG feature (Anti-Ligature)	
Provided By:	Customer Name:	Job No:	Date:

#188 / #488 Tear Drop ZERO Compress O-Matic® INSTALLATION INSTRUCTIONS



Before Installation:

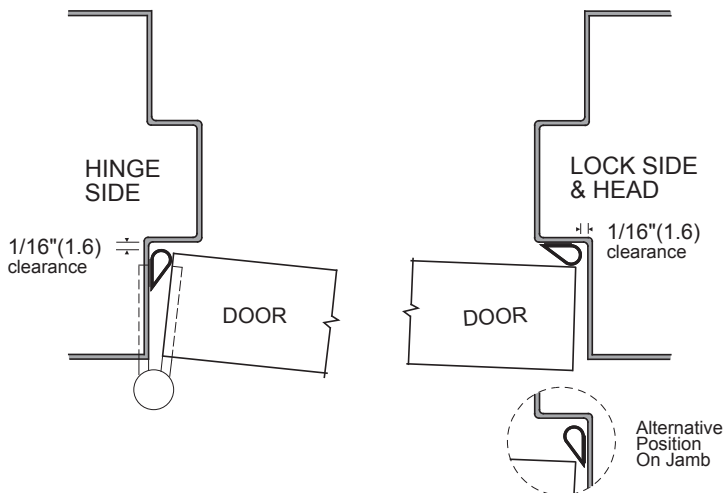
- 1 For proper adhesion, clean surface of frame where the gasketing is to be applied (See illustration). Check for any impediments (dust, dirt, oil, grease, etc.) or loose paint and remove them from the surface area. Solvent cleaner or common detergent cleaner may be used.
- 2 Surface area must be completely dry before the installation process begins.
- 3 Gasketing is best applied at a temperature range of 70 to 90°F (21 to 32°C). Do not apply if temperature falls below 50°F (10°C) or exceeds 100°F (38°C).
- 4 Gasketing should be installed after the doors and frames have been finish painted and the paint has dried.

To Install:

- 1 Measure and cut the gasket to fit the head and jambs. The first piece of gasketing should be the head piece and applied on the entire length of the head (See illustration below for location on head). Remove the paper backing of self adhesive strip (PSA) about 1' to 2' (304.8 to 609.6mm) at a time. Align and install gasketing into place. Press firmly for proper adhesion.

IMPORTANT: DO NOT STRETCH THE SEAL DURING INSTALLATION.

- 2 The lock jamb gasketing should be installed next (Location as illustrated), following procedurs as outlined in step 1.
- 3 Install the hinge jamb gasketing last (Location as illustrated), following procedures as outlined in step 1.
- 4 After installation, check to make sure the gasketing does not obstruct the operation of door.



ZERO INTERNATIONAL

415 Concord Avenue, Bronx, NY 10455-1004
Tel: 718-585-3230 • Fax: 718-292-2243
Zero.Customer.Support@allegion.com
www.zerointernational.com



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LIGHTING CUT SHEETS

FINELITE

High Performance Recessed (HPR LED) 2x4



Date

Project

Type

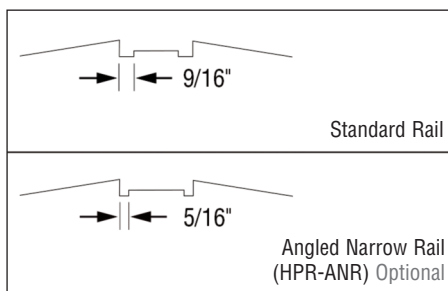
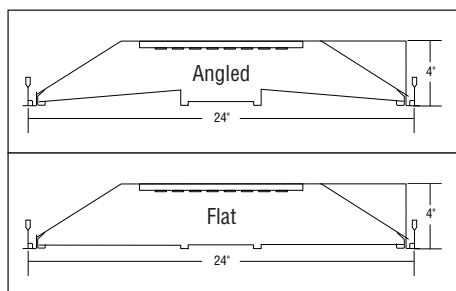
Comments



Refer to page 2 for all door styles

DESCRIPTION

HPR LED is a highly efficient recessed luminaire delivering excellent visual comfort and outstanding performance. Advanced optical design makes HPR LED a powerful solution for low-ceiling applications and eliminates the shadows common to other LED recessed products.



DIMENSIONS

NARROW RAIL OPTION

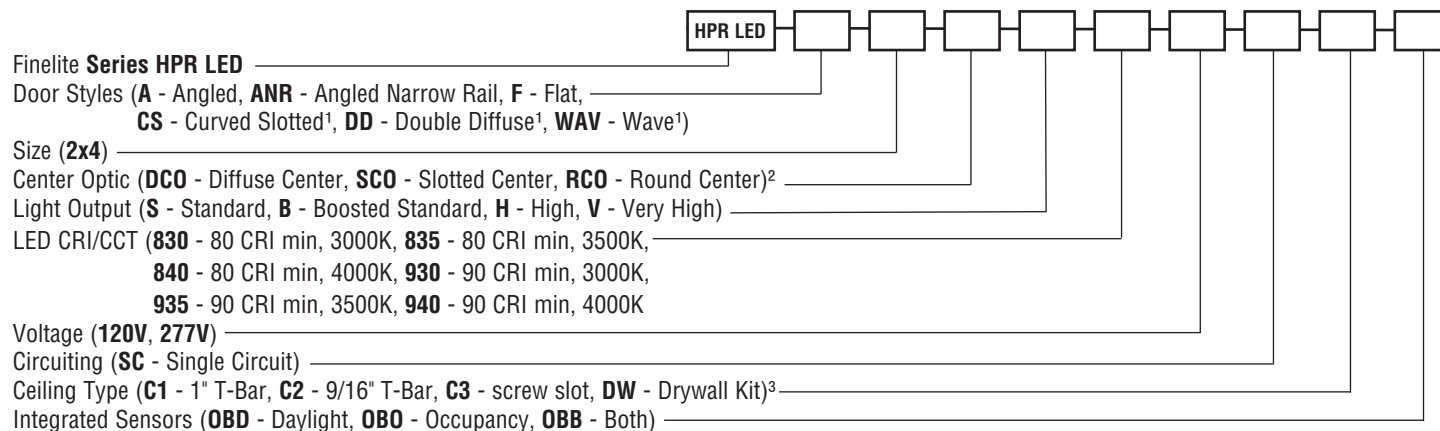
Available in angled door style with the same center optic choices. The optional narrow rails are approximately 5/16" wide. The standard rails are approximately 9/16" wide.

100% SERVICEABLE FROM BELOW

The replaceable light engine and driver are easy to access from below the ceiling.

ORDERING GUIDE

Sample Number: HPR LED - A - 2x4 - DCO - S - 835 - 277V - SC - C1 - OBO



¹ Curved Slotted, Double Diffuse and Wave door not available with Center Optic options

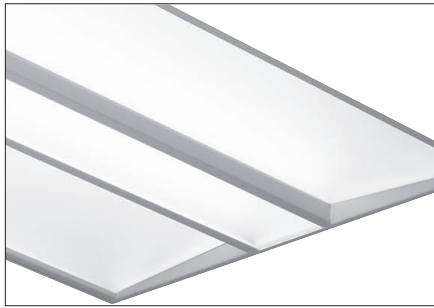
² Only available with Angled (A), Angled Narrow Rail (ANR) and Flat (F) door options

³ Surface Mount available

FINELITE

High Performance Recessed (HPR LED) 2x4

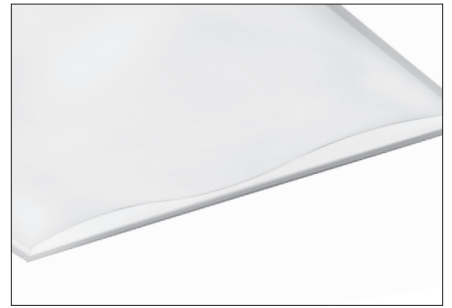
DOOR STYLES



A - Angled
ANR - Angled Narrow Rail

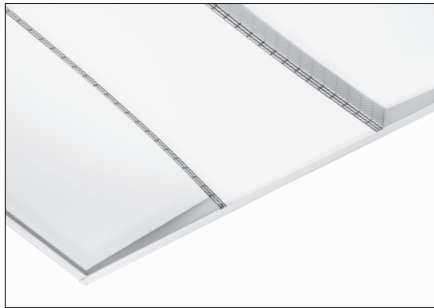


F - Flat

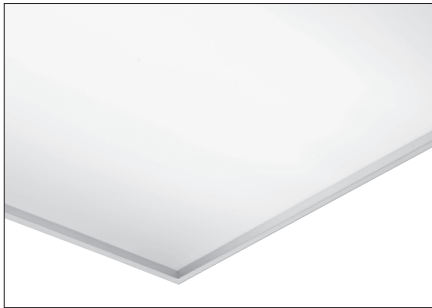


WAV - Wave

DOOR STYLES



CS - Curved Slotted



DD - Double Diffuse

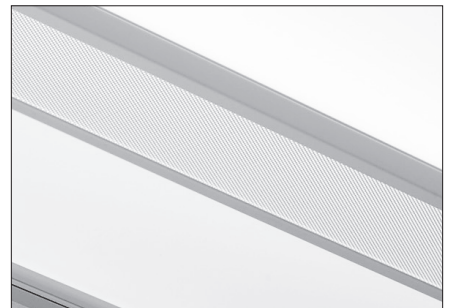
CENTER OPTICS



DCO - Diffuse Center



SCO - Slotted Center



RCO - Round Center

DCO, SCO, and RCO are only available on Angled (A), Angled Narrow Rail (ANR), and Flat (F) doors.

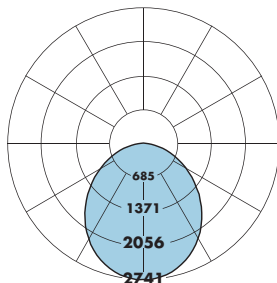


FINELITE

High Performance Recessed (HPR LED) 2x4

PHOTOMETRY

HPR LED-A-2x4-DC0-V
 Very High Output - Angled Rail
 Efficacy: 127 lumens per watt
 Total luminaire output: 6979 Lumens
 55.1 Watts
 Peak Candela Value: 2741 @ 0°
 CCT: 3500K
 ITL LM79 Report 85145



CANDLEPOWER SUMMARY

	0.0	22.5	45	67.5	ACROSS	Flux
0	2741	2741	2741	2741	2741	2741
5	2730	2728	2728	2727	2727	259
10	2685	2684	2683	2682	2678	
15	2613	2607	2609	2605	2602	735
20	2511	2506	2502	2498	2498	
25	2380	2374	2371	2366	2367	1091
30	2223	2216	2213	2209	2211	
35	2043	2036	2033	2030	2033	1271
40	1845	1838	1836	1834	1837	
45	1635	1628	1627	1626	1630	1256
50	1417	1412	1412	1410	1413	
55	1200	1195	1196	1195	1187	1069
60	986	984	984	978	974	
65	780	778	774	766	761	766
70	582	583	576	569	565	
75	401	400	393	388	389	420
80	239	236	232	229	229	
85	103	100	97	91	89	111
90	0	0	0	0	0	

Angled (A) and Flat (F) Total Light Output, 3500K, 80 CRI (Lumens)

S*	B*	H*	V**
3772	4742	5416	6979

Power, 3500K, 80 CRI (Watts)

S*	B*	H*	V**
27.0	35.2	40.6	55.1

Efficacy, 3500K, 80 CRI (Lumens Per Watt)

S*	B*	H*	V**
140	135	135	127

* Family Correlation based on 3500K Very High Output (V) test - 120V.

** Correlation based on source ITL report: 85145

Angled Narrow Rail (ANR) Total Light Output, 3500K, 80 CRI (Lumens)

S*	B*	H*	V ^y
3680	4626	5283	6808

Power (Watts)

S*	B*	H*	V ^y
26.9	35.1	40.5	55.0

Efficacy, 3500K, 80 CRI (Lumens Per Watt)

S*	B*	H*	V ^y
137	132	130	124

* Family Correlation based on 3500K Very High Output (V) test - 120V.

** Correlation based on source ITL report: 85151

**S - Standard Output, B - Boosted Standard Output,
H - High Output, V - Very High Output**

Lumen Adjustment Factors - 80 CRI

3000K	0.985
3500K	1.000
4000K	1.032

Lumen Adjustment Factors - 90 CRI

3000K	0.746
3500K	0.760
4000K	0.789

Apply a lumen adjustment factor to calculate lumens for the desired CCT and CRI.

SAMPLE LUMEN ADJUSTMENT CALCULATION

High Output (H) Angled (A) & Flat (F)
4000K, 90 CRI

Lumen Adjustment Factor = 0.789

Total Light Output =
5416 lm x 0.789 = 4273 lm

$$\text{Efficacy} = \frac{4273 \text{ lm}}{40.6 \text{ W}} = 105 \text{ lm/W}$$

** Correlation based on ITL report: 85145



FINELITE

High Performance Recessed (HPR LED) 2x4

Wave (WAV) Total Light Output, 3500K, 80 CRI (Lumens)			
S*	B*	H*	V†
3821	4804	5486	7069
Power, 3500K, 80 CRI (Watts)			
S*	B*	H*	V†
27.0	35.2	40.6	55.1
Efficacy, 3500K, 80 CRI (Lumens Per Watt)			
S*	B*	H*	V†
142	136	135	128

* Family Correlation based on 3500K Very High Output (V) test - 120V.

† Correlation based on source ITL report: 85837

Curve Slotted (CS) Total Light Output, 3500K, 80 CRI (Lumens)			
S*	B*	H*	V‡
3569	4486	5124	6602
Power, 3500K, 80 CRI (Watts)			
S*	B*	H*	V‡
27.0	35.2	40.6	55.1
Efficacy, 3500K, 80 CRI (Lumens Per Watt)			
S*	B*	H*	V‡
132	127	126	120

* Family Correlation based on 3500K Very High Output (V) test - 120V.

‡ Correlation based on source ITL report: 86020

Double Diffuse (DD) Total Light Output, 3500K, 80 CRI (Lumens)			
S*	B*	H*	V‡
3076	3867	4417	5691
Power, 3500K, 80 CRI (Watts)			
S*	B*	H*	V‡
27.0	35.2	40.6	55.1
Efficacy, 3500K, 80 CRI (Lumens Per Watt)			
S*	B*	H*	V‡
114	110	109	103

* Family Correlation based on 3500K Very High Output (V) test - 120V.

‡ Correlation based on source ITL report: 85156

S - Standard Output, **B** - Boosted Standard Output,
H - High Output, **V** - Very High Output

Lumen Adjustment Factors - 80 CRI	
3000K	0.985
3500K	1.000
4000K	1.032

Lumen Adjustment Factors - 90 CRI	
3000K	0.746
3500K	0.760
4000K	0.789

Apply a lumen adjustment factor to calculate lumens for the desired CCT and CRI.



FINELITE

High Performance Recessed (HPR LED) 2x4

SPECIFICATIONS

CONSTRUCTION: Die-formed 20-gauge cold-rolled steel housing. All components are hard-tooled to tolerances of +/- 0.010". UV stabilized weather-strip pile gasket with polypropylene backing. Hinged door frame assembly provides easy access to light arrays and driver compartment for servicing from below. Seismic brackets are integrated into the luminaire assembly. Additional wire entrances are positioned on the ends of the housing to allow easy wiring access for the installer.

REFLECTORS: Die-formed 20-gauge cold-rolled steel reflectors are finished in 96LG high reflectance matte white powder coat paint.

AIR RETURN: Refer to 2x4 Air Return Tech Sheet for more information.

OPTICAL SYSTEM: Components include diffuser panels and a central optic element held in place with a frame constructed from die-formed cold-rolled steel. The diffusers are UV-stabilized and impact-resistant frosted virgin acrylic, 0.120" thick. They are either angled toward the central optic or parallel to the ceiling plane. The standard center rails are approximately 9/16" wide. Optional narrows rails are approximately 5/16" wide. Optional wave door includes frosted acrylic panel that undulates from side to side.

DOUBLE DIFFUSE: Visible diffuser: UV-stabilized and impact-resistant frosted virgin acrylic, 0.120" thick. Inner diffuser: 0.120" thick with 60% round perforations white/white.

DOOR STYLE: *Curved Slotted (CS)* includes perforated rails that slope inward and a diffuse frosted acrylic center optic.

CENTER OPTIC OPTIONS: Only available with Angled (A), Angled Narrow Rail (ANR), and Flat (F) door styles.

Diffuse Center Optic (DCO): UV-stabilized and impact-resistant frosted virgin acrylic.

Slotted Center Optic (SCO): Die-formed cold-rolled steel panel with a 1/16" x 1/2" rectangular hole pattern. Virgin acrylic overlay.

Round Center Optic (RCO): Die-formed cold-rolled steel panel with precision-punched 3/32" round hole pattern arranged in staggered formation. Virgin acrylic overlay.

LIGHT OUTPUT: Four lumen packages available, Standard (S), Boosted Standard (B), High (H), and Very High (V). A separate chart summarizes lumen distribution and wattage. Light engines are replaceable.

LUMEN MAINTENANCE: 90% of initial light output (L90) at 100,000+ hours; 70% of initial light output (L70) at 200,000+ hours.

DRIVER: Replaceable 120V/277V Constant Current Reduction dimming driver standard. Can be wired dimming or non-dimming. 0-10V dimming controls with a range of 10%- 100%. Dimming to 1% available, consult factory. Driver is fully accessible from below the ceiling. Power Factor: ≥0.9. Total Harmonic Distortion (THD): <20%. Expected driver lifetime: 100,000 hours.

LUTRON DRIVER OPTIONS: Lut3W-3-wire, LutES - EcoSystem, Lut2W-2-wire.

ELECTRICAL: Optional emergency to generator/inverter wiring, internal generator transfer switch, nightlight wiring, step-dimming driver, backup battery. Chicago Plenum option. Factory-choice low-profile backup battery available. Bodine BSL722 battery pack also available. Backup batteries deliver 1700 lumens. One quarter of the 2x4 will be illuminated in emergency mode.



INTEGRATED SENSORS: Integrated PIR (Passive Infrared) occupancy and/or daylight sensors available. Refer to Occupancy Sensor and Daylight Sensor tech sheets for more info.

MOUNTING: Standard flange design works with most lay-in ceiling types. Integral pry-out tabs secure the luminaire to the ceiling grid from above. Tie-in locations for tie-wire on all corners. Consult local code for appropriate tie-wire recommendations. Drywall Kit available. Surface mount and air return versions available; refer to separate tech sheets.

FINISH: Housing and door assembly painted with 96 LG high reflectance matte white powder coat paint. Optional adder: Anti-microbial paint. Contact factory.

FEED: Optional whips (with flex connectors) supplied in a maximum of 11' lengths. Lead Wires.

LABELS: Luminaire and electrical components are ETL-listed conforming to UL 916, 1598, 8750, 924 in the U.S.A. and CAN/CSA C22.2 No. 205, 250, and 141 in Canada. In accordance with NEC Code 410.73 (G), this luminaire contains an internal driver disconnect. Damp Location. IC-rated. Finelite products use electronic components that are RoHS compliant, and the mechanical components of the luminaire have been verified to not knowingly contain any restricted substances listed per RoHS Directive 2002/95/EC.

WEIGHT: 33 lbs maximum.

WARRANTY: 10-year performance-based warranty on all standard components. Optional accessories such as emergency battery packs are covered by their individual manufacturer warranties.

FINELITE High Performance 2" Aperture (HP-2) - Wall Mount Indirect/Direct

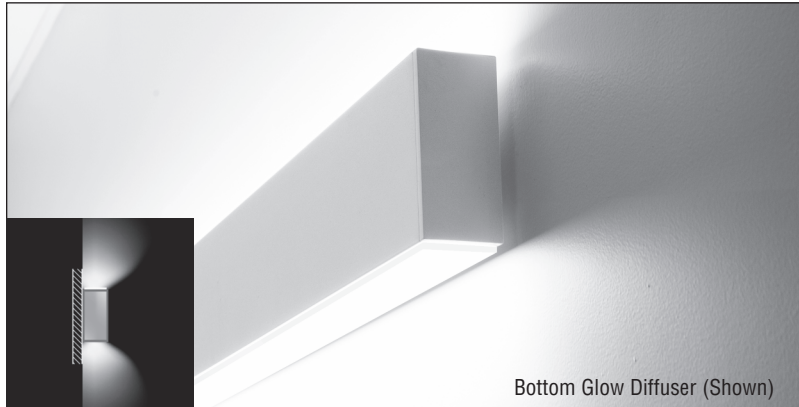


Date

Project

Type

Comments

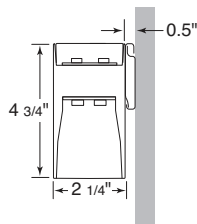
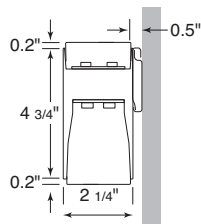


Bottom Glow Diffuser (Shown)

DESCRIPTION

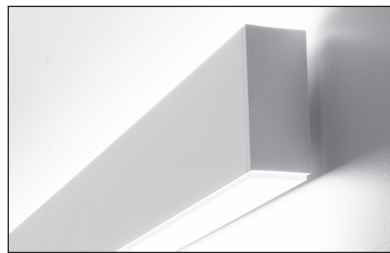
High Performance 2" Aperture Wall Mount Indirect/Direct (HP-2 WM-ID) is a patented, linear LED luminaire with Flush, Top Glow™ and Bottom Glow™ options for up- and downlight. The micro shape delivers excellent performance using an advanced optical design and mid-power LEDs to achieve 90% of initial light output at 100,000 hours.

Top Glow Diffuser (Standard)



Bottom Glow Diffuser (Optional)

Flush Uplight and Downlight Diffuser (Standard)



BOTTOM GLOW DIFFUSER

The optional Bottom Glow diffuser adds a clean line of light along the downlight element.

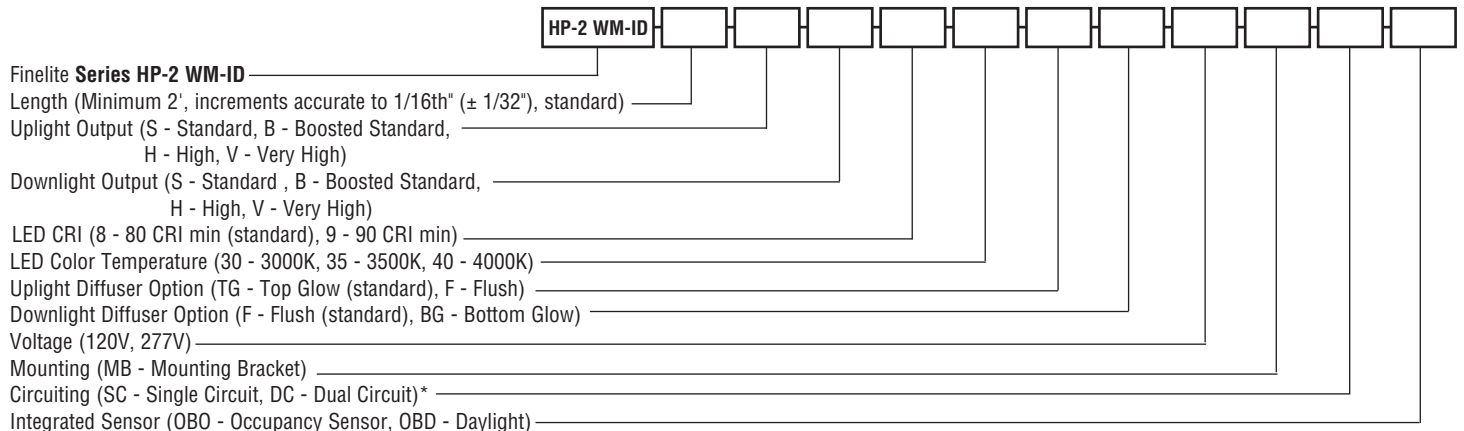
Tailored Lighting 10 working days

TAILORED LIGHTING

Any length greater than 2 feet, in increments down to 1/16th-inch (± 1/32") and 90-degree mitered corners in a single plane.

ORDERING GUIDE

Sample Number: HP-2 WM-ID - 32'- S - H - 8 - 35 - TG - F - 120V - MB - SC - OBO



* Contact factory for switching options. **Protected by one or more US Patents: 8915613; D702,391; D702,390; D700,732; D727,554 S; D727,550 S, D727,551 S**

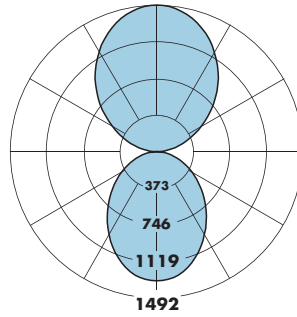
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Due to continuing product improvements, Finelite reserves the right to change specifications without notice. Please visit www.finelite.com for most current data.

FINELITE High Performance 2" Aperture (HP-2) - Wall Mount Indirect/Direct

PHOTOMETRY

Very High Output/ Very High Output - 4' Luminaire
 Distribution: 55% Up (V) / 45% Down (V)
 Efficacy: 94.7 lumens per watt
 Uplight: 3843 lumens (961 lumens/foot)
 Downlight: 3145 lumens (786 lumens/foot)
 Total luminaire output: 6988 lumens (1747 lumens/foot)
 73.8 watts (18.5 watts/foot)
 CCT: 3500K
 ITL LM79 Report 85132



	0.0	22.5	45	67.5	90	Flux
0	1314	1314	1314	1314	1314	
5	1306	1307	1305	1304	1304	124
15	1241	1233	1231	1225	1220	346
25	1114	1098	1089	1076	1064	501
35	942	925	910	887	877	568
45	749	734	718	693	683	552
55	553	542	526	506	499	470
65	368	360	349	337	332	346
75	203	198	192	187	184	204
85	60	59	58	57	55	64
90	0	0	0	0	0	
95	71	68	68	69	70	77
105	244	241	236	235	234	252
115	442	439	437	427	425	431
125	661	649	653	643	638	581
135	884	871	875	866	866	673
145	1099	1084	1088	1084	1077	679
155	1283	1268	1275	1269	1263	585
165	1415	1405	1408	1406	1403	396
175	1482	1482	1482	1482	1481	141
180	1492	1492	1492	1492	1492	

↑ Indirect ↓ Direct

	↑S*	↑B*	↑H*	↑V**
↓S*	2861 [↑55% 45%↓]	3262 [↑60% 40%↓]	4265 [↑70% 30%↓]	5113 [↑75% 25%↓]
↓B*	3195 [↑49% 51%↓]	3596 [↑55% 45%↓]	4600 [↑65% 35%↓]	5447 [↑70% 30%↓]
↓H*	4030 [↑39% 61%↓]	4432 [↑44% 56%↓]	5435 [↑55% 45%↓]	6282 [↑61% 39%↓]
↓V*	4736 [↑33% 67%↓]	5137 [↑38% 62%↓]	6141 [↑48% 52%↓]	6988 [↑55% 45%↓]

3000K	0.985
3500K	1.000
4000K	1.032

3000K	0.746
3500K	0.760
4000K	0.789

Apply a lumen adjustment factor to calculate lumens for the desired CCT and CRI.

	↑S*	↑B*	↑H*	↑V**
↓S*	715	815	1066	1278
↓B*	799	899	1150	1362
↓H*	1008	1108	1359	1571
↓V*	1184	1284	1535	1747

	↑S*	↑B*	↑H*	↑V**
↓S*	7.2	8.2	10.7	12.8
↓B*	8.2	9.2	11.7	13.8
↓H*	10.7	11.6	14.2	16.3
↓V*	12.8	13.8	16.3	18.5

	↑S*	↑B*	↑H*	↑V**
↓S*	98.8	99.4	99.8	99.6
↓B*	97.4	97.8	98.6	98.6
↓H*	94.3	95.2	96.0	96.3
↓V*	92.2	93.0	94.2	94.7

* Family Correlation based on 4' luminaire 3500K Very High Output (V) test - 120V.
 ** Correlation based on ITL report: 85132
 S - Standard Output, B - Boosted Standard Output, H - High Output, V - Very High Output

Protected by one or more US Patents: 8915613; D702,391; D702,390; D700,732; D727,554 S; D727,550 S, D727,551 S

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SAMPLE LUMEN ADJUSTMENT CALCULATION

High Output (H) / Standard Output (S),
 4000K, 90CRI

Lumen Adjustment Factor = 0.789

Total Light Output =
 4266 lm x 0.789 = 3366 lm

Total Light Output per Foot =
 1067 lm/ft x 0.789 = 841 lm/ft

watts/foot = 10.7 W/ft

$$\text{Efficacy} = \frac{841 \frac{\text{lm}}{\text{ft}}}{10.7 \frac{\text{W}}{\text{ft}}} = 78.6 \text{ lm/W}$$



FINELITE High Performance 2" Aperture (HP-2) - Wall Mount Indirect/Direct

SPECIFICATIONS

CONSTRUCTION: Precision-cut 6061-T6 extruded aluminum body. Internal joiner system, plug-together wiring, standard.

ENDCAPS: Flat diecast aluminum endcaps add 0.25" to each end of luminaire.

MITERED CORNER: Illuminated 90° corners in a single plane, with Top Glow™ or Flush uplight diffuser, and/or Flush downlight diffuser, standard. Custom angles are available (90° minimum on inside corners), contact factory.

REFLECTORS: Die-formed 24-gauge cold-rolled steel reflectors are finished in 96 LG high reflectance matte white powder coat paint.

UPLIGHT DIFFUSER: 12' maximum lens length. Top Glow frost white lens standard, 73% transmissive, 99% diffusion. Internal secondary diffusers at corners ensure visually seamless, uniform, continuous illumination. Optional: Flush frost white snap-in lens, 73% transmissive, 99% diffusion.

DOWNLIGHT DIFFUSER: 12' maximum lens length. Flush frost white snap-in lens standard, 73% transmissive, 99% diffusion. Internal secondary diffusers at corners ensure visually seamless, uniform, continuous illumination. Optional: Bottom Glow™ frost white snap-in lens option, 73% transmissive, 99% diffusion.

LIGHT OUTPUT: Four lumen packages available, Standard Output (S), Boosted Standard Output (B), High Output (H), and Very High Output (V). A separate chart summarizes lumen distribution and wattage. Light engines are replaceable.

LUMEN MAINTENANCE: 90% of initial light output (L90) at 100,000+ hours; 70% of initial light output (L70) at 200,000+ hours.

DRIVER: Replaceable 120V/277V Constant Current Reduction dimming driver standard. Can be wired dimming or non-dimming. 0-10V dimming controls with a range of 10%- 100%. Dimming to 1% available; consult factory. For lengths 3 feet and greater, separate dimming for uplight and downlight available. Driver is fully accessible from below the ceiling. Power Factor: 0.9. Total Harmonic Distortion (THD) <20%. Expected driver lifetime: 100,000 hours.

LUTRON DRIVER OPTIONS: Lut3W-3-wire, LutES-EcoSystem, Lut2W-2-wire.

ELECTRICAL: Optional emergency to generator/inverter wiring, internal generator transfer switch, nightlight wiring, step-dimming driver, backup battery. Factory-choice low-profile backup battery available. 12' minimum luminaire length for low profile battery pack. Backup batteries deliver 1000 lumens. Half of a 4' section will be illuminated in emergency mode.



INTEGRATED SENSORS: Integrated PIR (Passive Infrared) occupancy and/or daylight sensors available with Flush and Bottom Glow downlight diffusers. Refer to Occupancy Sensor and Daylight Sensor tech sheets for more info.

MOUNTING: Luminaire hangs securely from mounting brackets fastened directly to the wall for easy installation. Luminaire stands 0.5" off the wall. The mounting bracket is concealed behind the luminaire.

FINISHES: Finelite Signal White powder coat standard. Optional Adders: 185 Tiger Drylac's RAL colors.

FEED: Standard with one 18-gauge/5-conductor single-circuit feed controlling uplight and downlight together (power and dimming). Specify dual feeds for independent control of uplight and downlight. 14-gauge feed used when luminaire current exceeds 5 amps.

LENGTHS: Any length, 2-foot minimum, in increments down to 1/16th-inch (± 1/32"). 12-foot maximum section length.

LABELS: Luminaire and electrical components are ETL-listed conforming to UL 1598 in the U.S.A. and CAN/CSA C22.2 No. 250.0 in Canada. In accordance with NEC Code 410.73 (G), this luminaire contains an internal driver disconnect. Damp Location. Finelite products use electronic components that are RoHS compliant, and the mechanical components of the luminaire have been verified to not knowingly contain any restricted substances listed per RoHS Directive 2002/95/EC.

WEIGHT: 2.9 lb/ft.

WARRANTY: 10-year performance-based warranty on all standard components. Optional accessories such as emergency battery packs are covered by their individual manufacturer warranties.

Protected by one or more US Patents: 8915613; D702,391; D702,390; D700,732; D727,554 S; D727,550 S, D727,551 S

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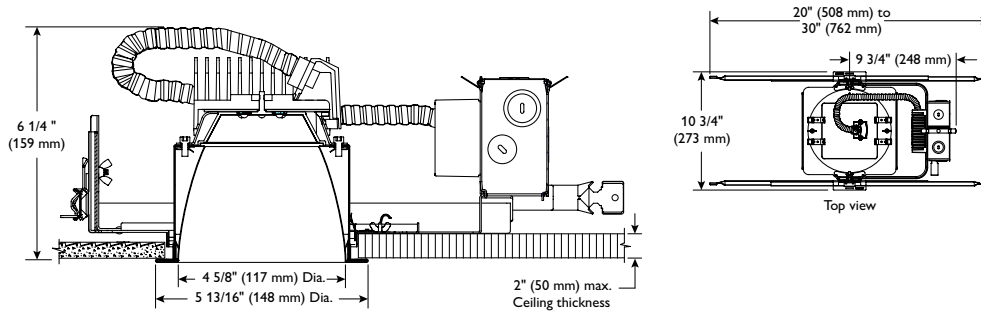
C4X4L10DL

Calculite LED 4 1/2" x 4 1/2" downlight

Catalog number:

Notes:

Type:



Ordering guide: light engines

Light engine series	Style	Color	Reflector finish	Flange	Options
C4X4L10	DL (Downlight)	27K (2700K) 30K (3000K) 35K (3500K) 40K (4000K)	CL (Clear) CCL (Comfort clear) CCD (Comfort clear diffuse) CCZ (Champagne bronze) WH (Painted white)	W (Painted white) P (Aperture-matching/polished)	EM (Integral emergency test switch) ¹

Example: C4X4L10DL35KCLWEM

¹See LED-EM for details and restrictions.

Ordering guide: frame-in kits

Frame-in kit series	Installation options	Input voltage	Driver	Options
C4X4L10	N (New construction)	1 (120V) 2 (277V)	Z10V (0-10V dimming) LD (Lutron driver)	EM (Emergency)

Example: C4X4L10N1Z10VEM

Features

Aperture: 4 5/8" x 4 5/8" (117mm) I.D., 5 13/16" (148mm) O.D.

Input wattage: 20W (+/- 5%)

Reflector cone: Aluminum. Provides 50° cutoff to source & source image.

Self-flanged.

Depth (including frame-in kit): 5 3/4" (146mm)

Power connection: Attaches to frame-in kit via push-in connector (on frame). Removable cover provides access.

Options

Dimming capability: See LED-DIM specification sheet.

Emergency capability (integral): Add "EM" suffix. See LED-EM spec sheet.

Emergency capability (inverter): See LED-LMI specification sheet.

Labels

UL (suitable for wet locations), cUL, I.B.E.W.

5 year warranty

Technology

LED board: Array of high brightness royal blue LED's.

Remote phosphor technology: Remote phosphor technology provides increased efficiency and color consistency. Phosphor lens assembly positioned in front of LED array converts blue light to white. Color shift will not exceed +/- 100K over life.

Optical mixing chamber: Philips Lightolier-specific mixing chamber redirects back-reflected light through aperture resulting in 20% increase in efficiency.

Thermal management: Heat sink and thermal design along with clean room assembly ensures specified performance.

Rated life: Based on IESNA LM-80-2008

50,000 hours at 70% lumen maintenance.

Photometric performance: Tested in accordance to IESNA LM-79-2008

PHILIPS
LIGHTOLIER



LUMINAIRE CUT SHEET

MARINA VILLAGE

ALAMEDA, CA
Type: **F5**

Note: This Fixture Cut Is For Information Only. Refer To Specs For All Catalogue Numbers, Lamps, Finishes, Accessories, Etc

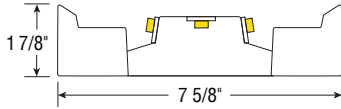


FINELITE

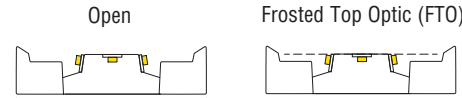
Series 16 LED Indirect/Direct - 3E

3E FEATURES

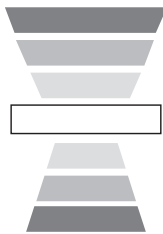
DIMENSIONS & LIGHT ENGINES



OPTIC OPTIONS



DIMMING



The uplight and downlight can be dimmed together or separately. 0-10V controls with a range of 10-100%. Dimming to 1% available.

LUMEN PACKAGES

Available in four outputs.

- Standard Output
- Boosted Output
- High Output
- Very High Output

Date

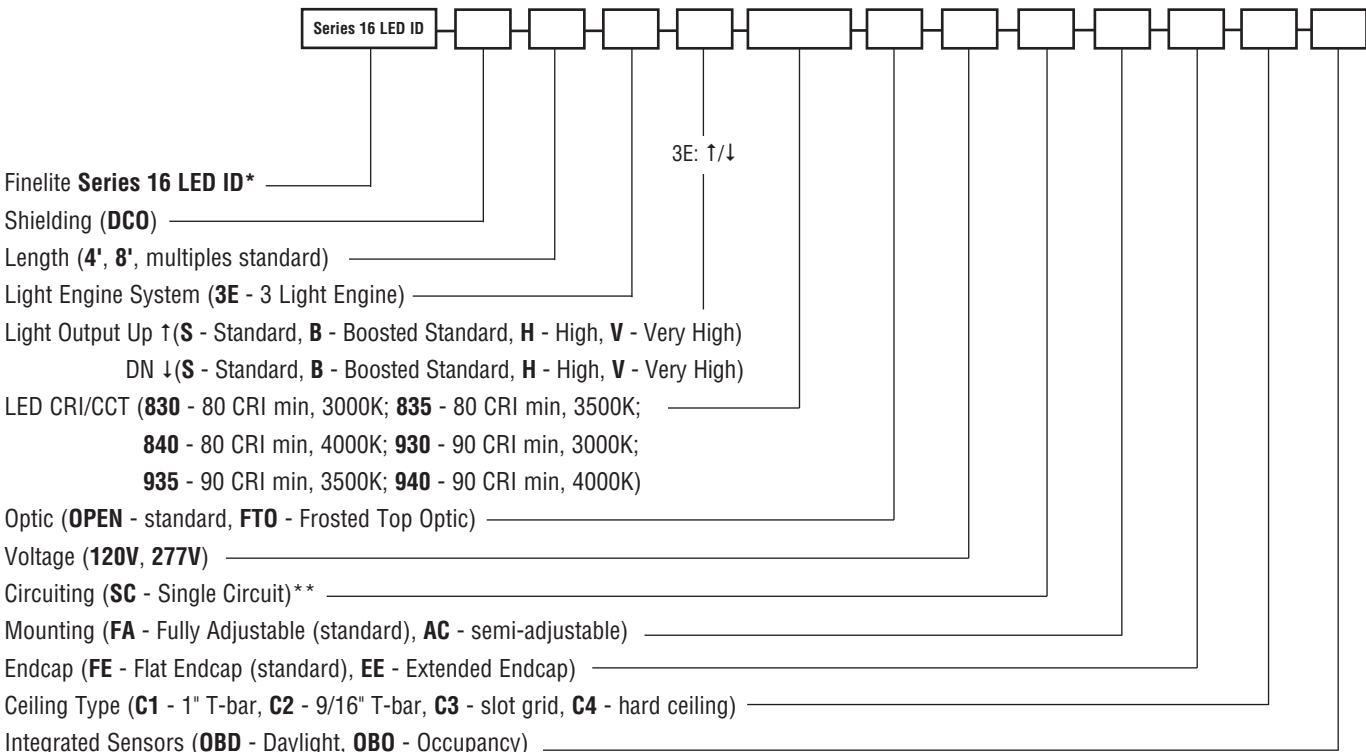
Project

Type

Comments

ORDERING GUIDE:

Sample Number: S16 LED ID - DCO - 8' - 3E - S/B - 835 - OPEN - 120V - SC - FA - FE - C1 - OBO



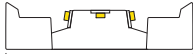
* Indirect luminaires available on 3E.
** Contact factory for switching options.



FINELITE

Series 16 LED Indirect/Direct - 3E

3E OPEN PHOTOMETRY - 4 ft. Luminaire



Series16-LED-ID-DCO-3E-V-V-835-OPEN

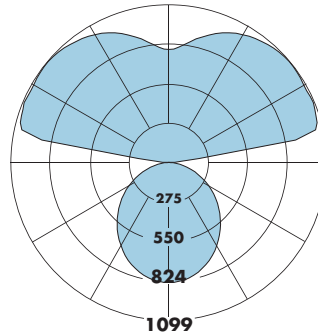
Distribution: 67% Up / 33% Down

Efficacy: 117 Lumens per watt

Total Luminaire Output: 6657 lumens (1664 lumens/foot)
56.8 watts (14.2 watts/foot)

CCT: 3500K

ITL LM79 Report 85122



CANDLEPOWER SUMMARY						
	0	22.5	45.0	67.5	90.0	Flux
0	839	839	839	839	839	
5	835	834	834	835	834	79
15	800	795	798	798	794	224
25	728	720	723	722	719	332
35	629	623	624	620	618	389
45	515	510	510	505	503	393
55	394	389	387	383	383	346
65	266	263	261	257	257	258
75	138	137	135	134	133	144
85	30	31	31	31	31	36
90	0	0	0	0	0	
95	46	271	139	80	76	236
105	202	408	779	1000	1075	740
115	351	528	833	1021	1091	770
125	479	630	884	1045	1097	749
135	583	709	912	1046	1090	677
145	667	761	920	1023	1056	559
155	728	788	899	976	999	408
165	768	793	850	893	907	240
175	786	789	797	807	809	77
180	789	789	789	789	789	

3E OPEN

↑ Indirect	↓ Direct
------------	----------

Total Light Output, 3500K, 80 CRI (Lumens) - 4 ft. Luminaire				
	↑S*	↑B*	↑H*	↑V**
↓S*	2725 [↑67% 33%↓]	3194 [↑72% 28%↓]	4366 [↑79% 21%↓]	5356 [↑83% 17%↓]
↓B*	2957 [↑62% 38%↓]	3426 [↑67% 33%↓]	4598 [↑75% 25%↓]	5588 [↑80% 20%↓]
↓H*	3536 [↑52% 48%↓]	4005 [↑57% 43%↓]	5178 [↑67% 33%↓]	6168 [↑72% 28%↓]
↓V*	4026 [↑45% 55%↓]	4495 [↑51% 49%↓]	5667 [↑61% 39%↓]	6657 [↑67% 33%↓]

Light Output, 3500K, 80 CRI (Lumens Per Foot)				
	↑S*	↑B*	↑H*	↑V**
↓S*	681	799	1092	1339
↓B*	739	856	1150	1397
↓H*	884	1001	1294	1542
↓V*	1006	1124	1417	1664

Power (Watts Per Foot)				
	↑S*	↑B*	↑H*	↑V**
↓S*	5.7	6.6	9.1	11.2
↓B*	6.2	7.1	9.6	11.7
↓H*	7.5	8.5	10.9	13.0
↓V*	8.6	9.6	12.1	14.2

Efficacy, 3500K, 80 CRI (Lumens Per Watt)				
	↑S*	↑B*	↑H*	↑V**
↓S*	120	121	120	119
↓B*	120	120	120	119
↓H*	118	118	119	118
↓V*	116	117	117	117

* Family Correlation based on 4 ft. luminaire 3500K Very High Output (V) test - 120V.

** Correlation based on ITL report: 85122

S - Standard Output, B - Boosted Standard Output, H - High Output, V - Very High Output

Lumen Adjustment Factors - 80 CRI	
3000K	0.985
3500K	1.000
4000K	1.032

Lumen Adjustment Factors - 90 CRI	
3000K	0.746
3500K	0.760
4000K	0.789

Apply a lumen adjustment factor to calculate lumens for the desired CCT and CRI.

SAMPLE LUMEN ADJUSTMENT CALCULATION

High Output (H) / High Output (H),
Open, 4000K, 90CRI

$$\text{Lumen Adjustment Factor} = 0.789$$

$$\text{Total Light Output} = 5178 \text{ lm} \times 0.789 = 4085 \text{ lm}$$

$$\text{Total Light Output per Foot} = 1295 \text{ lm/ft} \times 0.789 = 1022 \text{ lm/ft}$$

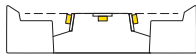
$$\text{watts/foot} = 10.9 \text{ W/ft}$$

$$\text{Efficacy} = \frac{1022 \frac{\text{lm}}{\text{ft}}}{10.9 \frac{\text{W}}{\text{ft}}} = 94 \text{ lm/W}$$

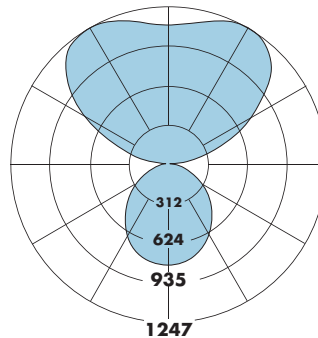
FINELITE

Series 16 LED Indirect/Direct - 3E

3E FROSTED TOP OPTIC (FTO) PHOTOMETRY - 4 ft. Luminaire



For applications where a soft beam edge on wall or vertical surface is desired.



Series16-LED-ID-DCO-3E-V-V-835-FTO

Distribution: 65% Up / 35% Down

Efficacy: 108 Lumens per watt

Total Luminaire Output: 6043 lumens (1511 lumens/foot)
56.2 watts (14.1 watts/foot)

CCT: 3500K

ITL LM79 Report 88524

CANDLEPOWER SUMMARY						
	0	22.5	45.0	67.5	90.0	Flux
0	799	799	799	799	799	
5	794	794	795	794	794	75
15	760	756	759	758	756	214
25	693	685	688	687	684	316
35	599	592	593	589	587	370
45	491	486	485	480	477	373
55	374	370	368	362	361	328
65	252	250	247	242	242	244
75	131	130	128	126	126	136
85	30	30	30	29	29	35
90	0	0	0	0	0	
95	59	63	65	61	58	75
105	223	240	278	297	303	287
115	415	455	538	588	607	518
125	606	671	798	880	911	693
135	778	851	998	1102	1140	752
145	916	974	1108	1207	1241	683
155	1013	1046	1137	1208	1232	521
165	1070	1080	1123	1154	1168	317
175	1096	1098	1101	1106	1108	105
180	1099	1099	1099	1099	1099	

3E Frosted Top Optics (FTO)

↑ Indirect	↓ Direct
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Total Light Output, 3500K, 80 CRI (Lumens) - 4 ft. Luminaire				
	↑S*	↑B*	↑H*	↑V**
↓S*	2474 [↑165% 35%↓]	2890 [↑170% 30%↓]	3930 [↑178% 22%↓]	4808 [↑182% 18%↓]
↓B*	2694 [↑160% 40%↓]	3110 [↑165% 35%↓]	4150 [↑174% 26%↓]	5028 [↑179% 21%↓]
↓H*	3244 [↑150% 50%↓]	3660 [↑156% 44%↓]	4700 [↑165% 35%↓]	5578 [↑171% 29%↓]
↓V*	3709 [↑144% 56%↓]	4125 [↑149% 51%↓]	5165 [↑160% 40%↓]	6043 [↑165% 35%↓]

Light Output, 3500K, 80 CRI (Lumens Per Foot)				
	↑S*	↑B*	↑H*	↑V**
↓S*	618	722	982	1202
↓B*	673	777	1037	1257
↓H*	811	915	1175	1395
↓V*	927	1031	1291	1511

Power (Watts Per Foot)				
	↑S*	↑B*	↑H*	↑V**
↓S*	5.6	6.6	9	11.1
↓B*	6.1	7.1	9.5	11.6
↓H*	7.4	8.4	10.8	12.9
↓V*	8.6	9.5	11.9	14.1

Efficacy, 3500K, 80 CRI (Lumens Per Watt)				
	↑S*	↑B*	↑H*	↑V**
↓S*	110	110	109	108
↓B*	110	110	109	108
↓H*	109	109	109	108
↓V*	108	108	108	108

* Family Correlation based on 4 ft. luminaire 3500K Very High Output (V) test - 120V.

** Correlation based on ITL report: 88524

S - Standard Output, B - Boosted Standard Output, H - High Output, V - Very High Output

Lumen Adjustment Factors - 80 CRI	
3000K	0.985
3500K	1.000
4000K	1.032

Lumen Adjustment Factors - 90 CRI	
3000K	0.746
3500K	0.760
4000K	0.789

Apply a lumen adjustment factor to calculate lumens for the desired CCT and CRI.

SAMPLE LUMEN ADJUSTMENT CALCULATION

High Output (H) / High Output (H),
Open, 4000K, 90CRI

Lumen Adjustment Factor = 0.789

Total Light Output =
4700 lm x 0.789 = 3708 lm

Total Light Output per Foot =
1175 lm/ft x 0.789 = 927 lm/ft

watts/foot = 10.8 W/ft

$$\text{Efficacy} = \frac{927 \frac{\text{lm}}{\text{ft}}}{10.8 \frac{\text{W}}{\text{ft}}} = 86 \text{ lm/W}$$

PHILIPS LIGHTOLIER

Downlighting

SlimSurface LED

4" and 6" square aperture
surface mount downlight



Project: _____
 Location: _____
 Cat.No: _____
 Type: _____
 Lamps: _____ Qty: _____
 Notes: _____

SlimSurface LED is a 5/8" thick surface mounted luminaire with the appearance of a recessed downlight. Easy to install into most standard j-boxes, the SlimSurface LED square apertures are available as a 4" 650lm & 6" 1000lm fixture.

Ordering guide

example: S4S830K7AL

Family	CRI	CCT	Lumens	Finish	Dimming
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S4S SlimSurface 4" Square	8 80 9 90 ¹	27K 2700K 30K 3000K 35K 3500K 40K 4000K	7 650lm	blank White AL Aluminum BK Black W White AL Aluminum BK Black	blank ELV / Triac (120V) Z10U 0-10V (120V-277V)
S6S SlimSurface 6" Square	8 80 9 90 ¹	27K 2700K 30K 3000K 35K 3500K 40K 4000K	10 1000lm	blank White AL Aluminum BK Black W White AL Aluminum BK Black	blank ELV / Triac (120V) Z10U 0-10V (120V-277V)

1. Configurations using 90 CRI are only available with 2700K CCT.



White



Black



Aluminum

Features

- Flange:** One piece plastic flange. Injection molded white, applied aluminum or black.
- Lens:** High transmittance lens allowing for smooth, comfortable light pattern.
- Power supply:** Integral class 2 driver. Factory wired electronic LED driver (see Electrical section for specifications)
- LED Strip:** Utilizes Philips LEDs.
- Lifetime:** Expected lifetime 50,000 hours and backed by a 5-year warranty (see Philips.com/warranties for details).
- Compliance:** Non-conductive fixture for shower light application.

Electrical

Electronic power supply: RoHS compliant. Class 2 power unit. Unit tolerates sustained open circuit and short circuit output conditions without damage.

Dimming: Intended for ELV/Triac (120V) or 0-10V dimming (120V-277V) based on the configuration. Min 90°C supply conductors.

Labels

cULus listed for damp locations (wall mount applications and wet location - covered ceilings). ENERGY STAR® certified.

Electrical specifications	Dimming	Input volts	Input frequency	Input current	Input Power	THD Factor	Power Factor	Minimum Operating Temp.
Slim 4" 650lm	Triac	120V	50/60Hz	0.08A	9.5W	<15%	>0.9	-20°C
	0-10V	120V	50/60Hz	0.08A	10.0W	<20%	>0.9	-20°C
		277V	50/60Hz	0.04A	10.2W	<20%	>0.9	-20°C
Slim 6" 1000lm	Triac	120V	50/60Hz	0.13A	14.2W	<15%	>0.9	-20°C
	0-10V	120V	50/60Hz	0.12A	14.5W	<20%	>0.9	-20°C
		277V	50/60Hz	0.06A	14.7W	<20%	>0.9	-20°C

For more details, please see LED-DIM spec sheet.



S4S & S6S SlimSurface LED

4" and 6" square aperture surface mount downlight

Compatibility

Installs into standard J-box applications:



3 1/2" round (plastic)



4" square (plastic)
Not compatible with S5R



4" octagonal (metal)



4" square (metal)
Not compatible with S5R

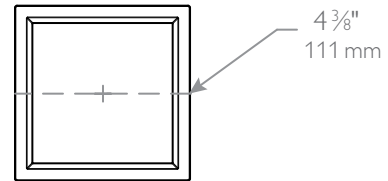
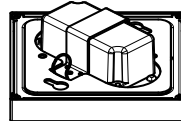
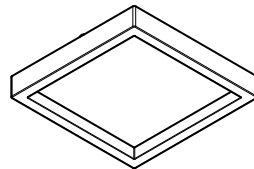
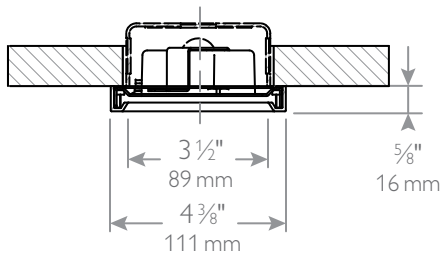


Fire rated J-box
Fire rated classification is per the ceiling and junction box ratings.

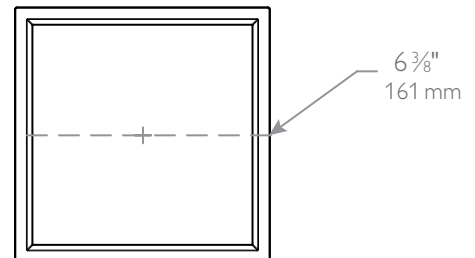
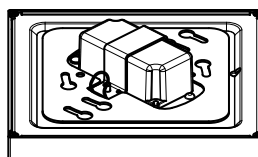
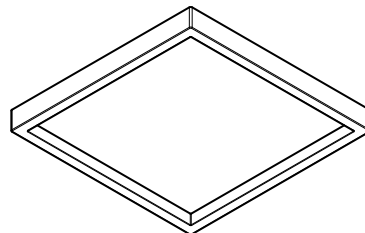
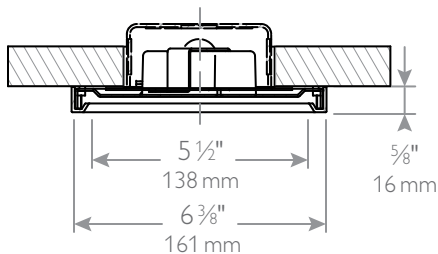
Note: A 2 1/8" deep octagon junction box is recommended for through circuit wiring applications.

Dimensions

SlimSurface LED 4" downlight



SlimSurface LED 6" downlight

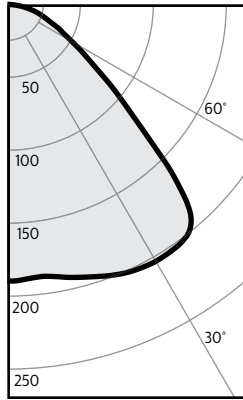


S4S & S6S SlimSurface LED

4" and 6" square aperture surface mount downlight

S4S927K7 • 10 W LED, 90CRI, 2700 K

Candela Curves



Angle	Mean CP	Lumens
0	189	
5	188	18
10	189	
15	193	55
20	198	
25	201	93
30	203	
35	202	126
40	196	
45	153	116
50	103	
55	71	66
60	51	
65	39	38
70	28	
75	21	21
80	13	
85	4	5
90	0	

Single unit data

Height to Lighted Plane	Initial center beam foot-candles	Beam dia. (ft)*
5'	8	7.5'
6'	5	9.0'
7'	4	10.5'
8'	3	12.0'
9'	2	13.5'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq.ft.
5'	22.5	0.40
6'	14.7	0.26
7'	10.5	0.19
8'	8.8	0.16
9'	7.0	0.13

38'x38'x10' Room, Workplane 2.5' above floor, 80/50/20% Reflectances

Coefficients of utilization

Ceiling	80%				70%		50%		30%		0%
	70	50	30	10	50	10	50	10	50	10	0
Wall	70	50	30	10	50	10	50	10	50	10	0

RCR Zonal cavity method - Effective floor reflectance = 20%

Room Cavity Ratio	80%				70%		50%		30%		0%
	70	50	30	10	50	10	50	10	50	10	0
0	119	119	119	119	116	116	111	111	106	106	100
1	110	106	102	99	104	97	100	94	96	91	87
2	101	94	88	83	92	82	89	80	85	78	74
3	93	84	76	70	82	70	79	68	76	67	64
4	86	75	67	61	73	60	71	59	69	59	56
5	79	67	59	53	66	52	64	52	62	51	49
6	73	61	52	46	60	46	58	46	56	45	43
7	68	55	47	41	54	41	53	41	52	40	38
8	63	50	42	37	50	37	48	36	47	36	34
9	59	46	38	33	46	33	45	33	44	33	31
10	55	43	35	30	42	30	41	30	40	30	28

Zonal lumens & percentages

Zone	Lumens	%Luminaire
0-30	166	30.7%
0-40	292	54.2%
0-60	474	88.0%
0-90	539	100.0%

CRI and CCT adjustment factors

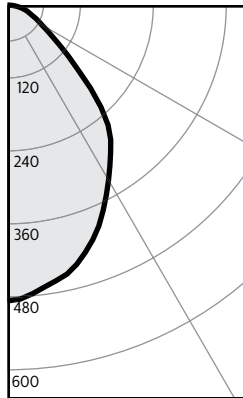
90 CRI 2700K = 84%
80 CRI 2700K = 100%
80 CRI 3000K = 100%
80 CRI 3500K = 105%
80 CRI 4000K = 109%

Report: 943GFR

Output lumens:	539 lms	Efficacy:	59.3 lm/w
Spacing Criterion:	1.5	CCT ³ :	2700K
Beam Angle:	86°	CRI:	90 min
Input Watts ² :	9.1W		

S6S927K7 • 14 W LED, 90CRI, 2700 K

Candela Curves



Angle	Mean CP	Lumens
0	486	
5	476	45
10	460	
15	441	123
20	410	
25	373	170
30	333	
35	296	184
40	258	
45	193	147
50	131	
55	90	83
60	65	
65	51	50
70	39	
75	30	30
80	20	
85	9	9
90	0	

Single unit data

Height to Lighted Plane	Initial center beam foot-candles	Beam dia. (ft)*
5'	19	5.5'
6'	14	6.6'
7'	10	7.7'
8'	8	8.8'
9'	6	9.9'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq.ft.
5'	21.8	2.80
6'	14.2	1.84
7'	10.2	1.31
8'	8.5	1.09
9'	6.8	0.88

38'x38'x10' Room, Workplane 2.5' above floor, 80/50/20% Reflectances

Coefficients of utilization

Ceiling	80%				70%		50%		30%		0%
	70	50	30	10	50	10	50	10	50	10	0
Wall	70	50	30	10	50	10	50	10	50	10	0

RCR Zonal cavity method - Effective floor reflectance = 20%

Room Cavity Ratio	80%				70%		50%		30%		0%
	70	50	30	10	50	10	50	10	50	10	0
0	119	119	119	119	116	116	111	111	106	106	100
1	111	107	103	100	105	98	100	95	97	93	88
2	103	96	90	85	94	84	90	82	87	80	77
3	95	86	79	74	85	73	82	72	79	71	68
4	88	78	70	65	77	64	74	63	72	63	60
5	82	71	63	57	70	57	68	56	66	56	53
6	76	65	57	51	64	51	62	51	61	50	48
7	71	59	52	46	59	46	57	46	56	45	43
8	67	55	47	42	54	42	53	42	52	41	39
9	63	51	43	38	50	38	49	38	48	38	36
10	59	47	40	35	47	35	46	35	45	35	33

Zonal lumens & percentages

Zone	Lumens	%Luminaire
0-30	338	40.2%
0-40	522	62.1%
0-60	753	89.5%
0-90	841	100.0%

CRI and CCT adjustment factors

90 CRI 2700K = 84%
80 CRI 2700K = 100%
80 CRI 3000K = 100%
80 CRI 3500K = 105%
80 CRI 4000K = 109%

Report: 957GFR

Output lumens:	841 lms	Efficacy:	63.2 lm/w
Spacing Criterion:	1.1	CCT ³ :	2700K
Beam Angle:	82°	CRI:	90 min
Input Watts ² :	13.3W		

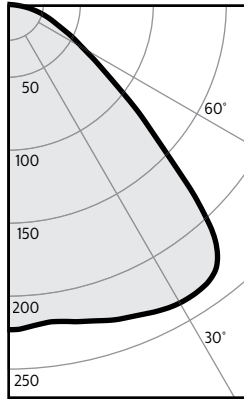
1. Tested using absolute photometry as specified in LM79: IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
 2. Wattage: controlled to within 5%
 3. Correlated Color Temperature: within specs as defined in ANSI_NEMA_ANSLG C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products.

S4S & S6S SlimSurface LED

4" and 6" square aperture surface mount downlight

S4S827K7 • 10 W LED, 80CRI, 2700K

Candela Curves



Angle	Mean CP	Lumens
0	223	
5	221	21
10	221	
15	225	64
20	229	
25	233	108
30	237	
35	236	146
40	224	
45	175	133
50	121	
55	83	76
60	60	
65	44	44
70	33	
75	24	25
80	15	
85	5	6
90	0	

Single unit data

Height to Lighted Plane	Initial center beam foot-candles	Beam dia. (ft)*
5'	9	7.5'
6'	6	9.0'
7'	5	10.5'
8'	3	12.0'
9'	3	13.5'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq.ft.
5'	25.9	0.41
6'	17.0	0.27
7'	12.1	0.19
8'	10.1	0.16
9'	8.1	0.13

Coefficients of utilization

Ceiling	80%				70%		50%		30%		0%	
	70	50	30	10	50	10	50	10	50	10	0	
Wall	70	50	30	10	50	10	50	10	50	10	0	
RCR	Zonal cavity method - Effective floor reflectance = 20%											
Room Cavity Ratio	0	119	119	119	119	116	116	111	111	106	106	100
	1	110	106	102	99	104	97	100	94	96	91	87
	2	101	94	88	83	92	82	89	80	85	78	74
	3	93	84	76	70	82	70	79	69	77	67	64
	4	86	75	67	61	74	60	71	59	69	59	56
	5	79	67	59	53	66	53	64	52	62	51	49
	6	73	61	52	46	60	46	58	46	57	45	43
	7	68	55	47	41	55	41	53	41	52	41	38
	8	63	51	42	37	50	37	49	37	47	36	34
	9	59	46	38	33	46	33	45	33	44	33	31
	10	55	43	35	30	42	30	41	30	40	30	28

Zonal lumens & percentages

Zone	Lumens	%Luminaire
0-30	192	30.9%
0-40	338	54.4%
0-60	547	88.0%
0-90	622	100.0%

CRI and CCT adjustment factors

90 CRI 2700K = 84%
80 CRI 2700K = 100%
80 CRI 3000K = 100%
80 CRI 3500K = 105%
80 CRI 4000K = 109%

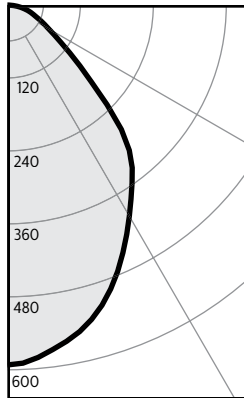
Report: 944GFR

Output lumens:	622lms	Efficacy:	67.6lm/w
Spacing Criterion:	1.5	CCT ³ :	2700K
Beam Angle:	101°	CRI:	80min
Input Watts ² :	9.2W		

38'x38'x10' Room, Workplane 2.5' above floor, 80/50/20% Reflectances

S6S827K7 • 14 W LED, 80CRI, 2700K

Candela Curves



Angle	Mean CP	Lumens
0	625	
5	618	59
10	604	
15	584	164
20	546	
25	494	227
30	440	
35	390	244
40	337	
45	250	193
50	170	
55	117	108
60	85	
65	65	65
70	51	
75	39	41
80	27	
85	12	13
90	0	

Single unit data

Height to Lighted Plane	Initial center beam foot-candles	Beam dia. (ft)*
5'	25	5.5'
6'	17	6.6'
7'	13	7.7'
8'	10	8.8'
9'	8	9.9'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq.ft.
5'	24.2	3.68
6'	15.8	2.42
7'	11.3	1.73
8'	9.5	1.44
9'	7.5	1.15

Coefficients of utilization

Ceiling	80%				70%		50%		30%		0%	
	70	50	30	10	50	10	50	10	50	10	0	
Wall	70	50	30	10	50	10	50	10	50	10	0	
RCR	Zonal cavity method - Effective floor reflectance = 20%											
Room Cavity Ratio	0	119	119	119	119	116	116	111	111	106	106	100
	1	111	107	103	100	105	98	100	95	97	93	88
	2	103	96	90	85	94	84	90	82	87	80	77
	3	95	86	79	74	85	73	82	72	79	71	68
	4	88	78	70	65	77	64	74	63	72	63	60
	5	82	71	63	57	70	57	68	56	66	56	53
	6	76	65	57	51	64	51	62	51	61	50	48
	7	71	59	52	46	59	46	57	46	56	45	43
	8	67	55	47	42	54	42	53	42	52	41	39
	9	63	51	43	38	50	38	49	38	48	38	36
	10	59	47	40	35	47	35	46	35	45	35	33

Zonal lumens & percentages

Zone	Lumens	%Luminaire
0-30	449	40.4%
0-40	693	62.3%
0-60	994	89.3%
0-90	1113	100.0%

CRI and CCT adjustment factors

90 CRI 2700K = 84%
80 CRI 2700K = 100%
80 CRI 3000K = 100%
80 CRI 3500K = 105%
80 CRI 4000K = 109%

Report: 964GFR

Output lumens:	1113lms	Efficacy:	83.1lm/w
Spacing Criterion:	1.1	CCT ³ :	2700K
Beam Angle:	83°	CRI:	80min
Input Watts ² :	13.4W		

38'x38'x10' Room, Workplane 2.5' above floor, 80/50/20% Reflectances

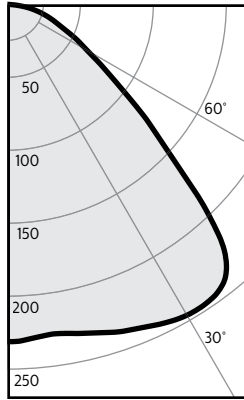
1. Tested using absolute photometry as specified in LM79: IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
2. Wattage: controlled to within 5%
3. Correlated Color Temperature: within specs as defined in ANSI_NEMA_ANSI C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products.

S4S & S6S SlimSurface LED

4" and 6" square aperture surface mount downlight

S4S830K7 • 10W LED, 80CRI, 3000K

Candela Curves



Angle	Mean CP	Lumens
0	231	
5	229	22
10	230	
15	236	67
20	241	
25	246	113
30	248	
35	247	153
40	237	
45	185	139
50	125	
55	87	80
60	63	
65	47	47
70	34	
75	25	26
80	15	
85	5	6
90	0	

Single unit data

Height to Lighted Plane	Initial center beam foot-candles	Beam dia. (ft)*
5'	9	7.5'
6'	6	9.0'
7'	5	10.5'
8'	4	12.0'
9'	3	13.5'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq.ft.
5'	27.2	0.40
6'	17.9	0.26
7'	12.8	0.19
8'	10.6	0.16
9'	8.5	0.13

38'x38'x10' Room, Workplane 2.5' above floor, 80/50/20% Reflectances

Coefficients of utilization

Ceiling	80%				70%		50%		30%		0%	
	70	50	30	10	50	10	50	10	50	10	0	
Wall	Zonal cavity method - Effective floor reflectance = 20%											
RCR	Zonal cavity method - Effective floor reflectance = 20%											
Room Cavity Ratio	0	119	119	119	119	116	116	111	111	106	106	100
	1	110	106	102	99	104	97	100	94	96	91	87
	2	101	94	88	83	92	82	89	80	85	78	74
	3	93	84	76	70	82	70	79	69	77	67	64
	4	86	75	67	61	74	60	71	59	69	59	56
	5	79	67	59	53	66	52	64	52	62	51	49
	6	73	61	52	46	60	46	58	46	57	45	43
	7	68	55	47	41	55	41	53	41	52	40	38
	8	63	51	42	37	50	37	49	36	47	36	34
	9	59	46	38	33	46	33	45	33	44	33	31
	10	55	43	35	30	42	30	41	30	40	30	28

Zonal lumens & percentages

Zone	Lumens	%Luminaire
0-30	202	30.9%
0-40	355	54.3%
0-60	574	87.9%
0-90	653	100.0%

CRI and CCT adjustment factors

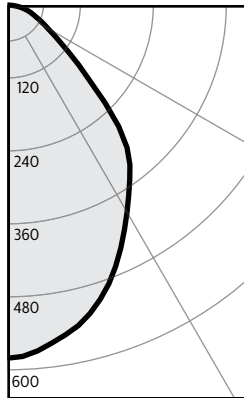
90 CRI 2700K = 84%
80 CRI 2700K = 100%
80 CRI 3000K = 100%
80 CRI 3500K = 105%
80 CRI 4000K = 109%

Report: 945GFR

Output lumens:	653lms	Efficacy:	71.8lm/w
Spacing Criterion:	1.5	CCT ³ :	3000K
Beam Angle:	86°	CRI:	80min
Input Watts ² :	9.1W		

S6S830K7 • 14W LED, 80CRI, 3000K

Candela Curves



Angle	Mean CP	Lumens
0	582	
5	572	54
10	551	
15	526	148
20	489	
25	442	203
30	394	
35	351	220
40	307	
45	227	176
50	153	
55	106	99
60	77	
65	59	60
70	45	
75	34	36
80	22	
85	10	10
90	0	

Single unit data

Height to Lighted Plane	Initial center beam foot-candles	Beam dia. (ft)*
5'	23	5.5'
6'	16	6.6'
7'	12	7.7'
8'	9	8.8'
9'	7	9.9'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq.ft.
5'	26.2	3.33
6'	17.1	2.18
7'	12.2	1.56
8'	10.2	1.30
9'	8.1	1.04

38'x38'x10' Room, Workplane 2.5' above floor, 80/50/20% Reflectances

Coefficients of utilization

Ceiling	80%				70%		50%		30%		0%	
	70	50	30	10	50	10	50	10	50	10	0	
Wall	Zonal cavity method - Effective floor reflectance = 20%											
RCR	Zonal cavity method - Effective floor reflectance = 20%											
Room Cavity Ratio	0	119	119	119	119	116	116	111	111	106	106	100
	1	111	107	103	100	105	98	100	95	97	93	88
	2	103	96	90	85	94	84	90	82	87	80	77
	3	95	86	79	74	85	73	82	72	79	71	68
	4	88	78	70	65	77	64	74	63	72	63	60
	5	82	71	63	57	70	57	68	56	66	56	53
	6	76	65	57	51	64	51	62	51	61	50	48
	7	71	59	52	46	59	46	57	46	56	45	43
	8	67	55	47	42	54	42	53	42	52	41	39
	9	63	51	43	38	50	38	49	38	48	38	36
	10	59	47	40	35	47	35	46	35	45	35	33

Zonal lumens & percentages

Zone	Lumens	%Luminaire
0-30	405	40.2%
0-40	625	62.1%
0-60	900	89.5%
0-90	1006	100.0%

CRI and CCT adjustment factors

90 CRI 2700K = 84%
80 CRI 2700K = 100%
80 CRI 3000K = 100%
80 CRI 3500K = 105%
80 CRI 4000K = 109%

Report: 958GFR

Output lumens:	1006lms	Efficacy:	75.1lm/w
Spacing Criterion:	1.1	CCT ³ :	3000K
Beam Angle:	82°	CRI:	80min
Input Watts ² :	13.4W		

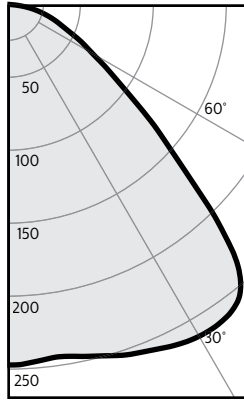
1. Tested using absolute photometry as specified in LM79: IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
2. Wattage: controlled to within 5%
3. Correlated Color Temperature: within specs as defined in ANSI_NEMA_ANSI C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products.

S4S & S6S SlimSurface LED

4" and 6" square aperture surface mount downlight

S4S835K7 • 10W LED, 80CRI, 3500K

Candela Curves



Angle	Mean CP	Lumens
0	247	
5	245	23
10	245	
15	249	71
20	255	
25	259	121
30	263	
35	262	163
40	249	
45	194	149
50	135	
55	93	86
60	67	
65	50	50
70	37	
75	27	28
80	17	
85	6	7
90	0	

Single unit data

Height to Lighted Plane	Initial center beam foot-candles	Beam dia. (ft)*
5'	10	7.5'
6'	7	9.0'
7'	5	10.5'
8'	4	12.0'
9'	3	13.5'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq.ft.
5'	29.1	0.40
6'	19.1	0.26
7'	13.6	0.19
8'	11.4	0.16
9'	9.1	0.13

Coefficients of utilization

Ceiling	80%				70%		50%		30%		0%
	70	50	30	10	50	10	50	10	50	10	0
Wall	0										
RCR	Zonal cavity method - Effective floor reflectance = 20%										

Room Cavity Ratio	0		1		2		3		4		5		6		7		8		9		10	
	0	119	119	119	119	116	116	111	111	106	106	100	106	106	100	96	91	87	87	87	87	87
1	110	106	102	99	104	97	100	94	96	91	85	85	85	85	85	85	85	85	85	85	85	85
2	101	94	88	83	92	82	89	80	85	78	74	74	74	74	74	74	74	74	74	74	74	74
3	93	84	76	70	82	70	79	69	77	67	64	64	64	64	64	64	64	64	64	64	64	64
4	86	75	67	61	74	60	71	59	69	59	56	56	56	56	56	56	56	56	56	56	56	56
5	79	67	59	53	66	53	64	52	62	51	49	49	49	49	49	49	49	49	49	49	49	49
6	73	61	52	46	60	46	58	46	57	45	43	43	43	43	43	43	43	43	43	43	43	43
7	68	55	47	41	55	41	53	41	52	40	38	38	38	38	38	38	38	38	38	38	38	38
8	63	51	42	37	50	37	49	36	47	36	34	34	34	34	34	34	34	34	34	34	34	34
9	59	46	38	33	46	33	45	33	44	33	31	31	31	31	31	31	31	31	31	31	31	31
10	56	43	35	30	42	30	41	30	40	30	28	28	28	28	28	28	28	28	28	28	28	28

Zonal lumens & percentages

Zone	Lumens	%Luminaire
0-30	216	30.9%
0-40	379	54.3%
0-60	614	87.9%
0-90	698	100.0%

CRI and CCT adjustment factors

90 CRI 2700K = 84%
80 CRI 2700K = 100%
80 CRI 3000K = 100%
80 CRI 3500K = 105%
80 CRI 4000K = 109%

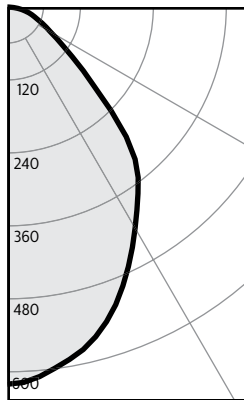
Report: 946GFR

Output lumens:	698lms	Efficacy:	76.7lm/w
Spacing Criterion:	1.5	CCT ³ :	3500K
Beam Angle:	99°	CRI:	80min
Input Watts ² :	9.1W		

38'x38'x10' Room, Workplane 2.5' above floor, 80/50/20% Reflectances

S6S835K7 • 14W LED, 80CRI, 3500K

Candela Curves



Angle	Mean CP	Lumens
0	620	
5	610	58
10	589	
15	561	157
20	521	
25	471	217
30	420	
35	375	235
40	327	
45	242	188
50	163	
55	113	106
60	82	
65	63	64
70	48	
75	37	38
80	24	
85	11	11
90	0	

Single unit data

Height to Lighted Plane	Initial center beam foot-candles	Beam dia. (ft)*
5'	25	5.5'
6'	17	6.6'
7'	13	7.7'
8'	10	8.8'
9'	8	9.9'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq.ft.
5'	28.6	3.58
6'	18.7	2.35
7'	13.3	1.68
8'	11.2	1.40
9'	8.9	1.12

Coefficients of utilization

Ceiling	80%				70%		50%		30%		0%
	70	50	30	10	50	10	50	10	50	10	0
Wall	0										
RCR	Zonal cavity method - Effective floor reflectance = 20%										

Room Cavity Ratio	0		1		2		3		4		5		6		7		8		9		10	
	0	119	119	119	119	116	116	111	111	106	106	100	106	106	100	97	93	88	88	88	88	88
1	111	107	103	100	105	98	100	95	97	93	87	87	87	87	87	87	87	87	87	87	87	87
2	103	96	90	85	94	84	90	82	87	80	77	77	77	77	77	77	77	77	77	77	77	77
3	95	86	79	74	85	73	82	72	79	71	68	68	68	68	68	68	68	68	68	68	68	68
4	88	78	70	65	77	64	74	63	72	63	60	60	60	60	60	60	60	60	60	60	60	60
5	82	71	63	57	70	57	68	56	66	56	53	53	53	53	53	53	53	53	53	53	53	53
6	76	65	57	51	64	51	62	51	61	50	48	48	48	48	48	48	48	48	48	48	48	48
7	71	59	52	46	59	46	57	46	56	45	43	43	43	43	43	43	43	43	43	43	43	43
8	67	55	47	42	54	42	53	42	52	41	39	39	39	39	39	39	39	39	39	39	39	39
9	63	51	43	38	50	38	49	38	48	38	36	36	36	36	36	36	36	36	36	36	36	36
10	59	47	40	35	47	35	46	35	45	35	33	33	33	33	33	33	33	33	33	33	33	33

Zonal lumens & percentages

Zone	Lumens	%Luminaire
0-30	432	40.2%
0-40	667	62.1%
0-60	961	89.5%
0-90	1074	100.0%

CRI and CCT adjustment factors

90 CRI 2700K = 84%
80 CRI 2700K = 100%
80 CRI 3000K = 100%
80 CRI 3500K = 105%
80 CRI 4000K = 109%

Report: 959GFR

Output lumens:	1074lms	Efficacy:	80.8lm/w
Spacing Criterion:	1.1	CCT ³ :	3500K
Beam Angle:	82°	CRI:	80min
Input Watts ² :	13.3W		

38'x38'x10' Room, Workplane 2.5' above floor, 80/50/20% Reflectances

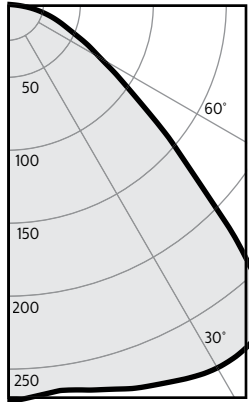
1. Tested using absolute photometry as specified in LM79: IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
2. Wattage: controlled to within 5%
3. Correlated Color Temperature: within specs as defined in ANSI_NEMA_ANSI C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products.

S4S & S6S SlimSurface LED

4" and 6" square aperture surface mount downlight

S4S840K7 • 10W LED, 80CRI, 4000K

Candela Curves



Angle	Mean CP	Lumens
0	271	
5	269	26
10	269	
15	273	78
20	279	
25	284	133
30	288	
35	287	179
40	272	
45	212	163
50	148	
55	103	94
60	74	
65	55	55
70	41	
75	30	30
80	19	
85	6	8
90	0	

Single unit data

Height to Lighted Plane	Initial center beam foot-candles	Beam dia. (ft)*
5'	11	7.5'
6'	8	9.0'
7'	6	10.5'
8'	4	12.0'
9'	3	13.5'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq.ft.
5'	31.9	0.40
6'	20.9	0.26
7'	15.0	0.19
8'	12.5	0.16
9'	10.0	0.13

38'x38'x10' Room, Workplane 2.5' above floor, 80/50/20% Reflectances

Coefficients of utilization

Ceiling	80%				70%		50%		30%		0%
	70	50	30	10	50	10	50	10	50	10	0
Wall	70	50	30	10	50	10	50	10	50	10	0

RCR Zonal cavity method - Effective floor reflectance = 20%

Room Cavity Ratio	80%				70%		50%		30%		0%
	70	50	30	10	50	10	50	10	50	10	0
0	119	119	119	119	116	116	111	111	106	106	100
1	110	106	102	99	104	97	100	94	96	91	87
2	101	94	88	83	92	82	89	80	85	78	74
3	93	84	76	70	82	70	79	68	76	67	64
4	86	75	67	60	73	60	71	59	69	58	56
5	79	67	59	53	66	52	64	52	62	51	49
6	73	61	52	46	60	46	58	46	56	45	43
7	68	55	47	41	54	41	53	41	51	40	38
8	63	50	42	37	50	37	48	36	47	36	34
9	59	46	38	33	46	33	45	33	43	33	31
10	55	43	35	30	42	30	41	30	40	30	28

Zonal lumens & percentages

Zone	Lumens	%Luminaire
0-30	237	30.9%
0-40	416	54.3%
0-60	674	87.9%
0-90	766	100.0%

CRI and CCT adjustment factors

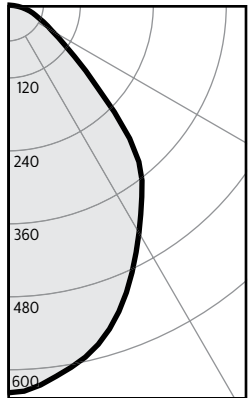
90 CRI 2700K = 84%
80 CRI 2700K = 100%
80 CRI 3000K = 100%
80 CRI 3500K = 105%
80 CRI 4000K = 109%

Report#: 947GFR

Output lumens:	766lms	Efficacy:	84.2lm/w
Spacing Criterion:	1.5	CCT ³ :	4000K
Beam Angle:	99°	CRI:	80min
Input Watts ² :	9.1W		

S6S840K7 • 14W LED, 80CRI, 4000K

Candela Curves



Angle	Mean CP	Lumens
0	637	
5	626	59
10	604	
15	577	162
20	535	
25	484	223
30	432	
35	385	241
40	336	
45	249	193
50	168	
55	116	109
60	84	
65	65	66
70	49	
75	38	39
80	25	
85	11	12
90	0	

Single unit data

Height to Lighted Plane	Initial center beam foot-candles	Beam dia. (ft)*
5'	25	5.5'
6'	18	6.6'
7'	13	7.7'
8'	10	8.8'
9'	8	9.9'

* Beam diameter is where foot-candles drop to 50% of maximum.

Multiple unit data - RCR 2

Spacing on center	Initial center beam foot-candles	Watts per sq.ft.
5'	30.3	3.68
6'	19.8	2.41
7'	14.1	1.72
8'	11.8	1.44
9'	9.4	1.15

38'x38'x10' Room, Workplane 2.5' above floor, 80/50/20% Reflectances

Coefficients of utilization

Ceiling	80%				70%		50%		30%		0%
	70	50	30	10	50	10	50	10	50	10	0
Wall	70	50	30	10	50	10	50	10	50	10	0

RCR Zonal cavity method - Effective floor reflectance = 20%

Room Cavity Ratio	80%				70%		50%		30%		0%
	70	50	30	10	50	10	50	10	50	10	0
0	119	119	119	119	116	116	111	111	106	106	100
1	111	107	103	100	105	98	100	95	97	93	88
2	103	96	90	85	94	84	90	82	87	80	77
3	95	86	79	74	85	73	82	72	79	71	68
4	88	78	70	65	77	64	74	63	72	63	60
5	82	71	63	57	70	57	68	56	66	56	53
6	76	65	57	51	64	51	62	51	61	50	48
7	71	59	52	46	59	46	57	46	56	45	43
8	67	55	47	42	54	42	53	42	52	41	39
9	63	51	43	38	50	38	49	38	48	38	36
10	59	47	40	35	47	35	46	35	45	35	33

Zonal lumens & percentages

Zone	Lumens	%Luminaire
0-30	443	40.2%
0-40	685	62.1%
0-60	987	89.5%
0-90	1103	100.0%

CRI and CCT adjustment factors

90 CRI 2700K = 84%
80 CRI 2700K = 100%
80 CRI 3000K = 100%
80 CRI 3500K = 105%
80 CRI 4000K = 109%

1. Tested using absolute photometry as specified in LM79: IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
2. Wattage: controlled to within 5%
3. Correlated Color Temperature: within specs as defined in ANSI_NEMA_ANSI C78.377-2008: Specifications for the Chromaticity of Solid State Lighting Products.

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Philips Lighting North America Corporation
200 Franklin Square Drive, Somerset, NJ 08873
Tel. 855-486-2216

Philips Lighting Canada Ltd.
281 Hillmount Rd, Markham, ON, Canada L6C 2S3
Tel. 800-668-9008

Model: WL-LED200

LEDme® Step Light

WAC LIGHTING

Responsible Lighting®

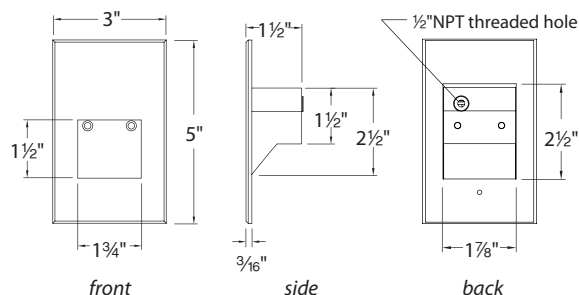


Fixture Type:

Catalog Number:

Project: _____

Location: _____



PRODUCT DESCRIPTION

Vertical rectangle LEDme® Step Light. Designed for safety and style on stairways, patios, decks, balcony areas, walkways and building perimeters.

Features an architectural design. Energy efficient for long-lasting indoor and outdoor lighting solutions. Creates an attractive, romantic impression at night.

FEATURES

- 316 marine grade cast stainless steel (SS) available
- Direct wiring, no driver needed
- Low profile, flush to wall aesthetics with no visible hardware
- 40,000 hour rated life
- Balanced lighting, free of shadows with minimum glare
- Up to 200 fixtures can be connected in parallel
- Replaceable LED module
- 5 year WAC Lighting product warranty

SPECIFICATIONS

Construction: Die-cast aluminum or 316 marine grade cast stainless steel

Power: Direct wiring, no remote driver needed. Input voltage: 120V or 277V AC 50/60Hz

Light Source: 3000K CCT Samsung HV-AC High Power LED, CRI: 85
Optional color lenses. Total power consumption of 3.9W

Mounting: Fits into 2" x 4" J-Box with minimum inside dimensions of 3"L x 2"W x 2"H Includes bracket for J-Box mount.

Dimming: Dim to 10% with electronic low voltage (ELV) dimmer
Approved dimmers: Lutron Nova-T NTELV-300 & NTELV-600, Lutron Vietri VTELV-600, Lutron Diva DVELV-300P, Lutron Skylark SELV-300P, Lutron Maestro MAELV-600

Standards: IP66, UL & cUL Listed for wet locations

ORDER NUMBER

Model #	Color	Finish
WL-LED200 120V	C White 3000K	SS Stainless Steel
WL-LED200F 277V	AM Amber 610nm	BK Black
	RD Red 640nm	WT White
	BL Blue 450nm	BN* Brushed Nickel
		BZ Bronze

*Brushed Nickel Finish is for interior use only

FINISHES



Example: **WL-LED200F-AM-BZ**

wacighting.com
Phone (800) 526.2588
Fax (800) 526.2585

Headquarters/Eastern Distribution Center
44 Harbor Park Drive
Port Washington, NY 11050

Central Distribution Center
1600 Distribution Ct
Lithia Springs, GA 30122

Western Distribution Center
1750 Archibald Avenue
Ontario, CA 91760

Model: WL-LED200

LEDme® Step Light

WAC LIGHTING

Responsible Lighting®

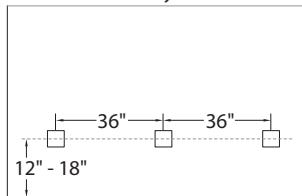
FIXTURE PERFORMANCE

Input Voltage	Light Color	Finish	Lumens
WL-LED200 120V	C White	SS Stainless Steel	36
		BK Black	27
		WT White	63
		BN Brushed Nickel	27
	AM Amber	BZ Bronze	29
		SS Stainless Steel	21
		BK Black	16
		WT White	31
	RD Red	BN Brushed Nickel	16
		BZ Bronze	17
		SS Stainless Steel	2
		BK Black	2
	BL Blue	WT White	4
		BN Brushed Nickel	2
		BZ Bronze	2
		SS Stainless Steel	4
BL Blue	BK Black	3	
	WT White	7	
	BN Brushed Nickel	3	
	BZ Bronze	4	

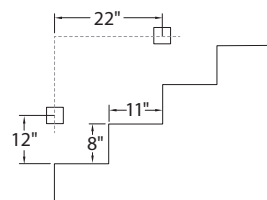
Input Voltage	Light Color	Finish	Lumens
WL-LED200F 277V	C White	SS Stainless Steel	33
		BK Black	23
		WT White	54
		BN Brushed Nickel	23
	AM Amber	BZ Bronze	26
		SS Stainless Steel	18
		BK Black	13
		WT White	27
	RD Red	BN Brushed Nickel	13
		BZ Bronze	14
		SS Stainless Steel	2
		BK Black	1.5
	BL Blue	WT White	3
		BN Brushed Nickel	1.5
		BZ Bronze	2
		SS Stainless Steel	4
BL Blue	BK Black	3	
	WT White	4	
	BN Brushed Nickel	3	
	BZ Bronze	3	

SPACING RECOMMENDATIONS FOR OPTIMAL LIGHT DISTRIBUTION

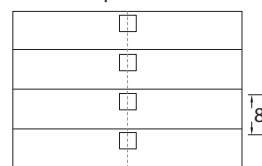
Corridors / Hallways



Stairs - Wall Mount



Stairs - Step Mount



Mount in center of stair as close to the upper tread as possible.
For best results use one light per step for steps narrower than 5'.

wacighting.com
Phone (800) 526.2588
Fax (800) 526.2585

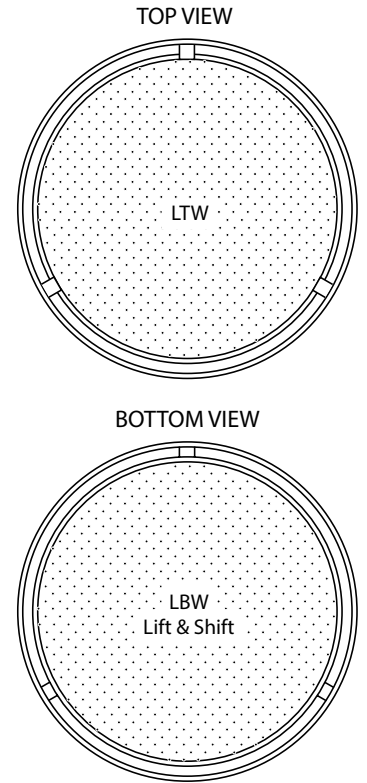
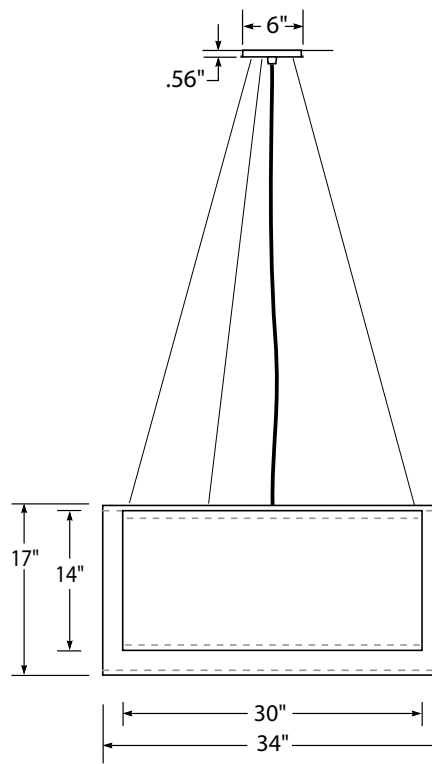
Headquarters/Eastern Distribution Center
44 Harbor Park Drive
Port Washington, NY 11050

Central Distribution Center
1600 Distribution Ct
Lithia Springs, GA 30122

Western Distribution Center
1750 Archibald Avenue
Ontario, CA 91760

Shadow Drum 34" Pendant P2034

Design modifications are always welcome.



- Welded steel / aluminum
- Two washable diffusers
- LBW etched white acrylic inner bottom lens
- LTW white acrylic inner top lens
- 6' black or white cord
- Three suspension cables
- Canopy finished to match frame
- Mounts to standard J-box
- Suitable for damp locations

weight: 13 lbs
 US LISTED
 MADE IN USA

P2034						
CORD COLOR	FINISH	DIFFUSER 1	DIFFUSER 2	LAMPING	VOLTAGE	
<input type="checkbox"/> Black <input type="checkbox"/> White	F2 Chrome F3 Black F4 Earth F5 Copper F6 Brass F7 Bronze F8 Steel F10 Hammered Copper F11 White	TransLUMENATE® (outer shade) See web for options.	LUMENATE® (inner shade) See web for options.	LED 3/18.9W XICATO UNV 6300 Lumens 3000K 0-10V Dimming Lamps not included: CFL 2/32W TBX-GX24Q-3 CFL 4/32W TBX-GX24Q-3 INC 3/Med. Base	120V 277V 347V CFL Only	
+ OPTIONS						

- | | | | |
|---|---|--|---|
| SUSPENSION OPTIONS
STM - Field Cuttable Ball Swivel Stem with 1.78" deep canopy.
Specify length in 1' increments.

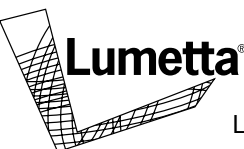
CXX3 - Cord Extra (Specify length)
CXS3 - Cord Braided Silver (not LED) | CANOPY OPTIONS
CAC - Canopy Alternative Color
CF105 - Flair Canopy 10.5" Dia
CSF6 - Swivel Stem on CF6
CSF105 - Swivel Stem on CF105
CR432 - Cluster Canopy* 4.5" x 42"
CR860 - Cluster Canopy* 8" x 60"
C66 - Square Canopy 6"
C1010 - Square Canopy 10"

*Specify arrangement and heights. | LENS OPTIONS
LTC4 - Top Lens Clear Acrylic
LTY4 - Top Lens Metal Perf.
LTO4 - Top Lens Opaque

LBY4 - Bottom Lens Metal Perf.
LBA4 - Applied LUMENATE® Bottom Lens | CFL BALLAST OPTIONS
BDLI - Dimming Ballast
Lutron Internal
BDAI - Dimming Ballast
Advance Internal
BEI - Emergency Ballast
Internal |
|---|---|--|---|

Project Name	Specifier Name & Location	Quantity
<input type="text"/>	<input type="text"/>	<input type="text"/>

Notes



FINELITE High Performance 2" Aperture (HP-2) - Wall Mount Indirect

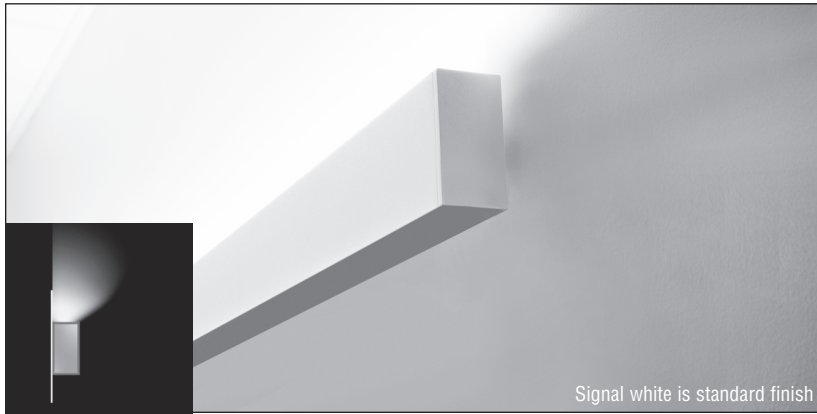


Date

Project

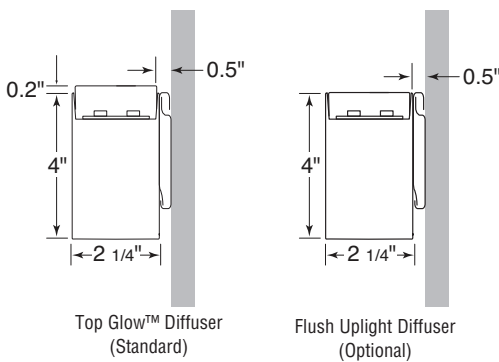
Type

Comments



DESCRIPTION

High Performance 2" Aperture Wall Mount Indirect (HP-2 WM-I) is a patented, linear LED luminaire with Flush and Top Glow™ options for the uplight. The micro shape delivers excellent performance using an advanced optical design and mid-power LEDs to achieve 90% of initial light output at 100,000 hours.



Tailored Lighting 10 working days

DIMENSIONS & DIFFUSER

Patented, standard Top Glow™ diffuser provides an added architectural element.

SEAMLESS ILLUMINATION

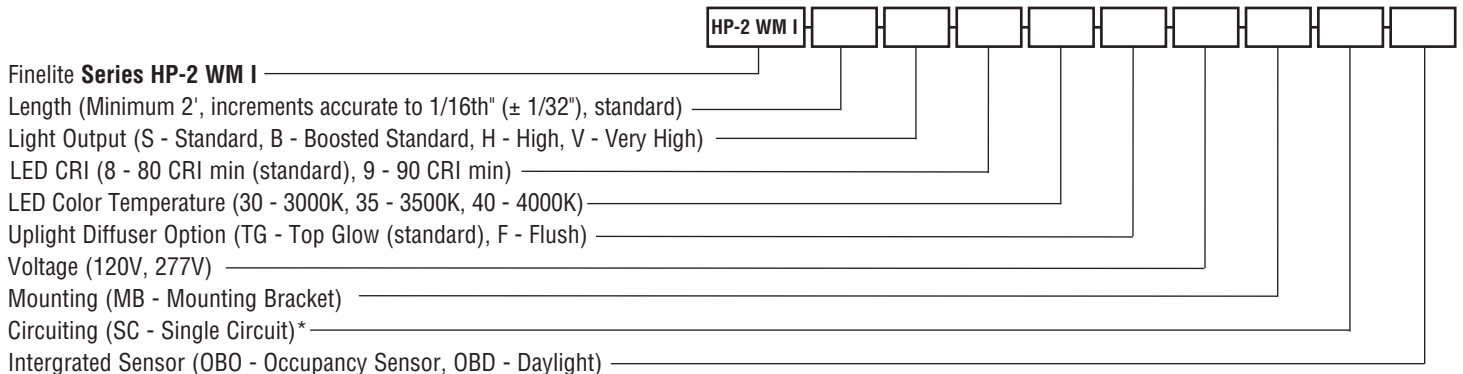
Internal secondary diffusers at corners ensure visually seamless, uniform, continuous illumination.

TAILORED LIGHTING

Any length greater than 2 feet, in increments down to 1/16th-inch ($\pm 1/32"$) and 90-degree mitered corners in a single plane.

ORDERING GUIDE

Sample Number: HP-2 WM I - 32' - S - 8 - 35 - TG - 120V - MB - SC - OBO



* Contact factory for switching options.

Protected by one or more US Patents: 8915613; D702,391; D702,390; D700,732; D727,554 S; D727,550 S, D727,551 S

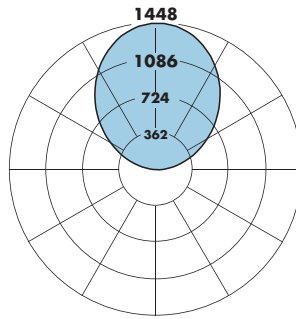
Finelite, Inc. • 30500 Whipple Road • Union City, CA 94587-1530 • 510 / 441-1100 • Fax: 510 / 441-1510 • www.finelite.com

Due to continuing product improvements, Finelite reserves the right to change specifications without notice. Please visit www.finelite.com for most current data.

FINELITE High Performance 2" Aperture (HP-2) - Wall Mount Indirect

PHOTOMETRY

Very High Output - 4' Luminaire
 Efficacy: 102.2 lumens per watt
 Total luminaire output: 3749 lumens (937 lumens/foot)
 36.7 watts (9.2 watts/foot)
 Peak Candela Value: 1448 @ 180°
 CCT: 3500K
 ITL LM79 Report 85134



	0.0	22.5	45	67.5	90	Flux
90	0	0	0	0	0	
95	72	73	73	72	72	80
105	245	243	240	236	237	254
115	439	436	433	424	422	427
125	651	644	642	633	632	573
135	868	856	859	849	846	660
145	1074	1061	1062	1056	1051	663
155	1249	1235	1241	1235	1229	570
165	1374	1366	1370	1367	1365	386
175	1439	1439	1439	1439	1439	136
180	1448	1448	1448	1448	1448	

Total Light Output, 3500K, 80 CRI (Lumens) - 4' Luminaire			
S*	B*	H*	V**
1535	1929	2916	3749

Light Output, 3500K, 80 CRI (Lumens Per Foot)			
S*	B*	H*	V**
384	482	729	937

Power (Watts Per Foot)			
S*	B*	H*	V**
3.6	4.6	7.0	9.2

Efficacy, 3500K, 80 CRI (Lumens Per Watt)			
S*	B*	H*	V**
106.8	105.7	103.6	102.2

Lumen Adjustment Factors - 80 CRI	
3000K	0.985
3500K	1.000
4000K	1.032

Lumen Adjustment Factors - 90 CRI	
3000K	0.746
3500K	0.760
4000K	0.789

Apply a lumen adjustment factor to calculate lumens for the desired CCT and CRI.

SAMPLE LUMEN ADJUSTMENT CALCULATION

High Output (H), 4000K, 90 CRI
 Lumen Adjustment Factor = 0.789

$$\text{Total Light Output} = 2916 \text{ lm} \times 0.789 = 2301 \text{ lm}$$

$$\text{Total Light Output per Foot} = 729 \text{ lm/ft} \times 0.789 = 575 \text{ lm/ft}$$

$$\text{watts/foot} = 7.0 \text{ W/ft}$$

$$\text{Efficacy} = \frac{575 \frac{\text{lm}}{\text{ft}}}{7.0 \frac{\text{W}}{\text{ft}}} = 82.1 \text{ lm/W}$$

* Family Correlation based on 4' luminaire 3500K Very High Output (V) test - 120V.

** Correlation based on ITL report: 85134

S - Standard Output, B - Boosted Standard Output, H - High Output, V - Very High Output

Protected by one or more US Patents: 8915613; D702,391; D702,390; D700,732; D727,554 S; D727,550 S, D727,551 S

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FINELITE High Performance 2" Aperture (HP-2) - Wall Mount Indirect

SPECIFICATIONS

---CONSTRUCTION: Precision-cut 6061-T6 extruded aluminum body. Internal joiner system, plug-together wiring, standard.

ENDCAPS: Flat diecast aluminum endcaps add 0.25" to each end of luminaire.

MITERED CORNERS: Illuminated 90° corners in a single plane with Top Glow™ and Flush uplight diffuser options. Custom angles are available (90° minimum on inside corners). Contact factory.

REFLECTORS: Die-formed 24-gauge cold-rolled steel reflectors are finished in 96 LG high reflectance matte white powder coat paint.

UPLIGHT DIFFUSER: 12" maximum lens length. Top Glow™ frost white lens standard, 73% transmissive, 99% diffusion. Internal secondary diffusers at corners ensure visually seamless, uniform, continuous illumination. Optional: Flush frost white snap-in lens, 73% transmissive, 99% diffusion.

LIGHT OUTPUT: Four lumen packages available, Standard Output (S), Boosted Standard Output (B), High Output (H), and Very High Output (V). A separate chart summarizes lumen distribution and wattage. Light engines are replaceable.

LUMEN MAINTENANCE: 90% of initial light output (L90) at 100,000+ hours; 70% of initial light output (L70) at 200,000+ hours.

DRIVER: Replaceable 120V/277V Constant Current Reduction dimming driver standard. Can be wired dimming or non-dimming. 0-10V dimming controls with a range of 10%- 100%. Dimming to 1% available; consult factory. Driver is fully accessible from below the ceiling. Power Factor: 0.9. Total Harmonic Distortion (THD) <20%. Expected driver lifetime: 100,000 hours.

LUTRON DRIVER OPTIONS: Lut3W-3-wire, LutES-EcoSystem, Lut2W-2-wire.

ELECTRICAL: Optional emergency to generator/inverter wiring, internal generator transfer switch, nightlight wiring, step-dimming driver, backup battery. Factory-choice low-profile backup battery available. 8" minimum luminaire length for low profile battery pack. Backup batteries deliver 1400 lumens. Half of a 4' section will be illuminated in emergency mode.



INTEGRATED SENSORS: Integrated PIR (Passive Infrared) occupancy and/or daylight sensors available. Refer to Occupancy Sensor and Daylight Sensor tech sheets for more info.

MOUNTING: Luminaire hangs securely from mounting brackets fastened directly to the wall for easy installation. Luminaire stands 0.5" off the wall. The mounting bracket is concealed behind the luminaire.

FINISHES: Finelite Signal White powder coat standard. Optional Adders: 185 Tiger Drylac RAL colors.

FEED: Standard with one 18-gauge/5-conductor single-circuit feed. 14-gauge feed used when luminaire current exceeds 5 amps. Optional 6' flex conduit whips available.

LENGTHS: Any length, 2-foot minimum, in increments down to 1/16th-inch ($\pm 1/32"$). 12-foot maximum section length.

LABELS: Luminaire and electrical components are ETL-listed conforming to UL 1598 in the U.S.A. and CAN/CSA C22.2 No. 250.0 in Canada. In accordance with NEC Code 410.73 (G), this luminaire contains an internal driver disconnect. Damp Location. Finelite products use electronic components that are RoHS compliant, and the mechanical components of the luminaire have been verified to not knowingly contain any restricted substances listed per RoHS Directive 2002/95/EC.

WEIGHT: 2.3 lb/ft.

WARRANTY: 10-year performance-based warranty on all standard components. Optional accessories such as emergency battery packs are covered by their individual manufacturer warranties.

Protected by one or more US Patents: 8915613; D702,391; D702,390; D700,732; D727,554 S; D727,550 S, D727,551 S

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Due to continuing product improvements, Finelite reserves the right to change specifications without notice. Please visit www.finelite.com for most current data.

ECO-LIGHTBAR LED

Undercabinet Linear Lighting

ELB

FEATURES

- 24VDC, 120W/5 amp max
- Two color temperature options:
 - 2,700°K ±50°K, CRI 90
 - 3,000°K ±50°K, CRI 90
- 50,000 hours, 70% lumen maintenance
- MLV dimmable
- Available in three lengths: 12", 24", 36"
- Very low profile – only 5/16" high
- No UV or infrared energy – objects will not discolor or fade over time
- Linkable up to 120W
- Remote power supply
- UL/C-UL listed for damp location 



HOUSING / HEAT SINK

- Extruded aluminum housing
- Cool operating temperature

MOUNTING

- Standard mounting clips included. Other mounting options available

FINISHES

- SA Satin Aluminum
- BZ Bronze

Project Notes:

ECO-LIGHTBAR

50,000-hour LED, 90 CRI
MLV dimming

- ELB-12-XX-27 12", 6W, 2,700K° ±50K, 500lm, 90CRI
- ELB-12-XX-30 12", 6W, 3,000K° ±50K, 500lm, 90CRI
- ELB-24-XX-27 24", 12W, 2,700K° ±50K, 1000lm, 90CRI
- ELB-24-XX-30 24", 12W, 3,000K° ±50K, 1000lm, 90CRI
- ELB-36-XX-27 36", 18W, 2,700K° ±50K, 1500lm, 90CRI
- ELB-36-XX-30 36", 18W, 3,000K° ±50K, 1500lm, 90CRI

XX= two digit finish code (SA) Satin Aluminum or (BZ) Bronze

ACCESSORIES

- 72" Power Feed ELB-PWR-72
- 144" Power Feed ELB-PWR-144
- Mounting Clips- 45° Angle ELB-ANG-MTG
- Mounting Clips- Adjustable ELB-ADJ-MTG
- Mounting Clips- Standard (included) ELB-STN-MTG
- 3" Connector ELB-CON-3
- 6" Connector ELB-CON-6
- 12" Connector ELB-CON-12
- 24" Connector ELB-CON-24
- 36" Connector ELB-CON-36

DRIVERS

- 24VDC 20W Electronic Driver D133-E
- 24VDC 40W Electronic Driver D134-E
- 24VDC 60W Electronic Driver D135-E
- 24VDC 100W Electronic Driver D136-E
- 24VDC 150W Electronic Driver D137-E
- 24VDC 300W Electronic Driver D157-E

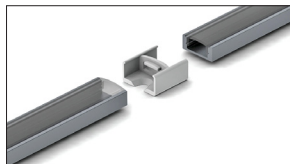


A Division of Troy-CSL

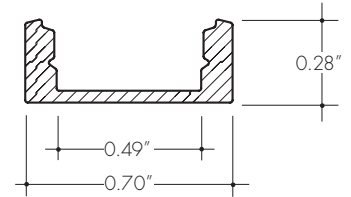
14508 Nelson Avenue City of Industry, CA 91744 Tel 626-336-4511 Fax 626-336-4266 www.csllighting.com

Rev 032416

The SlimLine 7 linear aluminum extrusion has been designed to fit many LED lighting needs. Multiple mounting and lens options allow for great flexibility and adaptability for any application. Extrusion and diffuser lenses are also field cuttable. Substantial aluminum mass in profile provides excellent heat sink for high power LEDs. Mounting brackets and endcaps are available in multiple finishes and can be ordered separately (page 2). Linear connector available for extending extrusion runs. Protected by U.S. Patent No. US D649,680 S.



two SlimLine 7 runs and linear connector



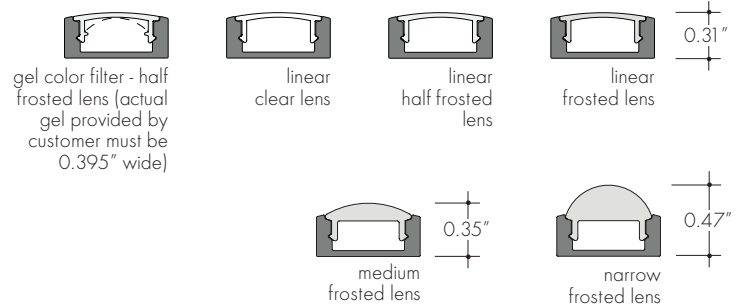
Technical information

Finish: Silver anodized

Diffuser lens: polycarbonate, snap-in-place, UV resistant

Mounting: multiple mounting brackets (page 2)

	39	78	118
Actual length	39.40"	78.75"	118.19"
Mounting brackets	minimum 3	minimum 3	minimum 4
Available lenses	clear half frosted frosted medium narrow	clear half frosted frosted medium narrow	clear half frosted frosted medium narrow gel color

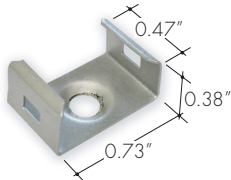


Ordering code

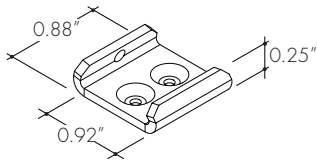
MODEL	LENGTH	DIFFUSER	FINISH
SL7	36	C	SA
SL7 - SlimLine 7	39 - 39.40" 78 - 78.75" 118 - 118.19"	C - Clear F - Frosted HF - 50% frosted M - Medium N - Narrow G - Gel color filter (view table above for length compatibility)	SA - Silver anodized

All accessories sold separately.

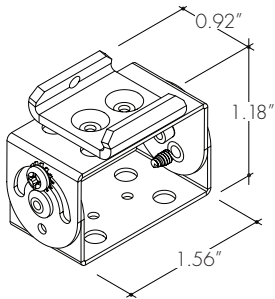
Mounting brackets



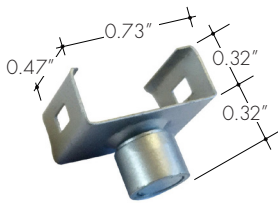
MC-SL7-S
gray finish, snaps on/off



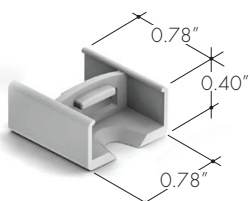
MC-SL7-A
metal finish, secured with set screw



MC-SL7-ADJ
metal finish, adjustable,
secured with set screw



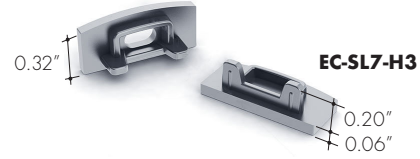
MC-SL7-MAG
metal finish, magnetic mounting bracket



LC-SL7
linear connector - gray finish

End-caps

EC-SL7-H4 w/powerfeed opening



metal finish, linear lens only

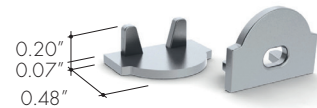
EC-SL7-M-H3



EC-SL7-M-H4 w/powerfeed opening

metal finish, medium lens only

EC-SL7-N-H3



EC-SL7-N-H4 w/powerfeed opening

metal finish, narrow lens only





With high efficiency and universal AC input, the PSV series of class 2 power supplies are suitable for indoor & outdoor applications and ideal for use with LED lighting.

Cooling is achieved by free air convection.

Input voltage
90 to 305 VAC

Output voltage
24VDC

Safety
UL 8750

Dimming
0-10V (non dimming option available)

Warranty
5 years



Technical information

Frequency
47-63Hz

Power factor
>0.92

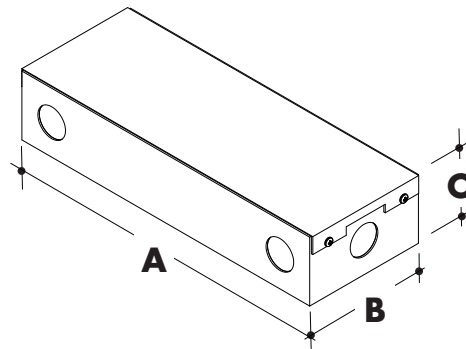
Efficiency
>85%

Load regulation accuracy
± 4%, Current accuracy ± 3%

Start-up delay
100ms at worst case

Ripple & Noise
<20% Peak-peak 20MHz Bandwidth

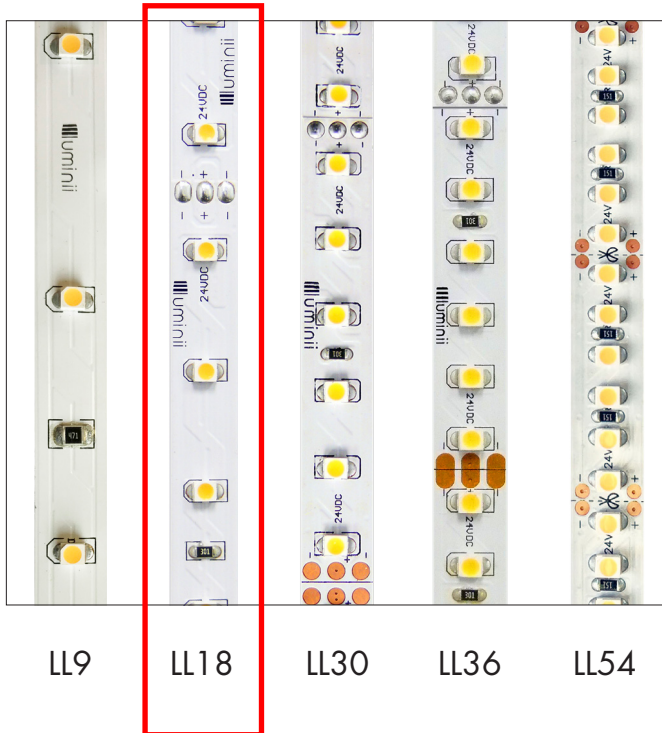
Energy star
No-load power consumption less than the fixed type constant current 0.5W (at 120V input).



MODELS	PSV Dry Models	PSV Wet Models
A Length	9.2"	9.5"
B Width	3.4"	4.12"
C Depth	1.9"	2.3"

Ordering code

MODEL	POWER	OUTPUT	DIMMING	LOCATION
PSV	40	24V	U2DIM	D
PSV - PSV Series	40 - 40 W 60 - 60 W 96 - 96 W	24V - 24 Volt	U2DIM - Dimming 0-10V U2ND - Non Dimming	D - Dry Location IP65 - Wet Location



Line LED LL series is a small profile high performance LED strip. The durable, but flexible products feature a heavier copper board core for better heat dissipation and even illumination over long runs.

Available in single row configurations ranging from 9 to 54 LEDs per foot with multiple power feed and connector options. Line LED LL series feature outstanding color consistency with single binning and CRI up to 98.

Mounting

LED strip is equipped with 3M™ adhesive transfer tape (9472LE). The strip must be adhered to either a luminii aluminum profile or an unpainted aluminum surface. For other surfaces the HST Aluminum heat sink tape will be required to reach the rated 50,000 hours average life

Applications

Indoor only - above and below cabinets, cove lighting, counter accent, architectural reveals, under banister, display and book cases, etc.

Approvals

Class 2 damp listed

Operating voltage
24 VDC

Average life
50,000 hours

Warranty
5 years



LM80

Technical information

MODEL	LL9	LL18	LL30	LL36	LL54
LEDS/ft	9	18	30	36	54
Light output 3000K	65 lum/ft	125 lum/ft	227 lum/ft	253 lum/ft	354 lum/ft
Average power consumption (for 15' section)	1.0 W/ft	1.5 W/ft	2.5 W/ft	3.0 W/ft	4.5 W/ft
Cutting increment	6.50"	4.00"	2.50"	2.00"	1.3"
Efficacy lum/watt	65	83	91	84	79
Maximum run length	100 ft	100 ft	48 ft	39 ft	26 ft
Dimensions	0.39" W 0.09" H	0.39" W 0.09" H	0.39" W 0.09" H	0.39" W 0.09" H	0.39" W 0.09" H

CCT INFO/LUMEN MULTIPLIER	Multiplier (referenced from 3000K)	TM-30-15		
		CRI	R _f	R _g
2200K	0.87	82	81	99
2400K	0.73	98	95	101
2700K	0.81	98	95	102
2900K	0.86	97	95	102
3000K	1.00	91	90	101
3500K	1.05	95	90	97
4100K	1.28	93	88	96

SECTION START/END OPTIONS

Female connector



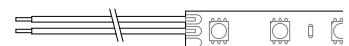
Male connector



No connector



Soldered leads (72")



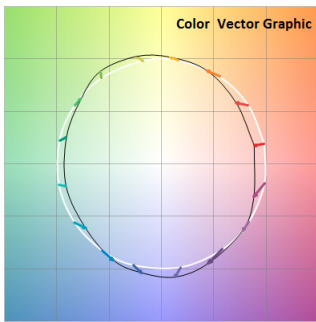
Ordering code **LL18-35K-XX-XX-XX**

MODEL	COLOR TEMPERATURE	SECTION START	SECTION END	LENGTH
LL9	22K	F	M	
LL9	22K - 2200K	F - Female connector	F - Female connector	view table above for increment options and maximum run limits
LL18	24K - 2400K	M - Male connector	M - Male connector	
LL30	27K - 2700K	*SL - Soldered lead wires (72")	*SL - Soldered lead wires (72")	
LL36	29K - 2900K	NC - No connector	*NC - No connector	
LL54	30K - 3000K 35K - 3500K 41K - 4100K			

*LL54 only available in this option

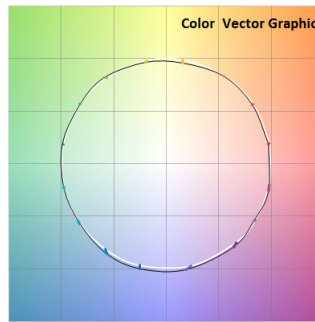
TM-30-15: Data

22K CCT



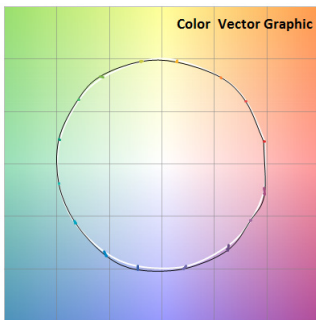
Hue Bin	R_f	Graphic shifts (%)	
		Chroma	Hue
1	79	-10%	0%
2	79	-8%	8%
3	70	-2%	14%
4	85	2%	8%
5	90	5%	5%
6	90	6%	-3%
7	84	-2%	-8%
8	89	-6%	-4%
9	85	-6%	3%
10	78	-6%	11%
11	77	2%	14%
12	79	6%	9%
13	88	8%	-7%
14	67	4%	-20%
15	84	0%	-10%
16	75	-7%	-14%

24K CCT



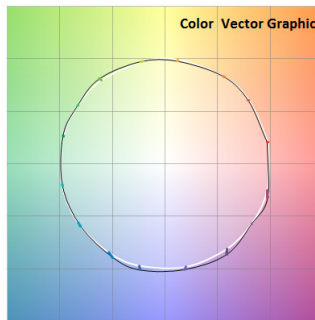
Hue Bin	R_f	Graphic shifts (%)	
		Chroma	Hue
1	97	-1%	0%
2	97	-1%	0%
3	97	0%	1%
4	95	-3%	-1%
5	96	-1%	2%
6	96	1%	3%
7	97	0%	1%
8	98	1%	0%
9	97	0%	2%
10	95	0%	3%
11	93	3%	4%
12	93	3%	1%
13	93	3%	-6%
14	92	2%	-4%
15	95	-1%	-1%
16	91	0%	-6%

27K CCT



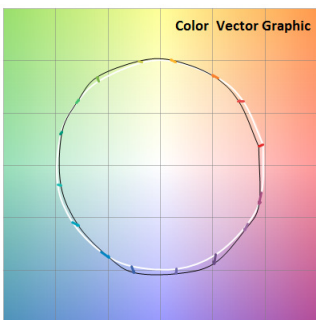
Hue Bin	R_f	Graphic shifts (%)	
		Chroma	Hue
1	97	-1%	0%
2	98	0%	0%
3	96	0%	1%
4	96	-2%	0%
5	96	0%	2%
6	95	2%	2%
7	96	1%	0%
8	98	1%	-1%
9	98	0%	1%
10	95	0%	3%
11	92	2%	5%
12	93	3%	1%
13	95	2%	-3%
14	93	3%	-3%
15	96	0%	-1%
16	91	1%	-6%

29K CCT



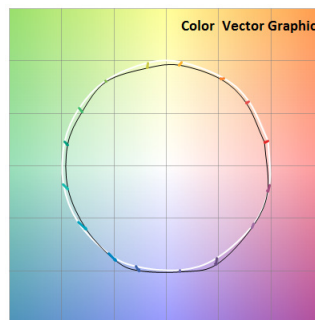
Hue Bin	R_f	Graphic shifts (%)	
		Chroma	Hue
1	79	-10%	0%
2	79	-8%	8%
3	70	-2%	14%
4	85	2%	8%
5	90	5%	5%
6	90	6%	-3%
7	84	-2%	-8%
8	89	-6%	-4%
9	85	-6%	3%
10	78	-6%	11%
11	77	2%	14%
12	79	6%	9%
13	88	8%	-7%
14	67	4%	-20%
15	84	0%	-10%
16	75	-7%	-14%

30K CCT



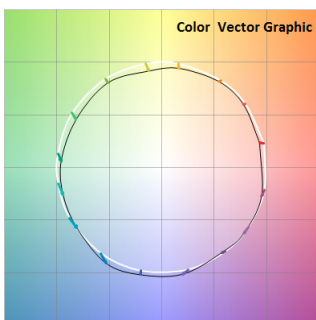
Hue Bin	R_f	Graphic shifts (%)	
		Chroma	Hue
1	90	-4%	-1%
2	91	-4%	3%
3	86	-1%	7%
4	91	1%	5%
5	92	2%	3%
6	93	4%	-1%
7	92	0%	-4%
8	95	-1%	-2%
9	94	-3%	1%
10	87	-3%	6%
11	84	0%	10%
12	88	6%	4%
13	92	4%	-1%
14	88	6%	-6%
15	89	1%	-7%
16	85	0%	-11%

35K CCT



Hue Bin	R_f	Graphic shifts (%)	
		Chroma	Hue
1	91	-4%	0%
2	93	-3%	0%
3	92	-2%	2%
4	92	-3%	1%
5	91	-5%	1%
6	96	-1%	1%
7	92	-4%	1%
8	93	-3%	2%
9	90	-4%	5%
10	83	-3%	10%
11	83	2%	10%
12	89	3%	4%
13	95	2%	-1%
14	90	5%	-4%
15	90	1%	-5%
16	88	0%	-6%

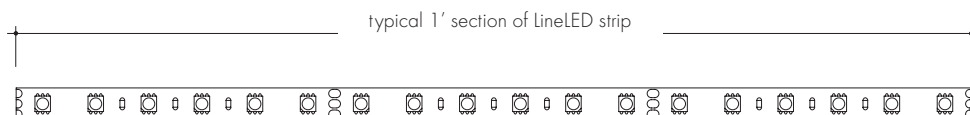
41K CCT



Hue Bin	R_f	Graphic shifts (%)	
		Chroma	Hue
1	88	-4%	1%
2	93	-2%	1%
3	93	-2%	1%
4	89	-4%	-2%
5	88	-7%	-1%
6	93	-4%	0%
7	88	-7%	3%
8	87	-4%	6%
9	82	-3%	12%
10	79	0%	12%
11	83	5%	9%
12	91	4%	0%
13	89	3%	-6%
14	92	-1%	-3%
15	84	0%	-7%
16	84	-1%	-6%

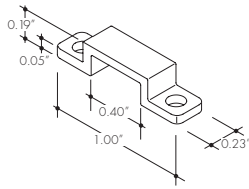
Power consumption per linear foot - loads tested with PSD series of power supplies (page3)

Length of strip (LF)	LL9		LL18		LL30		LL36		LL54	
	W/ft	Total wattage	W/ft	Total wattage	W/ft	Total wattage	W/ft	Total wattage	W/ft	Total wattage
1	1.20	0.90	1.65	1.65	2.70	2.70	3.25	3.25	5.35	5.30
2	1.20	1.90	1.65	3.30	2.70	5.40	3.25	6.50	5.30	10.60
3	1.20	2.70	1.65	4.95	2.70	8.10	3.25	9.75	5.25	15.80
4	1.20	3.70	1.63	6.58	2.65	10.60	3.20	12.80	5.20	20.60
5	1.15	4.90	1.63	8.21	2.65	13.25	3.20	16.00	5.15	26.00
6	1.15	6.10	1.62	9.83	2.65	15.90	3.15	18.90	5.10	30.80
7	1.15	7.10	1.62	11.45	2.60	18.20	3.15	22.05	5.05	35.70
8	1.10	8.10	1.62	13.07	2.60	20.80	3.10	24.80	5.00	40.00
9	1.10	8.60	1.60	14.67	2.60	23.40	3.10	27.90	4.95	44.80
10	1.10	9.60	1.60	16.50	2.55	25.50	3.05	30.50	4.90	48.90
11	1.05	10.90	1.57	18.07	2.55	28.05	3.05	33.50	4.85	53.30
12	1.05	11.90	1.57	19.64	2.55	30.60	3.00	36.00	4.80	57.40
13	1.05	12.90	1.57	21.21	2.50	32.50	3.00	39.00	4.70	60.60
14	1.05	14.10	1.55	22.76	2.50	35.00	3.00	42.00	4.60	64.30
15	1.00	14.80	1.55	24.31	2.50	37.50	3.00	45.00	4.50	67.40
16	1.00	15.60	1.55	25.86	2.45	39.20	2.95	47.20	4.40	70.50
17	1.00	16.80	1.52	27.38	2.45	41.65	2.95	50.15	4.35	73.40
18	1.00	17.80	1.52	28.90	2.45	44.10	2.90	52.50	4.30	77.00
19	1.00	18.80	1.52	30.42	2.40	45.60	2.90	55.10	4.25	81.30
20	0.95	18.90	1.50	31.20	2.40	48.00	2.85	57.00	4.20	83.50
21	0.95	19.84	1.50	32.70	2.40	50.40	2.85	59.85	4.10	85.70
22	0.95	20.78	1.50	34.20	2.35	51.70	2.80	61.60	4.00	87.10
23	0.95	21.72	1.48	35.68	2.35	54.05	2.80	64.60	3.90	88.80
24	0.95	22.66	1.47	37.15	2.35	56.40	2.75	66.00	3.80	90.10
25	0.95	23.60	1.47	38.62	2.30	57.50	2.75	68.75	3.70	92.30
26	0.95	24.54	1.45	40.07	2.30	59.80	2.70	70.20	3.60	93.60
27	0.95	25.48	1.45	41.52	2.30	62.10	2.70	72.90		
28	0.95	26.42	1.43	42.20	2.25	63.00	2.65	74.20		
29	0.95	27.46	1.42	43.00	2.25	65.25	2.65	76.85		
30	0.95	28.30	1.40	43.70	2.25	67.50	2.60	78.00		
31	0.95	29.06	1.40	45.10	2.20	68.20	2.60	80.60		
32	0.95	29.82	1.38	46.50	2.20	70.40	2.55	81.60		
33	0.95	30.58	1.37	47.70	W	72.60	2.55	84.15		
34	0.95	31.34	1.37	49.00	2.15	73.10	2.50	85.00		
35	0.95	32.10	1.36	50.45	2.15	75.25	2.50	87.50		
36	0.95	32.86	1.36	51.70	2.15	77.40	2.45	88.20		
37	0.95	33.62	1.36	52.50	2.10	77.70	2.45	90.65		
38	0.95	34.38	1.36	53.00	2.10	79.80	2.40	91.20		
39	0.95	35.14	1.35	53.90	2.10	81.90	2.40	93.60		
40	0.90	35.90	1.35	54.40	2.05	82.00				
41	0.90	36.65	1.35	55.75	2.05	84.05				
42	0.90	37.40	1.34	57.09	2.05	86.10				
43	0.90	38.15	1.34	58.43	2.02	86.90				
44	0.90	38.90	1.33	59.76	2.00	88.00				
45	0.90	39.65	1.33	61.07	2.00	90.00				
46	0.90	40.40	1.32	61.97	1.96	90.20				
47	0.90	41.15	1.32	62.70	1.95	91.65				
48	0.90	41.90	1.31	63.50	1.95	93.60				
49	0.90	42.65	1.31	64.05						
50	0.90	43.40	1.30	64.80						
51-60	0.85	50.50	1.30 - 1.25	65.20 - 70.80						
61-70	0.80	56.20	1.25 - 1.20	71.00 - 76.20						
71-80	0.75	64.50	1.20 - 1.10	77.00 - 81.60						
81-90	0.72	65.50	1.10 - 1.00	82.00 - 86.20						
91-100	0.70	69.30	1.00 - 0.95	87.00 - 91.40						



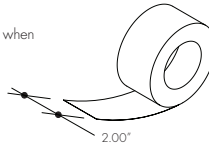
Accessories

Mounting clip:
recommended at every 12" when
LineLED strip is facing down.



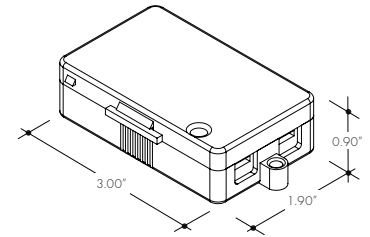
Part # CL-1

Heat sink tape:
included with LineLED strip when
no extrusions are ordered.



Part # HST

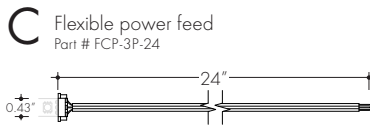
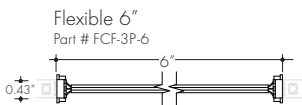
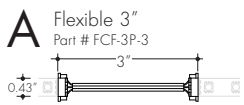
Splice Box:
low voltage, 4 terminal
splice box, black.



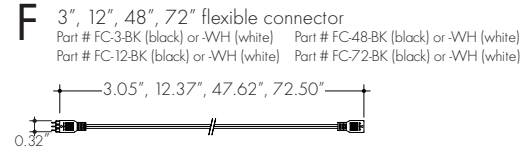
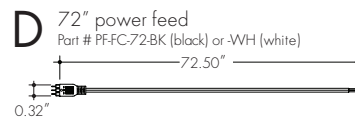
Part # LVSP-4T-BK

Connectors

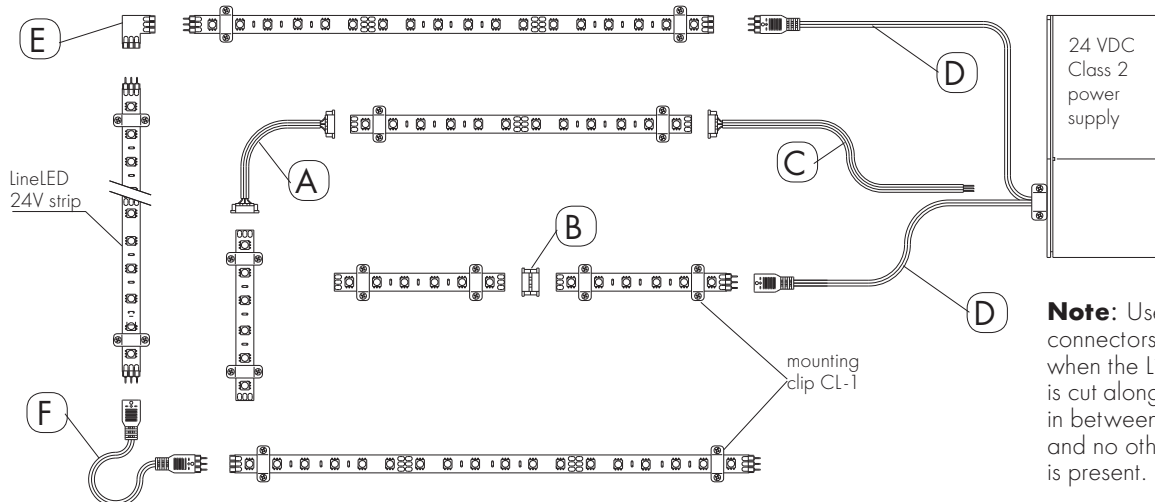
Field-cut connectors (will not work with LL54)



3-pin connectors (will not work with LL54)



Sample layout with connectors



Note: Use field-cut connectors (A,B,C) when the LineLED strip is cut along cutting lines in between solder pads and no other connector is present.

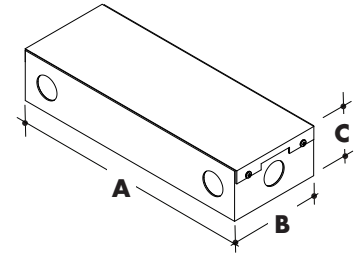
Power supply

See fixture and power supply instructions & spec sheet for wiring information. Dimming possible in select models - view Luminii website for list of compatible dimmers.

Non-Dimming:

MODEL	POWER	OUTPUT	DIMMING	LOCATION
PSV	40	24V	U2ND	D
PSV - PSV Series	40 - 40 W 60 - 60 W 96 - 96 W	24 - 24 VDC	U2ND - Non Dimming	D - Dry Location IP65 - Wet Location

MODELS	PSV Dry	PSV Wet
A Length	9.2"	9.5"
B Width	3.4"	4.12"
C Depth	1.9"	2.3"

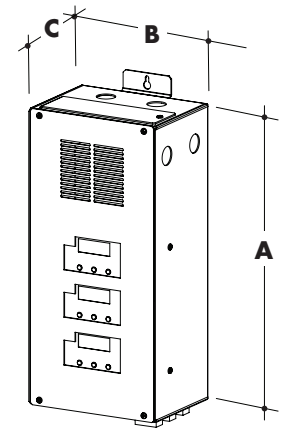


Dimming 0-10V:

MODEL	POWER	OUTPUT	DIMMING
PS010V	3X100	24	LIN
PS010V - 0-10V Power Supply dims down to 0%	3X100 - 3 X 100 WATT	24 - 24 VDC	LIN - Linear LOG - Logarithmic

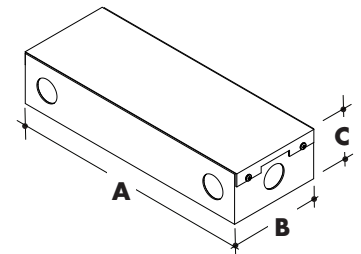
- features eldoLED's LINEARdrive configurable 0-10V drivers

MODELS	PSD010V
A Length	15.75"
B Width	6.60"
C Depth	4.80"



MODEL	POWER	OUTPUT	DIMMING	LOCATION
PSV	40	24V	U2DIM	D
PSV - PSV Series dims down to 5%	40 - 40 W 60 - 60 W 96 - 96 W	24 - 24 VDC	U2DIM - Dimming 0-10V	D - Dry Location IP65 - Wet Location

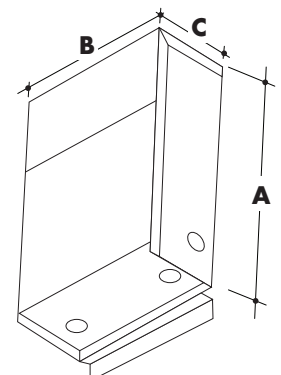
MODELS	PSV Dry	PSV Wet
A Length	9.2"	9.5"
B Width	3.4"	4.12"
C Depth	1.9"	2.3"



Dimming Magnetic low voltage:

MODEL	POWER	OUTPUT	INPUT
PSD	48	24	
PSD - PSD Series dims down to 0%	48 - 48 W 96 - 96 W 288 - 288 W (3x 96W)	24 - 24 VDC	Blank - 120 V 240 - 240 V 277 - 277 V

MODELS	PSD 48	PSD 96	PSD 288
A Length	11.25"	11.25"	13.06"
B Width	3.42"	3.42"	8.42"
C Depth	3.42"	3.27"	4.47"

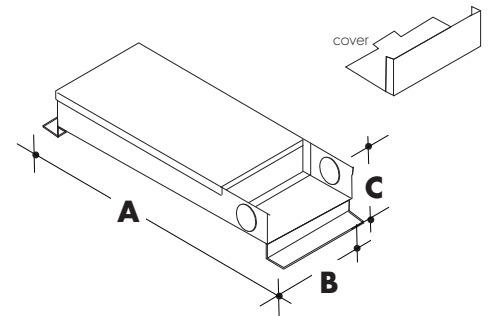


Power supply

See fixture and power supply instructions & spec sheet for wiring information. Dimming possible in select models - view Luminii website for list of compatible dimmers.

Dimming Electronic low voltage:

MODEL	CIRCUIT x POWER	OUTPUT	INPUT
CVE	48	24V	
CVE - CVE Series dims down to 0.1%	48 - 40W 48X2D - 2 x 40W 48X3D - 3 x 40W 48X4D - 4 x 40W 96 - 96W 96X2D - 2 x 96W 96X3D - 3 x 96W 96X4D - 4 x 96W	24 - 24 VDC	Blank - 120 V 277 - 277 V



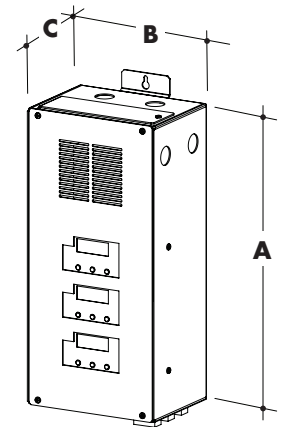
MODELS	Single circuit	Dual circuit	Three circuit	Four circuit
A Length	11.6"	11.5"	11.5"	11.5"
B Width	2.3"	4.0"	5.9"	7.75"
C Depth	1.3"	1.9"	1.9"	1.9"

DMX & DALI:

MODEL	POWER	OUTPUT
PSDMX	3X100	24
PSDMX - DMX Power Supply PSDALI - DALI Power Supply dims down to 0%	3X100 - 3 X 100 WATT	24 - 24 VDC

- Features eldoLED's LINEARdrive configurable dimmable drivers

MODELS	PSDMX	PSDALI
A Length	15.75"	15.75"
B Width	6.60"	6.60"
C Depth	4.80"	4.80"

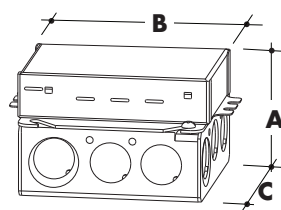


Luminii is a Lutron OEM Advantage Partner

MODEL
LTEA4U1UKL-CV240
Lutron -Hi-lume™ 1% 2-wire LED driver (120V forward phase only)

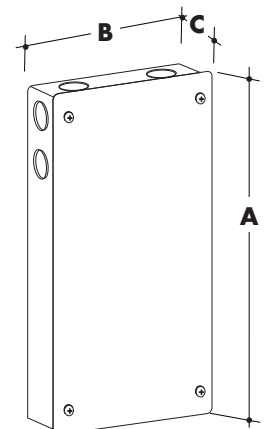
MODELS	LTEA	L3DA
A Length	4.89"	4.89"
B Width	2.66"	2.66"
C Depth	4.00"	4.00"

MODEL
L3DA4U1UKL-CV240
Hi-lume™ 1% EcoSystem Voltage LED Driver



MODEL
L3D0-96W24V-U
Hi-lume™ 0.1% EcoSystem Voltage LED Driver with Soft-On, Fade-to-Black™



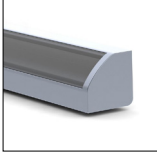
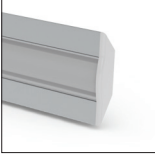
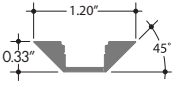
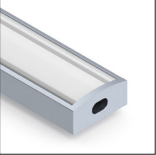

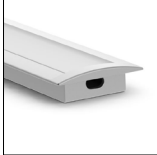
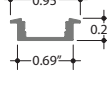
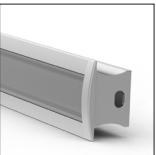

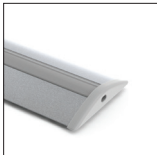
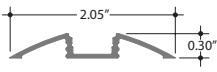

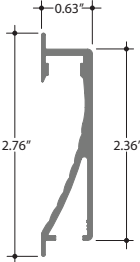
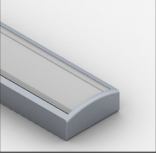
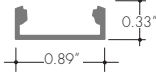
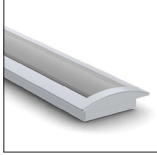
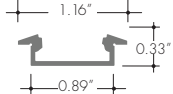
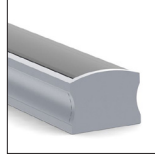
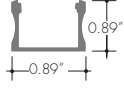
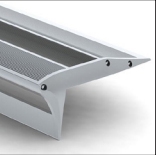
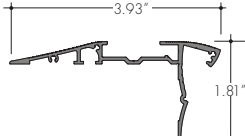

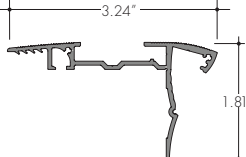

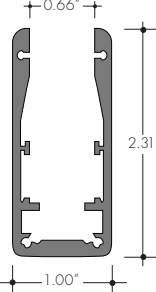
MODELS	L3D0
A Length	10.50"
B Width	5.50"
C Depth	2.00"



Optional mounting channels - lens type per channel / light transmission percentage per lens / dimensions

Lens options / light transmission percentage per lens

- Ⓒ Clear Ⓗ Half (50%) frosted Ⓐ Narrow
- Ⓕ Frosted Ⓜ Medium beam frosted Ⓒ Gel color filter suitable

 <p>Ⓒ 78% Ⓕ 50%</p> <p>Alu-Round</p>	 <p>0.94"</p>  <p>Ⓒ 70% Ⓕ 50% Ⓗ 61%</p> <p>Alu-45</p>	 <p>Ⓒ 79% Ⓕ 58% Ⓗ 69%</p> <p>Alu-Corner</p>	 <p>1.20" 0.33" 45°</p>
 <p>Ⓒ 85% Ⓕ 63% Ⓗ 75% Ⓜ 87% Ⓐ 84% Ⓒ 78%</p> <p>Slim Line 7</p>	 <p>0.69" 0.27"</p>	 <p>Ⓒ 85% Ⓕ 63% Ⓗ 75% Ⓜ 87% Ⓐ 84%</p> <p>Recessed Slim Line 7</p>	 <p>0.95" 0.27" 0.69"</p>
 <p>Ⓒ 63% Ⓕ 43% Ⓗ 54% Ⓜ 65% Ⓐ 60%</p> <p>Slim Line 15</p>	 <p>0.95" 0.59" 0.69"</p>	 <p>Ⓒ 85% Ⓕ 63% Ⓗ 75% Ⓜ 87%</p> <p>Alu-Flat</p>	 <p>2.05" 0.30"</p>
 <p>Ⓒ 47% Ⓕ 44%</p> <p>Alu-Wall</p>	 <p>0.63" 2.76" 2.36"</p>	 <p>Ⓒ 85% Ⓕ 60% Ⓗ 71%</p> <p>Slim Wide 8</p>	 <p>0.33" 0.89"</p>
 <p>Ⓒ 85% Ⓕ 60% Ⓗ 71%</p> <p>Recessed Slim Wide 8</p>	 <p>1.16" 0.33" 0.89"</p>	 <p>Ⓒ 69% Ⓕ 44% Ⓗ 55%</p> <p>Slim Wide 15</p>	 <p>0.89" 0.89"</p>
 <p>Ⓕ 34%</p> <p>Alu-Stair</p>	 <p>3.93" 1.81"</p>	 <p>Ⓕ 34%</p> <p>Alu-Stair-Carpet</p>	 <p>3.24" 1.81"</p>
 <p>Alu-Edge</p>	 <p>0.66" 2.31" 1.00"</p>		

Installation

All mounting channels are field cuttable using miter saw with circular blade suitable for cutting aluminum.

Ordering

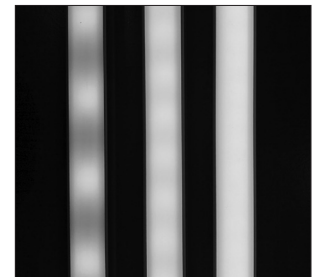
Extrusions are sold separately. View respective specsheets for details on ordering extrusions and their accessories (endcaps, mounting brackets, etc).

LED Dotting per extrusion

using the frosted lens option

extrusion	LED Models				
	LL9	LL18	LL30	LL36	LL54
SL7, RSL7, ALU-FLAT	CD	CD	CD	CD	SD
ALU-CORNER	CD	CD	CD	CD	SD
SLW8, RSLW8	CD	CD	CD	CD	SD
ALU-45	CD	CD	SD	SD	ND
ALU-WALL	CD	CD	SD	ND	ND
ALU-STAIR	CD	CD	ND	ND	ND
ALU-ROUND	CD	SD	ND	ND	ND
SL15, RSL15	CD	SD	ND	ND	ND
SLW15	CD	SD	ND	ND	ND

CD = Clear Dotting
SD = Slight Dotting
ND = No Dotting



Clear Dotting Slight Dotting NO Dotting

FEATURES & SPECIFICATIONS

INTENDED USE — Suitable for applications requiring attractive edge-lit exit signage, universal installation and low energy consumption.

CONSTRUCTION — Extruded brushed aluminum finish.

Clear acrylic panels- letters measure 6" high with 3/4" stroke, with 100 ft viewing distance rating, based upon UL 924 standard.

For single-face clear panels, EXIT is seen as a reversed image from the back.

OPTICS — LEDs mounted on printed circuit board. The typical life of the exit LED lamp is 10 years.

The LED operating frequency is 120Hz.

ELECTRICAL — Dual voltage input capacity (120/277V).

Battery: (EL Option) — Sealed, maintenance free nickel-cadmium battery delivers 90 minutes capacity to emergency lamps. Test switch provides manual activation of 30-second diagnostic testing for on-demand visual inspection.

Self-diagnostic testing (EL Option Only) for 30 seconds every 30 days and 90 minutes annually. Diagnostic evaluation of LED light source, AC to DC transfer, charging and battery condition.

INSTALLATION — EDG — Universal surface (top, end or back) mounting. Canopy provided.

EDGR — Recessed mounting. Bar hanger and brackets provided for both new or restricted ceiling access installation applications. Back wall mount (WM) option.

Universal directional indicators. Field selected and attached.

LISTINGS — UL damp location listed 32°-122°F (0°-50°C) standard. Meets UL924, NFPA 101 (current Life Safety Code), NEC and OSHA illumination standards.

WARRANTY — 3-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

NOTE: Actual performance may differ as a result of end-user environment and application.

All values are design or typical values, measured under laboratory conditions at 25°C.

Specifications subject to change without notice.

Catalog Number
Notes
Type



EDG (surface mount)



EDGR (recessed mount)

LED Edge-Lit Exits

EDG EDGR

LED Lamps



Specifications

EDG (End Mount)	EDG (Top Mount)
Length: 13-5/8 (34.6)	Length: 13 (33.0)
Depth: 5-1/2(14.0)	Depth: 4-5/16 (11.0)
Height: 11-1/8 (28.3)	Height: 11-3/4 (29.8)
Shipping Weight : 4 lbs (1.8 kgs)	Shipping Weight : 4 lbs (1.8 kgs)
EDG (Back Mount)	EDGR
Length: 13 (33.0)	Length: 13 (33.0)
Depth: 3 (7.6)	Depth: 1-3/4 (4.4)
Height: 11-1/8 (28.3)	Height: 8 (20.3)
Shipping Weight : 4 lbs (1.8 kgs)	Shipping Weight : 6.8 lbs (3.1 kgs)
	Shipping Weight (WM option) : 8.1 lbs (3.7 kgs)

All dimensions are inches (centimeters) unless otherwise noted.

ORDERING INFORMATION

For shortest lead times, configure products using **bolded options**.

Example: EDG 1 R EL

Family	Housing color	Number of faces	Letter color	Operations	Options
EDG Surface mount LED edge-lit exit	(blank) Brushed aluminum	1 Single face	R Red on clear (single face only) ¹	(blank) AC only	(blank) None
EDGR Recessed LED edge-lit exit	W White	2 Double face	G Green on clear (single face only) ¹	EL Nickel-cadmium battery	WM Recessed wall mount ⁶
			RMR Red on mirror ²	X2 Lamp wired on two separate AC circuits (specify 120V or 277V) ⁴	
			GMR Green on mirror ²	SD Self-diagnostics ⁵	
			RW Red on white ³		
			GW Green on white ³		

Accessories: Order as separate item.	
ELA US12	12" stem kit with brushed aluminum canopy ⁷
ELA W US12	12" stem kit with white canopy ⁷

Notes

- For single-face clear panels, EXIT is seen as a reversed image from the back.
- Available with single and double face.
- White panel standard for double and single face.
- Not available with EL and SD options. Both circuits can be energized at the same time.
- Available with EL option only.
- Available on EDGR single face only
- See spec sheet [ELA-StemKits](#). Only available for EDG.

EDG-EDGR LED, Surface and Recessed Mount Edge-Lit Exits

SPECIFICATIONS

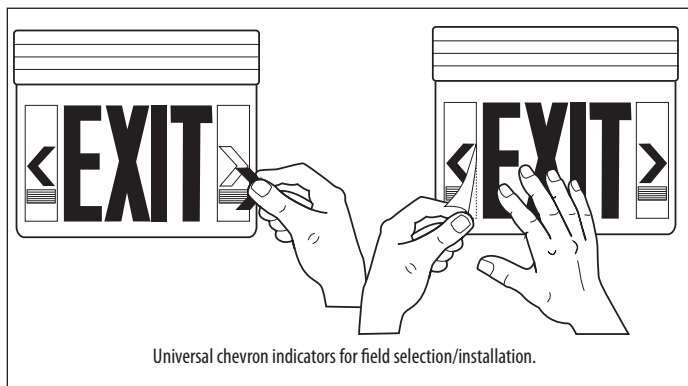
ELECTRICAL						
Primary Circuit						
Type	Typical LED life ¹	Supply voltage	EDG		EDGR	
			Input Watts	Max amps.	Input Watts	Max amps.
Red LED AC only	10 years	120	2.5	0.020	3.8	0.030
		277	2.8	0.010	4.5	0.014
Green LED AC only	10 years	120	2.2	0.020	3.8	0.030
		277	2.2	0.010	4.5	0.020
Red LED emergency	10 years	120	3.0	0.030	3.8	0.031
		277	3.1	0.010	4.5	0.015
Green LED emergency	10 years	120	2.6	0.020	3.8	0.031
		277	2.8	0.010	4.5	0.020

BATTERY (EL option)			
Sealed Nickel-Cadmium			
Shelf life ²	Typical life ²	Maintenance ³	Optimum temperature ⁴
3 years	7-9 years	none	32-122°F (0-50°C)

Notes

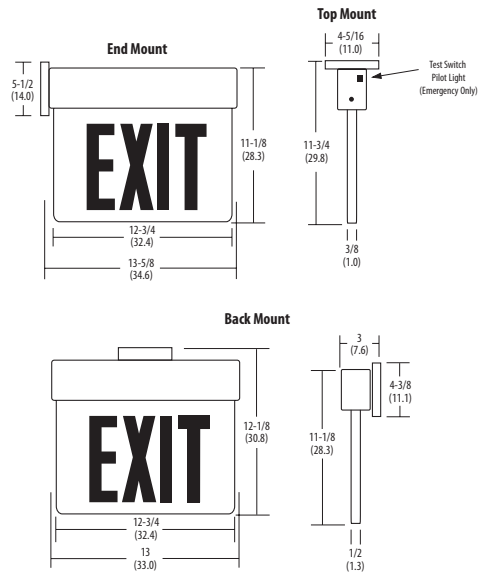
- Based on continuous operation. The typical life of the exit LED lamp is 10 years.
- At 77°F (25°C).
- All life safety equipment, including emergency lighting for path of egress must be maintained, serviced, and tested in accordance with all National Fire Protection Association (NFPA) and local codes. Failure to perform the required maintenance, service, or testing could jeopardize the safety of occupants and will void all warranties.
- Optimum ambient temperature range where unit will provide capacity for 90 minutes. Higher and lower temperatures affect life and capacity.

KEY FEATURES

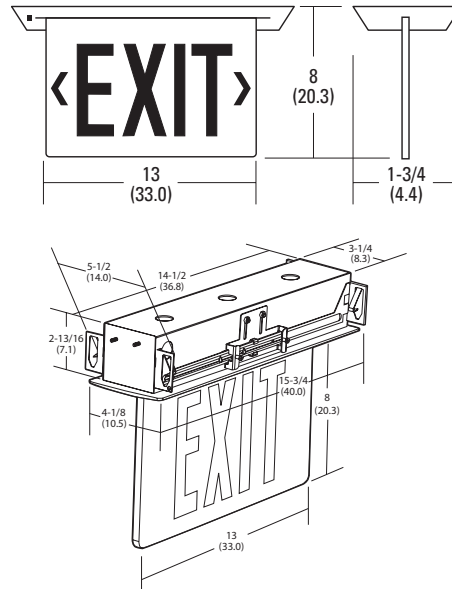


MOUNTING

EDG



EDGR



EDGR WM option

