

Project Manual

Including Specifications

for the

Mechatronics Facility

at

Building 'K'

Oxnard High School

Oxnard Union High School District

Prepared by:

FLEWELLING & MOODY

815 Colorado Blvd., Suite 200
Pasadena, CA 90041
(323)543-8300

F&M Project No. 2866.300
DSA A#03-120790

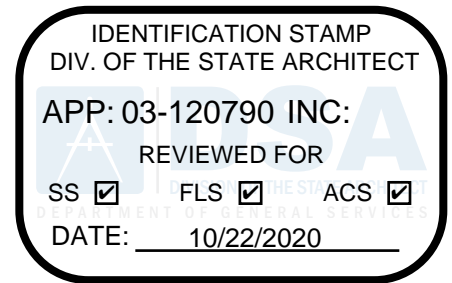
PROJECT MANUAL

FOR

OXNARD HIGH SCHOOL MECHATRONICS FACILITY

For OXNARD UNIFIED HIGH SCHOOL DISTRICT Oxnard, California

Prepared by
FLEWELLING & MOODY ARCHITECTS
815 Colorado Blvd., Suite 200
Los Angeles, CA 90041



ARCHITECT
Scott Gaudineer, C-14211
Flewelling & Moody Architects



STRUCTURAL ENGINEER
Wen Lin, 2970
Lin & Wu Engineering
Consulting Structural Engineers



MECHANICAL ENGINEER
Sunil Patel, 29448
Budlong & Associates, Inc.
M-E-P Consulting Engineers



ELECTRICAL ENGINEER
Manan Christian, E-22864
Budlong & Associates, Inc.
M-E-P Consulting Engineers

Flewelling & Moody
Project No. 2866

SECTION 00 00 80

PROJECT DIRECTORY

OWNER: Oxnard Union High School District
309 South "K" Street
Oxnard, California 93030
(805) 385-2500

ARCHITECT: Flewelling & Moody
815 Colorado Blvd., Suite 200
Los Angeles, California 90041
(323) 543-8300

STRUCTURAL ENGINEER: Lin & Wu Engineering
911 South Primrose Avenue, suite H
Monrovia, CA 91016
(626) 256-6688

ELECTRICAL ENGINEER: Budlong & Associates, Inc.
315 Arden Avenue, suite 23
Glendale, CA 91203
(818) 638-8780

MECHANICAL (PLUMBING) ENGINEER Budlong & Associates, Inc.
315 Arden Avenue, suite 23
Glendale, CA 91203
(818) 638-8780

END OF SECTION



BID: _____

OXNARD HIGH SCHOOL MECHATRONICS FACILITY

Bid Deadline:

Submit Bids to: Oxnard Union High School District
309 South K Street, Building G
Purchasing Department
Oxnard, CA 93030
Deanna.Rantz@oxnardunion.org

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BID NUMBER

MECHATRONICS FACILITY

OXNARD UNION HIGH SCHOOL DISTRICT

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NOTICE TO BIDDERS

Notice is hereby given that the governing board ("Board") of the Oxnard Union High School District ("District") will receive sealed bids for the following project, Bid No. _____, Bid Package _____ ("Project" or "Contract"):

The Project consists of:

Adding overhead canopy to enclose outdoor yard for conversion of an existing auto shop into a mechatronics facility.

To bid on this Project, the Bidder is required to possess one or more of the following State of California contractors' license(s):

A, B, and/or C-__

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

To bid on this Project, the Bidder is required to be registered as a public works contractor with the Department of Industrial Relations pursuant to the Labor Code.

Contract Documents will be available on or after _____, 20__, for review at the District Purchasing Office, and may be downloaded from the District's website, <https://www.oxnardunion.org/administrative-services/purchasing-warehousing/rfp/>. In addition, Contract Documents are available for bidders' review at the following builders' exchanges:

- A. Builder's Exchange of _____ County (____) ____ - _____
- B. _____

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.

Sealed bids will be received until _____ a.m./p.m., _____, 20__, at the District Purchasing Office, 309 South K Street, Building G, Oxnard, California 93030 at or after which time the bids will be opened and publicly read aloud. Any bid that is submitted after this time shall be nonresponsive 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.

Pursuant to Public Contract Code section 20111.6, only prequalified bidders will be eligible to submit a bid for contracts \$1 million or more using or planning to use state bond funds. Any bid submitted by a bidder who is not prequalified shall be non-

responsive and returned unopened to the bidder. Moreover, any bid listing subcontractors holding C-4, C-7, C-10, C-16, C-20, C-34, C-36, C-38, C-42, C-43 or C-46 licenses, if used, who have not been prequalified, shall be deemed nonresponsive and will not be considered.

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.

A bid bond by an admitted surety insurer on the form provided by the District a cashier's check or a certified check, drawn to the order of the Oxnard Union High School 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 ten (10) 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.

A mandatory 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. Failure to attend or tardiness will render bid ineligible. No sign in is allowable after the specified start time.

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.

Pursuant to Education Code section 17550, the District is requiring the Bidder to purchase and to remove from the school grounds all old materials required by the specifications to be removed from any existing school building on the same school grounds and not required for school purposes and to state in his or her bid the amount which he or she will deduct from the price bid for the work as the purchase price of the old materials. The board shall let the contract to any responsible bidder whose net bid is the lowest or shall reject all bids.

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.

The successful bidder will be required to certify that it either meets the Disabled Veteran Business Enterprise ("DVBE") goal of three percent (3%) participation or made a good faith effort to solicit DVBE participation in this Contract if it is awarded the Contract for the Work.

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 section 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>>.

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 successful Bidder shall comply with all requirements of Division 2, Part 7, Chapter 1, Articles 1-5 of the Labor Code.

The District has entered into a Project Labor Agreement that is applicable to this Project. A copy of the Project Labor Agreement is available for review at the District Facilities Office and may be downloaded from the District's website, <https://www.oxnardunion.org/administrative-services/purchasing-warehousing/rfp/> . The successful bidder and all subcontractors will be required to agree to be bound by the Project Labor Agreement.

Pursuant to Education Code section 17550, the District

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: _____.
- (2) In order to match other products in use on a particular public improvement either completed or in the course of completion: _____.
- (3) In order to obtain a necessary item that is only available from one source: _____.
- (4) In order to respond to an emergency declared by a local agency: _____.

The District shall award the Contract, if it awards it at all, to the lowest responsive responsible bidder based on: The base bid amount only.

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.

Publication Dates: XX/XX/XX & XX/XX/XX

END OF DOCUMENT

INSTRUCTIONS TO BIDDERS

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

Oxnard Union High School 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. A Bidder and its subcontractors must possess the appropriate State of California contractors' license and must maintain the license throughout the duration of the project. Bidders must also be registered as a public works contractor with the Department of Industrial Relations pursuant to the Labor Code. Bids submitted by a contractor who is not properly licensed or registered shall be deemed nonresponsive and will not be considered.
2. The District has prequalified bidders pursuant to Public Contract Code section 20111.6 for contracts \$1 million or more using or planning to use state bond funds. 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 nonresponsive and will not be considered. Moreover, any bid listing subcontractors holding C-4, C-7, C-10, C-16, C-20, C-34, C-36, C-38, C-42, C-43 or C-46 licenses, if used, who have not been prequalified, shall be deemed nonresponsive and will not be considered.
3. District will receive sealed bids from bidders as stipulated in the Notice to Bidders.
 - a. All bids must be sealed in an envelope, marked with the name and address of the Bidder, name of the Project, the Project Number and/or bid number, and time of bid opening.
 - b. Bids must be submitted to the Purchasing Office by date and time shown in the Notice to Bidders.
 - c. Bids must contain all documents as required herein.
4. Bidders are advised that on the date that bids are opened, telephones will not be available at the District Offices for use by bidders or their representatives.
5. Bids will be opened at or after the time indicated for receipt of bids.
6. Bidders must submit bids on the documents titled Bid Form and Proposal and must submit all other required District forms. Bids not submitted on the District's required forms shall be deemed nonresponsive and shall not be considered. Additional sheets required to fully respond to requested information are permissible.
7. Bidders shall not modify the Bid Form and Proposal or qualify their bids. Bidders shall not submit to the District a re-formatted, re-typed, altered, modified, or otherwise recreated version of the Bid Form and Proposal or other District-provided document.

8. Bids shall be clearly written and without erasure or deletions. District reserves the right to reject any bid containing erasures, deletions, or illegible contents.
9. 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 nonresponsive 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. Non-Collusion Declaration.
 - e. Iran Contracting Act Certification, if contract value is \$1,000,000 or more.
10. 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 ("Bid Bond"). 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 nonresponsive and will not be considered.
11. If Bidder to whom the Contract is awarded fails or neglects to enter into the Contract and submit required bonds, insurance certificates, and all other required documents, within **TEN (10)** 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.
12. 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. Failure to submit this list when required by law shall result in bid being deemed nonresponsive and the bid will not be considered.
13. All of the listed subcontractors are required to be registered as a public works contractor with the Department of Industrial Relations pursuant to the Labor Code.
 - 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.
- 14. A mandatory pre-bid conference and site visit ("Site Visit") is required as referenced in the Notice to Bidders. The 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, or post information on the District website. Oral statements shall not be relied upon and will not be binding or legally effective. Addenda or RFI's and answers 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.
- 15. Bidders shall submit the Non-Collusion Declaration with their bids. Bids submitted without the Non-Collusion Declaration shall be deemed nonresponsive and will not be considered.
- 16. The Contractor and all Subcontractors under the Contractor shall pay all workers on all work performed pursuant to the 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 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>.
- 17. The District has entered into a Project Labor Agreement that is applicable to this Project. A copy of the Project Labor Agreement is available for review at the District Facilities Office and may be downloaded from the District's website, <https://www.oxnardunion.org/administrative-services/purchasing-warehousing/rfp/> . The successful bidder and all subcontractors will be required to agree to be bound by the Project Labor Agreement.
- 18. Pursuant to Education Code section 17550, the District is requiring the Bidder to purchase and to remove from the school grounds all old materials required by the specifications to be removed from any existing school building on the same school grounds and not required for school purposes and to state in his or her bid the

amount which he or she will deduct from the price bid for the work as the purchase price of the old materials. The board shall let the contract to any responsible bidder whose net bid is the lowest or shall reject all bids.

19. Section 17076.11 of the Education Code requires school 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 form is attached. Do not submit this form with your Bid.
20. 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(s) thereof by the District is/are 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 Bidder 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 Bidder is required to make such verification as a condition to bidding. In submitting its Bid, Bidder shall rely on the results of its own independent investigation. In submitting its Bid, Bidder 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, Bidder 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 that the Bidder has 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, Bidder may not in any manner rely on the information in these reports and drawings. Subject to the foregoing, Bidder must make its own independent investigation of all conditions affecting the Work and must not rely on information provided by District.
21. 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 in advance and in writing. 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 notice of request for substitution of a specified item a minimum of **TEN (10)** calendar days prior to bid opening. The Successful Bidder will not be allowed to substitute specified items unless properly noticed.
 - b. Within 35 days after the date of the Notice of Award, the Successful Bidder shall submit data substantiating the request(s) for all substitution(s) 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.
22. 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.

23. All questions about the meaning or intent of the Contract Documents are to be directed via email to the District to Deanna Rantz, Director of Purchasing at Deanna.Rantz@oxnardunion.org. Interpretations or clarifications considered necessary by the District in response to such questions will be issued in writing or by Addenda and emailed to all parties recorded by the District as having received the Contract Documents or posted on the District's website at <https://www.oxnardunion.org/administrative-services/purchasing-warehousing/rfp/> . Questions that are not received by the Request for Information (RFI) deadline date for will not be answered. Only questions answered by formal written Addenda or via website posting will be binding. Oral and other interpretations or clarifications will be without legal effect.
24. Addenda may also be issued to modify other parts of the Contract Documents as deemed advisable by the District.
25. 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.
26. 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.
27. 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.
28. Discrepancies between written words and figures, or words and numerals, will be resolved in favor of figures or numerals.
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 any other basis for protest, an inadvertent error in listing the California contractor's 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 any other basis 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. The Bidder to whom Contract is awarded shall execute and submit the following documents by 5:00 p.m. of the **TENTH (10th)** 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 nonresponsive.
- a. Agreement: To be executed by successful Bidder. Submit four (4) copies, each bearing an original signature.
 - b. Performance Bond (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.
 - c. Payment Bond (Contractor's Labor and Material Bond) (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.
 - d. Insurance Certificates and Endorsements as required.
 - e. Workers' Compensation Certification.

- f. Prevailing Wage and Related Labor Requirements Certification.
 - g. Disabled Veteran Business Enterprise Participation Certification.
 - h. Drug-Free Workplace Certification.
 - i. Tobacco-Free Environment Certification.
 - j. Hazardous Materials Certification.
 - k. Lead-Based Materials Certification.
 - l. Criminal Background Investigation/Fingerprinting Certification.
 - m. Registered Subcontractors List: Must include Department of Industrial Relations (DIR) registration number of each subcontractor for all tiers.
31. Time for Completion: District may issue a Notice to Proceed within **NINETY (90)** days 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 90-day 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 90-day 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 90-day 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.
32. District reserves the right to reject any or all bids, including without limitation the right to reject any or all nonconforming, nonresponsive, 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 any inconsequential deviations or irregularities in any bid. 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.

33. It is the policy of the District that no qualified person shall be excluded from participating in, be denied the benefits of, or otherwise be subjected to discrimination in any consideration leading to the award of contract, based on race, color, gender, sexual orientation, political affiliation, age, ancestry, religion, marital status, national origin, medical condition or disability. The Successful Bidder and its subcontractors shall comply with applicable federal and state laws, including, but not limited to the California Fair Employment and Housing Act, beginning with Government Code section 12900, and Labor Code section 1735.
34. 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

00 21 20

MASTER SCHEDULE

	<u>DATE</u>	<u>TIME</u>
Advertisements		N/A
Mandatory Site Visit/Conference		X:00 a/p.m.
Bidder Clarification Request Deadline		X:00 a/p.m.
Deadline for Final Addendum		X:00 a/p.m.
Bids Due		X:00 a/p.m.
Notice of Intent		N/A
Board Award		N/A
Notice of Award & Preliminary Schedule Due		N/A
PLA Meeting		TBD
Pre-Construction Meeting		TBD
*Work to Commence		N/A
Work Completion		N/A

*Work may commence only when the executed contract, forms and bonds are received by the District (within 10 calendar days of Notice of Award) and a Notice to Proceed is issued by the District.

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 have been prepared for and around the Site and/or in connection with the Work by soil investigation engineers hired by Oxnard Union High School 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:

Update of Engineering Geology and Geotechnical Engineering Reports For Building K Remodel and Canopy Addition, Oxnard High School, 3400 West Gonzales Road, Oxnard, California, by Earth Systems Pacific, 1731-A Walter Street, Ventura, California, Project No. 303278-002, dated March 19, 2020

Revised Response to Engineering Geology and Seismology Review Oxnard High School Building K Addition, Oxnard, California, by Earth Systems Southern California, 1731-A Walter Street, Ventura, California, Project No. VT-19531-12, dated February 18, 2019

Engineering Geology and Geotechnical Engineering Report for Proposed Addition to Building K at Oxnard High School, Oxnard, California, by Earth Systems Southern California, 1731-A Walter Street, Ventura, California, Project No. VT-19531-12, dated July 31, 2007

Geotechnical Engineering Report for the New Oxnard High School, Gonzales Road between Patterson Road and Victoria Avenue, Oxnard, California, by Earth Systems Consultants Southern California, 1731-A Walter Street, Ventura, California, dated June 25, 1992

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, geotechnical conditions, or other actual conditions verifiable by independent investigation. These conditions are verifiable by Bidder by the performance of its own independent investigation that Bidder should perform as a condition to bidding and Bidder 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 the Oxnard Union High School District ("District" or "Owner")

From: _____
(Proper Name of Bidder)

The undersigned declares that Bidder has read and understands the Contract Documents, including, without limitation, the Notice to Bidders and the Instructions to Bidders, 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. _____ for the following project known as:

Oxnard Mechatronics Facility _____

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

_____ dollars	\$ _____
BASE BID	
<i>Bidder acknowledges and agrees that the Base Bid accounts for any and all costs.</i>	

Additive/Deductive Alternates:

Alternate #1

_____ dollars	\$ _____
Additive/Deductive	

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

- A. 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.
- B. 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.

- C. 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.
- D. The liquidated damages clause of the General Conditions and Agreement is hereby acknowledged.
- E. 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.
- F. The following documents are attached hereto:
 - Bid Bond on the District's form or other security
 - Designated Subcontractors List
 - Site Visit Certification
 - Non-Collusion Declaration
 - Iran Contracting Act Certification
- G. Receipt and acceptance of the following Addenda is hereby acknowledged:

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

- H. Purchase Price of Old Material. Bidder specifically acknowledges and understands that if it is awarded the Contract, that pursuant to Education Code section 17550, that it will purchase and remove from the school grounds all old materials required by the specifications to be removed from any existing school building on the same school grounds and not required for school purposes and to state in his or her bid the amount which he or she will deduct from the price bid for the work as the purchase price of the old materials. The deducted amount must be shown separately below:

Deducted Purchase Price of Old Material

_____ dollars - \$ _____
Deductive

- I. Bidder acknowledges that the license required for performance of the Work is a _____ license.

- J. Bidder 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.
- K. 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.
- L. Bidder hereby certifies that its bid includes sufficient funds to permit Bidder to comply with all local or state labor laws or regulations during the Project, including payment of prevailing wage, and that Bidder will comply with the provisions of Labor Code section 2810(d) if awarded the Contract
- M. Bidder agrees to comply with all requirements of the Project Labor Agreement.
- N. 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.
- O. 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.
- P. 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, 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.
- Q. 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 Identification No. of Bidder: _____

Telephone Number: _____

E-mail: _____

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

No.: _____ Class: _____ Expiration Date: _____

No.: _____ Class: _____ Expiration Date: _____

Public Works Contractor Registration No.: _____

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 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 Oxnard Union High School District ("District") of Ventura
County, State of California, as Obligee, in an amount equal to ten percent (10%) of the
Base Bid plus alternates, 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 ten (10) 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__.

Principal

By

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
(Public Contact Code Sections 4100-4114)

Bidder acknowledges and agrees that 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 Base 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, 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 bid(s) is/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 Base Bid plus alternate(s).

If further space is required for the list of proposed subcontractors, attach additional copies of page 2 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

Project/Contract between the Oxnard Union High School District ("District") and _____ ("Contractor" or "Bidder").

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

Check option that applies:

_____ I certify that I visited the Site of the proposed Work, received the attached _____ pages of information, 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, received the attached _____ pages of information, 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 Oxnard Union High School District, its Architect, its Engineers, 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: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

**NON-COLLUSION DECLARATION
(Public Contract Code Section 7106)**

The undersigned declares:

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

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: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

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

Project/Contract between the Oxnard Union High School District ("District") and _____ ("Contractor" or "Bidder").

Prior to bidding on or submitting a proposal for a contract for goods or services of \$1,000,000 or more, the bidder/proposer must submit this certification pursuant to Public Contract Code section 2204.

The bidder/proposer must complete **ONLY ONE** of the following two options. To complete OPTION 1, check the corresponding box **and** complete the certification below. To complete OPTION 2, check the corresponding box, complete the certification below, and attach documentation demonstrating the exemption approval.

- OPTION 1.** Bidder/Proposer 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 we are 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.
- OPTION 2.** Bidder/Proposer has received a written exemption from the certification requirement pursuant to Public Contract Code sections 2203(c) and (d). *A copy of the written documentation demonstrating the exemption approval is included with our bid/proposal.*

CERTIFICATION:

I, the official named below, CERTIFY UNDER PENALTY OF PERJURY, that I am duly authorized to legally bind the bidder/proposer to the OPTION selected above. This certification is made under the laws of the State of California.

<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

WORKERS' COMPENSATION CERTIFICATION

Project/Contract between the Oxnard Union High School District ("District") and _____ ("Contractor" or "Bidder").

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: _____

Signature: _____

Print Name: _____

Title: _____

(In accordance with 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

00 45 46.01

**PREVAILING WAGE AND
RELATED LABOR REQUIREMENTS CERTIFICATION**

Project/Contract between the Oxnard Union High School District ("District") and
_____ ("Contractor" or "Bidder").

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.

Date: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

**DISABLED VETERAN BUSINESS
ENTERPRISE PARTICIPATION CERTIFICATION**

PROJECT/CONTRACT NO.: _____ between the Oxnard Union High School District ("District") and _____ ("Contractor" or "Bidder") ("Contract" or "Project").

GENERAL INSTRUCTIONS

Section 17076.11 of the Education Code requires school districts using, or planning to use, funds allocated pursuant to the State of California School Facility Program ("Program") for the construction and/or modernization of school buildings 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 school district on projects that receive state funding. Therefore, the 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 ("OSDS")*	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 OSDS (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 after good faith efforts	Make good faith efforts, including contacts, advertisement and DVBE solicitation	Complete all of this form and the Certification

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

**BID NUMBER
MECHATRONICS FACILITY**

OXNARD HIGH SCHOOL

**OXNARD UNION HIGH SCHOOL DISTRICT
DISABLED VETERAN BUSINESS
ENTERPRISE PARTICIPATION
CERTIFICATION
00 45 46.02 -1**

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	
A.	
B.	
C.	
D.	
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, if any			*
2. OSDS, provides assistance locating DVBEs at https://caleprocure.ca.gov/pages/PublicSearch/supplier-search.aspx	(916) 375-4940		*
3. DVBE Organization (List)			*

*Write "recorded message" in this column, if applicable.

**BID NUMBER
MECHATRONICS FACILITY**

OXNARD HIGH SCHOOL

**OXNARD UNION HIGH SCHOOL DISTRICT
DISABLED VETERAN BUSINESS
ENTERPRISE PARTICIPATION
CERTIFICATION
00 45 46.02 -2**

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 your 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 OSDS		
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.			
DVBE 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.

**BID NUMBER
MECHATRONICS FACILITY**

OXNARD HIGH SCHOOL

**OXNARD UNION HIGH SCHOOL DISTRICT
DISABLED VETERAN BUSINESS
ENTERPRISE PARTICIPATION
CERTIFICATION
00 45 46.02 -3**

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

**BID NUMBER
MECHATRONNICS FACILITY**

OXNARD HIGH SCHOOL

**OXNARD UNION HIGH SCHOOL DISTRICT
DISABLED VETERAN BUSINESS
ENTERPRISE PARTICIPATION
CERTIFICATION
00 45 46.02 -4**

DRUG-FREE WORKPLACE CERTIFICATION

Project/Contract between the Oxnard Union High School District ("District") and _____ ("Contractor" or "Bidder").

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 the Drug-Free Workplace Act of 1990.

Contractor must also comply with the provisions of Health & Safety Code section 11362.3 which prohibits the consumption or possession of cannabis or cannabis products in any public place, including school grounds, and specifically on school grounds while children are present.

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 and hereby certify that I will adhere to the requirements of the Drug-Free Workplace Act of 1990 and Health and Safety Code section 11362.3.

Date: _____
Signature: _____
Print Name: _____
Title: _____

END OF DOCUMENT

TOBACCO-FREE ENVIRONMENT CERTIFICATION

Project/Contract between the Oxnard Union High School District ("District") and _____ ("Contractor" or "Bidder").

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., Business and Professions Code section 22950 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. The prohibition on smoking includes the use of any electronic smoking device that creates an aerosol or vapor, in any manner or in any form, and the use of any oral smoking device for the purpose of circumventing the prohibition of tobacco smoking. Further, Health & Safety Code section 11362.3 prohibits the smoking or use of cannabis or cannabis products in any place where smoking tobacco is prohibited.

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: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

HAZARDOUS MATERIALS CERTIFICATION

Project/Contract between the Oxnard Union High School District ("District") and _____ ("Contractor" or "Bidder").

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 titled Hazardous Materials Procedures & Requirements, and shall comply with all the provisions outlined therein.

Date: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

LEAD-BASED MATERIALS CERTIFICATION

Project/Contract between the Oxnard Union High School District ("District") and _____ ("Contractor" or "Bidder").

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 those regulations. The OSHA Regulations define construction work as work for construction, alteration, and/or repair, including painting and decorating. Regulated work 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: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

IMPORTED MATERIALS CERTIFICATION

PROJECT/CONTRACT NO.: _____ between the Oxnard Union High School 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 and shall be provided to the District at least ten (10) days before delivery. 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

CRIMINAL BACKGROUND INVESTIGATION

Project/Contract between the Oxnard Union High School District ("District") and _____ ("Contractor" or "Bidder").

The undersigned does hereby certify to the governing board of the District as follows:

That I am a representative of the Contractor currently under contract with the District; that I am familiar with the facts herein certified; and that I am authorized and qualified to execute this certificate on behalf of Contractor.

Contractor certifies that it has taken at least one of the following actions with respect to the construction Project that is the subject of the Contract (check all that apply):

- The Contractor is a sole proprietor and intends to comply with the fingerprinting requirements of Education Code section 45125.1(k) with respect to all Contractor's employees who may have contact with District pupils in the course of providing services pursuant to the Contract, and hereby agrees to the District's preparation and submission of fingerprints such that the California Department of Justice may determine that none of those employees has been convicted of a felony, as that term is defined in Education Code section 45122.1. No work shall commence until such determination by DOJ has been made.
- The Contractor, who is not a sole proprietor, has complied with the fingerprinting requirements of Education Code section 45125.1 with respect to all Contractor's employees and all of its Subcontractors' employees who may have contact with District pupils in the course of providing services pursuant to the Contract, and the California Department of Justice has determined that none of those employees has been convicted of a felony, as that term is defined in Education Code section 45122.1. A complete and accurate list of Contractor's employees and of all of its subcontractors' employees who may come in contact with District pupils during the course and scope of the Contract is attached hereto; and/or
- Pursuant to Education Code section 45125.2, Contractor has installed or will install, prior to commencement of Work, a physical barrier at the Work Site, that will limit contact between Contractor's employees and District pupils at all times; and/or
- Pursuant to Education Code section 45125.2, Contractor certifies that all employees will be under the continual supervision of, and monitored by, an employee of the Contractor who the California Department of Justice has ascertained, or as described below, will ascertain, has not been convicted of a violent or serious felony. The name and title of the employee who will be supervising Contractor's and its subcontractors' employees is:

Name: _____

Title: _____

NOTE: If the Contractor is a sole proprietor, and elects the above option, Contractor must have the above-named employee's fingerprints prepared and submitted by the District, in accordance with Education Code section 45125.1(k). No work shall commence until such determination by DOJ has been made.

Contractor's responsibility for background clearance extends to all of its employees, Subcontractors, and employees of Subcontractors coming into contact with District pupils regardless of whether they are designated as employees or acting as independent contractors of the Contractor.

Date: _____

Signature: _____

Print Name: _____

Title: _____

REGISTERED SUBCONTRACTORS LIST
(Labor Code Section 1771.1)

Contractor acknowledges and agrees that it must clearly set forth below the name and Department of Industrial Relations (DIR) registration number of each subcontractor **for all tiers** who will perform work or labor or render service to Contractor or its subcontractors in or about the construction of the Work **at least two (2) weeks before the subcontractor is scheduled to perform work**. This document is to be updated as all tiers of subcontractors are identified.

Contractor acknowledges and agrees that, if Contractor fails to list as to any subcontractor of any tier who performs any portion of Work, the Contract is subject to cancellation and the Contractor will be subjected to penalty under applicable law.

If further space is required for the list of proposed subcontractors, attach additional copies of page 2 showing the required information, as indicated below.

Subcontractor Name: _____
DIR Registration #: _____
Portion of Work: _____

Subcontractor Name: _____
DIR Registration #: _____
Portion of Work: _____

Subcontractor Name: _____
DIR Registration #: _____
Portion of Work: _____

Subcontractor Name: _____
DIR Registration #: _____
Portion of Work: _____

Subcontractor Name: _____
DIR Registration #: _____
Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Subcontractor Name: _____

DIR Registration #: _____

Portion of Work: _____

Date: _____

Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

NOTICE OF AWARD

Dated: _____ 20__

To: _____ (Contractor)

To: _____
(Address)

From: Governing Board ("Board") of the Oxnard Union High School District ("District")

Re: _____, Project No. _____ ("Project").

Contractor has been awarded the Contract for the above-referenced Project on _____
_____, 20__, by action of 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 **TEN (10)** calendar days of
the date of this Notice of Award.

The Contractor shall execute and submit the following documents by 5:00 p.m. of the
TENTH (10th) calendar day following the date of the Notice of Award.

- a. Agreement: To be executed by successful Bidder. Submit three (3) copies,
each bearing an original signature.
- b. Performance Bond (100%): On the form provided in the Contract Documents
and fully executed as indicated on the form.
- c. Payment Bond (Contractor's Labor & Material Bond) (100%): On the form
provided in the Contract Documents and fully executed as indicated on the
form.
- d. Insurance Certificates and Endorsements as required.
- e. Workers' Compensation Certification.
- f. Prevailing Wage and Related Labor Requirements Certification.
- g. Disabled Veteran Business Enterprise Participation Certification.
- h. Drug-Free Workplace Certification.

- i. Tobacco-Free Environment Certification.
- j. Hazardous Materials Certification.
- k. Lead-Based Materials Certification.
- l. Criminal Background Investigation/Fingerprinting Certification.

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.

OXNARD UNION HIGH SCHOOL DISTRICT

BY: _____

NAME: _____

TITLE: _____

END OF DOCUMENT

**BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL**

**OXNARD UNION HIGH SCHOOL DISTRICT
AGREEMENT
00 52 13 -i**

AGREEMENT

THIS AGREEMENT IS MADE AND ENTERED INTO THIS _____ DAY OF _____
_____, 20____, by and between the Oxnard Union High School 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" 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, valid, written 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 49 documents, which shall control over figured dimensions, which shall control over large-scale drawings, which shall control over small-scale drawings. In the case of a 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 the District with the functionally complete and operable Project described in the Drawings and Specifications. 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 _____ (____)

consecutive calendar days ("Contract Time") from the date specified in the District's Notice to Proceed.

1. **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.

2. **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.

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, and such deduction does not constitute a withholding or penalty. 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, provided that Contractor has complied with the claims procedure of the Contract Documents. This provision does not exclude the recovery of damages by either party under other provisions in the Contract Documents.

3. **Loss Or Damage:** The District and its agents and 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 whatsoever; and shall hold the District and its agents and authorized representatives harmless from all liability of every kind and nature arising from accident, negligence, or any cause whatsoever.

4. **Limitation Of District Liability:** District's financial obligations under this Contract shall be limited to the payment of the compensation provided in this Contract. Notwithstanding any other provision of this Contract, in no event shall District be liable, regardless of whether any claim is based on contract or tort, for any special, consequential, indirect or incidental damages, including, but not limited to, lost profits or revenue, lost bonding capacity, arising out of or in connection with this Contract for the services performed in connection with this Contract.

5. **Insurance and Bonds:** Prior to issuance of the Notice to Proceed by the District, Contractor shall provide all required certificates of insurance, insurance endorsements, and payment and performance bonds as evidence thereof.
6. **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.
7. **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 ("DSA") have authority to approve and/or suspend 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 and regulations. The Contractor shall be liable for any delay caused by its non-compliant Work.
8. **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 prior 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.
9. **Classification of Contractor's License:** Contractor hereby acknowledges that it currently holds valid Type _____ Contractor's license(s) issued by the State of California, Contractors' State License Board, in accordance with division 3, chapter 9, of the Business and Professions Code and in the classification called for in the Contract Documents.
10. **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 1771.1.
11. **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.
12. 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.

13. **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).

14. **No Representations:** No representations have been made other than as set forth in writing in the Contract Documents, including this Agreement. Each of the Parties to this Agreement warrants that it has carefully read and understood the terms and conditions of this Agreement and all Contract Documents, and that it has not relied upon the representations or advice of any other Party or any attorney not its own.
15. **Entire Agreement:** The Contract Documents, including this Agreement, set forth the entire agreement between the parties hereto and fully supersede any and all prior agreements, understandings, written or oral, between the parties hereto pertaining to the subject matter thereof.
16. **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

OXNARD UNION HIGH SCHOOL DISTRICT

By: _____

By: _____

Name: _____

Name: _____

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

**BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL**

**OXNARD UNION HIGH SCHOOL DISTRICT
AGREEMENT
00 52 13 -vi**

BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL

OXNARD UNION HIGH SCHOOL DISTRICT
NOTICE TO PROCEED
00 55 00 -1

NOTICE TO PROCEED

Dated: _____, 20__

TO: _____
("Contractor")

ADDRESS: _____

PROJECT: _____

PROJECT/CONTRACT NO.: _____ between the Oxnard Union High School 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__.

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. Registered Subcontractors List: A complete subcontractors list for all tiers, including the name, address, telephone number, email address, facsimile number, California State Contractors License number, license classification, Department of Industrial Relations registration number, and monetary value of all Subcontracts.

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

OXNARD UNION HIGH SCHOOL DISTRICT

BY: _____

NAME: _____

TITLE: _____

END OF DOCUMENT

**BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL**

**OXNARD UNION HIGH SCHOOL DISTRICT
NOTICE TO PROCEED
00 55 00 -3**

**BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL**

**OXNARD UNION HIGH SCHOOL DISTRICT
PERFORMANCE BOND
00 61 13.13 -i**

PERFORMANCE BOND
(100% of Contract Price)

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

KNOW ALL PERSONS BY THESE PRESENTS:

WHEREAS, the governing board ("Board") of the Oxnard Union High School 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" 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:

- Promptly 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.

Or, at the District's sole discretion and election, the Surety shall obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by the District of the lowest responsible bidder, arrange for a contract between such bidder and the District and make available as Work progresses sufficient funds to pay the cost of completion less the "balance of the Contract Price," and to pay and perform all obligations of Principals under the Contract, including, without limitation, all obligations with respect to warranties, guarantees and the payment of liquidated damages. The term "balance of the Contract Price," as used in this paragraph, shall mean the total amount payable to Principal by the District under the Contract and any modifications thereto, less the amount previously paid by the District to the Principal, less any withholdings by the District allowed under the Contract. District shall not be required or obligated to accept a tender of a completion contractor from the Surety for any or no reason.

The condition of the obligation is such that, if the above bound Principal, 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 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. The Surety also stipulates and agrees that it shall not be exonerated or released from the obligation of this bond by any overpayment or underpayment by the District that is based upon estimates approved by the Architect. The Surety 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____.

_____	Principal	_____	Surety
_____	By	_____	By
		_____	Name of California Agent of Surety
		_____	Address of California Agent of Surety
		_____	Telephone No. of California Agent of Surety

Contractor 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: Contractor must use this form, NOT a surety company form.)

KNOW ALL PERSONS BY THESE PRESENTS:

WHEREAS, the governing board ("Board") of the Oxnard Union High School 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" 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 its subcontractors, or their heirs, executors, administrators, successors, or assigns of any, all, or either of them shall fail to pay for any labor, materials, provisions, or other supplies, used in, upon, for or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts 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__.

_____	_____
Principal	Surety
_____	_____
By	By

	Name of California Agent of Surety

	Address of California Agent of Surety

	Telephone No. of California Agent of Surety

Contractor 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

BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL

OXNARD UNION HIGH SCHOOL DISTRICT
PAYMENT BOND
00 61 13.16 -3

**BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL**

**OXNARD UNION HIGH SCHOOL DISTRICT
PROPOSED CHANGE ORDER FORM
00 63 57 -i**

PROPOSED CHANGE ORDER FORM

Oxnard Union High School District
 309 South K Street
 Oxnard, CA 93030

PCO NO.:

Project: _____
Bid No.: _____
RFI #: _____

Date: _____
DSA File No.: _____
DSA Appl. No.: _____

Contractor hereby submits for District’s review and evaluation this Proposed Change Order (“PCO”), submitted in accordance with and subject to the terms of the Contract Documents, including Sections 17.7 and 17.8 of the General Conditions. Any spaces left blank below are deemed no change to cost or time.

Contractor understands and acknowledges that documentation supporting Contractor’s PCO must be attached and included for District review and evaluation. Contractor further understands and acknowledges that failure to include documentation sufficient to, in District’s discretion, support some or all of the PCO, shall result in a rejected PCO.

	<u>WORK PERFORMED OTHER THAN BY CONTRACTOR</u>	<u>ADD</u>	<u>DEDUCT</u>
(a)	<u>Material</u> (attach suppliers’ invoice or 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; “TBD” not permitted)	____ Calendar Days	

[REMAINDER OF PAGE LEFT BLANK INTENTIONALLY]

	WORK PERFORMED BY CONTRACTOR	ADD	DEDUCT
(l)	Material (attach itemized quantity and unit cost plus sales tax)		
(m)	Add Labor (attach itemized hours and rates, fully encumbered)		
(n)	Add Equipment (attach suppliers' invoice)		
(o)	Subtotal		
(p)	Add Overhead and Profit for Contractor , not to exceed fifteen percent (15%) of Item (d)		
(q)	Subtotal		
(r)	Add Bond and Insurance , not to exceed one and a half percent (1.5%) of Item (f)		
(s)	TOTAL		
(t)	Time (zero unless indicated; "TBD" not permitted)	_____ Calendar Days	

The undersigned Contractor approves the foregoing as to the changes, if any, to 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.

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 including, without limitation, cumulative impacts. Contractor is not entitled to separately recover amounts for overhead or other indirect costs. Any costs, expenses, damages, or time extensions not included are deemed waived.

SUBMITTED BY:

Contractor:

[Name]

Date

END OF DOCUMENT

**BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL**

**OXNARD UNION HIGH SCHOOL DISTRICT
PROPOSED CHANGE ORDER FORM
00 63 57 -iv**

**BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL**

**OXNARD UNION HIGH SCHOOL DISTRICT
SPECIAL CONDITIONS
00 72 13 -i**

00 63 63

CHANGE ORDER FORM

Oxnard Union High School District
309 South K Street
Oxnard, CA 93030

CHANGE ORDER NO.:

CHANGE ORDER

Project: _____
Bid No.: _____

Date: _____
DSA File No.: _____
DSA Appl. No.: _____

The following parties agree to the terms of this Change Order:

Owner: _____
[Name / Address]

Contractor: _____
[Name / Address]

Architect: _____
[Name / Address]

Project Inspector: _____
[Name / Address]

Reference	Description	Cost	Days Ext.
PCO # Requested by: Performed by: Reason:	[Description of change] [Requester] [Performer] [Reason]	\$	
PCO # Requested by: Performed by: Reason:	[Description of change] [Requester] [Performer] [Reason]	\$	
PCO # Requested by: Performed by: Reason:	[Description of change] [Requester] [Performer] [Reason]	\$	
Contract time will be adjusted as follows: Previous Completion Date: __[Date] _____[#] Calendar Days Extension (zero unless otherwise indicated) Current Completion Date: __[Date]	Original Contract Amount: Amount of Previously Approved Change Order(s): Amount of this Change Order: Contract Amount:	\$ \$ \$ \$	

BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL

OXNARD UNION HIGH SCHOOL DISTRICT
SPECIAL CONDITIONS
00 72 13 -ii

**BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL**

**OXNARD UNION HIGH SCHOOL DISTRICT
SPECIAL CONDITIONS
00 72 13 -iv**

**BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL**

**OXNARD UNION HIGH SCHOOL DISTRICT
GUARANTEE FORM
00 65 36 -i**

GUARANTEE FORM

_____ ("Contractor") hereby agrees that the _____
_____ ("Work" of Contractor) which Contractor has installed for the Oxnard Union
High School 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.: _____

Email: _____

END OF DOCUMENT

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, or extreme temperature conditions in excess of the norm for the location and time of year it occurred based on the closest weather station data averaged over the past five years, (2) that is unanticipated and would cause unsafe work conditions and/or is unsuitable for scheduled work that should not be performed during inclement weather (i.e., exterior finishes), and (3) at the Project.

1.1.1 Allowance Expenditure Directive: Written authorization for expenditure of allowance, if any.

1.1.2 Approval, Approved, and/or Accepted: Written authorization, unless stated otherwise.

1.1.3 Architect (or "Design Professional in General Responsible Charge"): 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-Builts: 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. See **Record Drawings**.

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
- 1.1.11.7** Non-Collusion Declaration
- 1.1.11.8** Notice of Award
- 1.1.11.9** Notice to Proceed
- 1.1.11.10** Agreement
- 1.1.11.11** (not used)
- 1.1.11.12** (not used)
- 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
- 1.1.11.17** Project Labor Agreement
- 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 Veteran Business Enterprise Participation Certification
- 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 Materials Certification
- 1.1.11.26** Imported Materials Certification
- 1.1.11.27** Criminal Background Investigation/Fingerprinting Certification
- 1.1.11.28** (not used)
- 1.1.11.29** (not used)
- 1.1.11.30** Registered Subcontractors List
- 1.1.11.31** Iran Contracting Act Certification
- 1.1.11.32** (not used)
- 1.1.11.33** All Plans, Technical Specifications, and Drawings

- 1.1.11.34** Any and all addenda to any of the above documents
- 1.1.11.35** 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 Design Professional in General Responsible Charge:** See definition of **Architect** above.
- 1.1.19 Dispute:** A separate demand by Contractor for a time extension, or 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.
- 1.1.20 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,
- 1.1.20.1** 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
- 1.1.20.2** 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.
- 1.1.21 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.
- 1.1.22 DSA:** Division of the State Architect.

1.1.23 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 price for a specific portion of work and whereby the Contractor performs the work as indicated herein on a time and materials basis.

1.1.24 Job Cost Reports: Any and all reports or records detailing the costs associated with work performed on or related to the Project that Contractor shall maintain for the Project. Specifically, Job Cost Reports shall contain, but are not limited by or to, the following information: a description of the work performed or to be performed on the Project; quantity, if applicable, of work performed (hours, square feet, cubic yards, pounds, etc.) for the Project; Project budget; costs for the Project to date; estimated costs to complete the Project; and expected costs at completion. The Job Cost Reports shall also reflect all Contract cost codes, change orders, elements of non-conforming work, back charges, and additional services.

1.1.25 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.

1.1.26 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.

1.1.27 Plans: See **Drawings**.

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

1.1.29 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.

1.1.30 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.

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

1.1.33 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.

1.1.34 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.

1.1.35 Proposed Change Order (or "PCO"): 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.

1.1.36 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.

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

1.1.38 Record Drawings: 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. See also **As-Builts**.

1.1.39 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.

1.1.40 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.

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

1.1.42 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.

1.1.43 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.

1.1.44 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.

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

1.1.46 Specifications: That portion of the Contract Documents, Division 1 through Division 49, 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.

1.1.47 State: The State of California.

1.1.48 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.

1.1.49 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.

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

1.1.51 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.

1.1.52 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 Work 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 become 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 one (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.

1.5.1.5 Electronic mail may be used for convenience but is not a substitute for the notice and service requirements herein.

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, in a good and workmanlike manner, within the Contract Time.

1.8.2 Unless otherwise specified, all materials shall be new and of the best quality of their respective kinds and grades as noted or specified, workmanship shall be of good quality, and Contractor shall use all diligence to inform itself fully as to the required manufacturer's instructions and to comply therewith.

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 from the elements, theft, vandalism, or other loss or damage 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 five (5) days' demand from District, present documentary evidence showing that orders have been placed.

1.8.6 District reserves the right but has no obligation, in response to Contractor's neglect or failure in complying with the above instructions, to place orders for such materials and/or equipment as the District may deem advisable in order that the Work may be completed at the date specified in the Contract, and all expenses incidental to the procuring of said materials and/or equipment shall be paid for by Contractor or deducted 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 ensure 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; the Contractor or Subcontractor's respective 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 within the Contract Documents 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 applicable at the time the Work is performed) 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 suspend 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 approval, 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 provided, 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 the testing laboratory and pay for the cost of all tests and inspections, excepting those inspections performed at Contractor's request and expense. Contractor shall reimburse the District for any and all laboratory costs or other testing costs for any materials found to be not in compliance with the Contract Documents. At the District's discretion, District may elect to deduct

laboratory or other testing costs for noncompliant materials from the Contract Price, and such deduction shall not constitute a withholding.

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 and complete, in a good and workmanlike manner, 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 (excluding DSA), fees, licenses, facilities, transportation, taxes, bonds and insurance, 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 agents, and 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 Contractors 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.

6.1.4 Contractor represents that it has no existing interest and will not acquire any interest, direct or indirect, which could conflict in any manner or degree with the performance of Work required under this Contract and that no person having any such interest shall be employed by Contractor.

6.2 Project Inspection Card(s)

Contractor shall verify that forms DSA 152 (or the current version applicable at the time the Work is performed) 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, an experienced and 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. If the Contractor's project manager and/or construction superintendent proves to be unsatisfactory to Contractor, or to District, any of the District's employees, agents, the Construction Manager, or the Architect, the unsatisfactory project manager and/or construction superintendent shall be replaced. However, Contractor shall notify District in writing before any change occurs, but no less than two (2) business days prior. Any replacement of the project manager and/or construction superintendent shall be made promptly and must be satisfactory to the District. 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 in writing prior to making any contemplated change. The District shall determine in writing 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 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 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, including DIR registration numbers.
- 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** A 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

Contractor shall maintain, and District shall have the right to inspect, Contractor's financial records for the Project, including, without limitation, Job Cost Reports for the Project in compliance with the criteria set forth herein. 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, Job Cost Reports, 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 of a design professional to detect errors, omissions or inconsistencies in the Contract Documents or to ascertain compliance with applicable laws, building codes or regulations. However, nothing in this provision shall abrogate Contractor's responsibilities for discovering and reporting any error, inconsistency, or omission pursuant to the Contract within the Contractor's standard of care including, without limitation, any applicable laws, ordinance, rules, 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 costs caused by noncompliant, defective, or delayed 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 the most current version applicable at the time the Work is performed) 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 Registrations

Contractor shall secure and pay for all permits (except DSA), licenses, registrations, approvals 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, approvals 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, approvals, 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, registrations, approvals 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 may 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 International 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 and arising from the correction of said Work.

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 applicable at the time the Work is performed, and as determined by those 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 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 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 therefore. 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 increased hours, 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 increased or additional Inspector charges as a result of Contractor's increased hours, or 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 and securing 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, including property immediately adjacent thereto, free from debris such as waste, rubbish (including personal rubbish of workers, e.g., food wrappers, etc.), and excess materials and equipment caused by the Work. Contractor shall not leave debris under, in, or about the Premises (or surrounding property or neighborhood), 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 continued operations. 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 may, at its sole discretion, 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 that 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, including Subcontractor caused Project delays, as it is for acts and omissions of persons directly employed by Contractor. The divisions or sections of the Specifications and/or the arrangement of the drawings 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 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, including, without limitation, sections 4107, 4107.5, and 4109 of the Public Contract Code, and section 1771.1 of the Labor 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, then 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, before proceeding with its Work, promptly report to the District in writing 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 and not caused by 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 operation(s) of the Premises and/or to District or any other contractor working on the Project. If simultaneous execution of any contract or Premises 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 with the Contract Documents, 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 As required by Section 4-317(c), Part 1, Title 24, CCR: "Should any existing conditions such as deterioration or non-complying construction be discovered which is not covered by the DSA-approved documents wherein the finished work will not comply with Title 24, California Code of Regulations, a construction change document, or a separate set of plans and specifications, detailing and specifying the required repair work shall be submitted to and approved by DSA before proceeding with the repair work."

9.9 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.

10.1.1.1.1 The District is not required to approve a preliminary schedule of construction with early completion, i.e., one that shows early completion dates for the Work and/or milestones. Contractor shall not be entitled to extra compensation if the District approves a Construction Schedule with an early completion date and Contractor completes the Project beyond the date shown in the schedule but within the Contract Time. A Construction Schedule

showing the Work completed in less than the Contract Time, the time between the early completion date and the end of the Contract Time shall be Float.

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 District acceptance.

10.1.1.2.2 And also 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%.
- 10.1.1.2.3.4** Closeout documentation shall have a value in the preliminary schedule of not less than 5%.

10.1.1.2.4 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.

10.1.1.2.5 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. For example, without limiting the foregoing, Contractor shall not "front-load" the preliminary schedule of values with dollar amounts greater than the value of activities performed early in the Project.

10.1.1.2.6 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. All submittals shall be submitted no later than 90 days after the Notice to Proceed.

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 Occupational Safety and Health ("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 Registered Subcontractors List. The name, address, telephone number, facsimile number, California State Contractors License number, classification, DIR registration number and monetary value of all Subcontracts of any tier 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 as well as updating the Registered Subcontractors List. 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.

10.2.3 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.

10.2.4 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.

10.2.5 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.

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

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 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 substances 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 or for the Project is available, that report may be available to the Contractor but shall not be a part of this Contract and shall not alleviate or excuse the Contractor's obligation to perform its own investigation. 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. Although any such report is not a part of this Contract, recommendations from the report may be included in the Drawings, Specifications, or other Contract Documents. It is Contractor's sole responsibility to thoroughly review all Contract Documents, Drawings, and Specifications.

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 potholing 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 a reasonable margin and shall not relieve Contractor of responsibilities to exercise reasonable care or 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 or 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 CalOSHA 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 at least as broad as 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, or in connection with, 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 coverage, and Automobile Liability Insurance coverage including owned, non-owned, and hired automobiles, 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 If Contractor's underlying policy limits are less than required, subject to the District's sole discretion, 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 in order to satisfy, in the aggregate with its underlying policy, the insurance requirements herein..

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 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.

13.1.2.3 The District, in its sole discretion, may accept the Excess Liability Insurance Policy that brings Contractor's primary limits to the minimum requirements herein.

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, rain, dust, 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 Offices, Inc. (ISO) Form CG 2415, or Contractor shall procure and maintain these coverages separately.

13.1.6.2 Contractor warrants that any retroactive date applicable to coverage under the policy shall predate 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, is 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 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 the following, or other language acceptable to the District:

“This policy shall not be canceled until written notice to District, Architect, and Construction Manager stating date of the cancellation by the insurance carrier. Date of cancellation 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.

13.1.7.2.3 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.

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

13.1.7.2.5 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).

13.1.7.2.6 Contractor's insurance limit shall apply separately to each insured against whom a claim is made or suit is brought.

13.1.7.3 No policy shall be amended, canceled or modified, and the coverage amounts shall not be reduced, until Contractor or Contractor's broker has provided written notice to District, Architect(s), and Construction Manager(s) stating date of the amendment, modification, cancellation or reduction, and a description of the change. Date of amendment, modification, cancellation or reduction may not be less than thirty (30) days after date of mailing notice.

13.1.7.4 Insurance written on a "claims made" basis shall be retroactive to a date that coincides with or precedes Contractor's commencement of Work, including subsequent policies purchased as renewals or replacements. Said policy 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 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**.

13.1.7.6 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 Contract.

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

13.1.8.2 If Contractor normally carries insurance in an amount greater than the minimum amounts required by District, that greater amount shall become the minimum required amount of insurance for purposes of the Contract. Therefore, Contractor hereby acknowledges and agrees that all insurance carried by it shall be deemed liability coverage for all actions it performs in connection with the Contract.

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, unless a longer period is provided for in the Contract Documents:

14.1.2.1 The acceptance by the District's governing board of the Work, subject to these General Conditions, or

14.1.2.2 The date that commissioning for the Project, if any, was completed.

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, unless a longer period is provided for in the Contract Documents, 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 District operations, 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 and Defense

14.2.1 To the furthest extent permitted by California law, the Contractor shall indemnify, keep and hold harmless the District, the Architect(s), and the Construction Manager(s), their respective consultants, separate contractors, board members, officers, representatives, , agents, and employees, in both individual and official capacities ("Indemnitees"), against all suits, claims, injury, damages, losses, and expenses ("Claims"), including but not limited to attorney's fees, caused by, arising out of, resulting from, or incidental to, in whole or in part, the performance of the Work under this Contract by the Contractor, its Subcontractors, vendors, or suppliers. However, the Contractor's indemnification and hold harmless obligation shall be reduced by the proportion of the Indemnitees' and/or Architect's liability to the extent the Claim(s) is/are caused by the sole negligence, active negligence, or willful misconduct of the Indemnitees, and/or defects in design furnished by the Architect, as found by a court or arbitrator of competent jurisdiction. This indemnification and hold harmless obligation of the Contractor shall not be construed to negate, abridge, or otherwise reduce any right or obligation of indemnity that would otherwise exist or arise as to any Indemnitee or other person described herein. This indemnification and hold harmless obligation includes, but is not limited to, 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 failure or alleged failure of Contractor's obligations regarding any stop payment notice actions or liens, including Civil Wage and Penalty Assessments and/or Orders by the DIR.

14.2.2 To the furthest extent permitted by California law, Contractor shall also defend Indemnitees, at its own expense, including but not limited to attorneys' fees and costs, against all Claims caused by, arising out of, resulting from, or incidental to, in whole or in part, the performance of the Work under this Contract by the Contractor, its Subcontractors, vendors, or suppliers. However, without impacting Contractor's obligation to provide an immediate and ongoing defense of Indemnitees, the Contractor's defense obligation shall be retroactively reduced by the proportion of the Indemnitees' and/or Architect's liability to the extent caused by the sole negligence, active negligence, or willful misconduct of the Indemnitees, and/or defects in design furnished by the Architect, as found by a court or arbitrator of competent jurisdiction. The District shall have the right to accept or reject any legal representation that Contractor proposes to defend the Indemnitees. If any Indemnitee provides its own defense due to failure to timely respond to tender of defense, rejection of tender of defense, or conflict of interest of proposed counsel, Contractor shall reimburse such Indemnitee for any expenditures. Contractor's defense obligation shall not be construed to negate, abridge, or otherwise reduce any right or obligation of defense that would otherwise exist as to any Indemnitee or other person described herein. Contractor's defense obligation includes, but is not limited to, 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 failure or alleged failure of Contractor's obligations regarding any stop payment notice actions or liens, including Civil Wage and Penalty Assessments and/or Orders by the DIR. The Contractor shall give prompt notice to the District in the event of any Claim(s).

14.2.3 Without limitation of the provisions herein, if the Contractor's obligation to indemnify and hold harmless the Indemnitees or its obligation to defend 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 fullest extent permitted by law.

14.2.4 Pursuant to Public Contract Code section 9201, the District shall provide timely notification to Contractor of the receipt of any third-party Claim relating to this Contract. The District shall be entitled to recover its reasonable costs incurred in providing said notification.

14.2.5 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.

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

14.2.7 The Contractor's defense and indemnification obligations hereunder shall survive the completion of Work, the warranty/guarantee period, and the termination of the Contract.

15. TIME

15.1 Notice to Proceed

15.1.1 District may issue a Notice to Proceed within ninety (90) days 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 ninety (90) days from the date of the Notice of Award, 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 in compliance with the time extension request procedures 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 (5) 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 Exceeds twelve (12) days of delay per year.

15.2.2 If the aforementioned conditions are met, a non-compensable 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 and competent work forces with the required levels of familiarity with the Project and skill, training and experience 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.

15.3.3 No Work during State 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 or Federally-required tests. The District or District's Representative will provide Contractor with a schedule of test dates concurrent with the District's issuance of the Notice to Proceed, or as soon as test dates are made available to the District.

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 and the direct correlation between the cause and effect. 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. In particular, Contractor must show an actual impact to the schedule, after making a good faith effort to mitigate the delay by rescheduling the work, by providing an analysis of the schedule ("Time Impact Analysis"). Such Time Impact Analysis shall describe in detail the cause and effect of the delay and the impact on the critical dates in the Project schedule. (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;

16.3.2.4 The delay could not have been avoided or mitigated by Contractor's reasonable diligence; and

16.3.2.5 Contractor timely 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 in advance of the changed Work being performed. 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 and approved 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 or extend the Contract Time, the cost of or length of extension in that Change Order shall be agreed to, in writing, by the District in advance of the Work by Contractor, and shall 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. Under no circumstances shall Contractor be entitled to any claim of additional compensation or time not expressly requested by Contractor in a Proposed Change Order or approved by District in an executed Change Order.

17.1.4 A Change order or Construction Change Directive will become effective when approved by the Board, notwithstanding that Contractor has not signed it. A Change Order or Construction Change Directive will become effective without Contractor's signature provided District indicates it as a "Unilateral Change Order". Any dispute as to the adjustment in the Contract Price or Contract Time, if any, of the Unilateral Change Order shall be resolved pursuant to the Payment and Claims and Disputes provisions herein.

17.1.5 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, by Architect's response(s) to RFI(s), or 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 Governing Board), 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, and Contractor shall not be entitled to separately recover additional amounts for overhead and/or profit.

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 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 and backup documentation pursuant to the revisions herein and sufficient, in the District's judgment, 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. The Contractor shall justify the proposed change in time by submittal of a schedule analysis that accurately shows the impact of the change on the critical path of the Construction Schedule ("Time Impact Analysis"). If Contractor fails to request a time extension in a PCO, including the Time Impact Analysis, then the Contractor is thereafter precluded from requesting, and waives any right to request, additional time and/or claim a delay. In no case shall Contractor or any of its Subcontractors be permitted to reserve rights for additional time for Change Order Work. A PCO that leaves the amount of time requested blank, or states that such time requested is "to be determined", is not permitted and shall also constitute a waiver of any right to request additional time and/or claim a delay.

17.7.4 Unknown and/or Unforeseen Conditions

If there is an Allowance, then Contractor must submit a Request for Allowance Expenditure Directive, including supporting documentation as described below, to receive authorization for the release of funds from the Allowance. Allowance Expenditure Directives shall be based on Contractor's costs, without overhead and profit, for products, delivery, installation, labor, insurance, payroll, taxes, bonding and equipment rental will be included in Allowance Expenditure Directive authorizing expenditure of funds from this Allowance. No overhead and profit shall be added to the Allowance Expenditure Directive. If cost of the unforeseen condition(s) exceed the Allowance, Contractor must submit a PCO for amounts in excess of the Allowance 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 as unsubstantiated, and the Contractor shall complete the Project without any increase in Contract Price and/or Contract Time based on that PCO.

17.7.5 Time to Submit Proposed Change Order

Contractor shall submit its PCO within five (5) working days of the date Contractor discovers, or reasonably should have discovered, the circumstances giving rise to the PCO, unless additional time to submit a PCO is granted in writing by the District. Time is of the essence in Contractor's submission of PCOs so that the District can promptly investigate the basis for the PCO. Accordingly, if Contractor fails to submit its PCO within this timeframe, Contractor waives, releases, and discharges any right to assert or claim any entitlement to an adjustment of the Contract Price and/or Time based on circumstances giving rise to the PCO.

17.7.6 Proposed Change Order Certification

In submitting a PCO, Contractor certifies and affirms that the cost and/or time request is submitted in good faith, that the cost and/or time request is accurate and in accordance with the provisions of the Contract Documents, and the Contractor submits the cost and/or request for extension of time recognizing the significant civil penalties and treble damages which follow from making a false claim or presenting a false claim under Government Code section 12650 et seq.

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 including, without limitation, cumulative impacts. Contractor is not entitled to separately recover amounts for overhead or other indirect costs. Any costs, expenses, damages, or time extensions not included are deemed waived.

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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 suppliers’ invoice or 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; “TBD” not permitted)	____ 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; “TBD” not permitted)	____ 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 the actual cost, not to exceed prevailing wage rates in the locality of the Site and shall be in the labor classification(s) necessary for the performance of the Work, plus

employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State or local laws. 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 to 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.

17.8.5 Overhead and Profit. The phrase "Overhead and Profit" shall include field and office supervisors and assistants, watchperson, use of small tools, consumable, insurance other than construction bonds and insurance required herein, and general conditions costs and home office expenses.

17.9 Change Order Certification

17.9.1 All Change Orders and PCOs must include the following certification by the Contractor, either in the form specifically or incorporated by this reference:

17.9.1.1 The undersigned Contractor approves the foregoing as to the changes, if any, to 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 including, without limitation, cumulative impacts. Contractor is not entitled to separately recover amounts for overhead or other indirect costs. Any costs, expenses, damages, or time extensions not included are deemed waived.

17.9.2 Accord and Satisfaction: Contractor's execution of any Change Order shall constitute a full accord and satisfaction, and release, of all Contractor (and if applicable, Subcontractor) claims for additional time, money or other relief arising from or relating to the subject matter of the change including, without limitation, impacts of all types, cumulative impacts, inefficiency, overtime, delay and any other type of claim.

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. Unit Prices, if any, may be used in District's discretion in calculating reasonable value. 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, including, without limitation, Job Cost Reports as provided in these General Conditions, 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. Change Orders altered in violation of this provision, if in conflict with the terms set forth herein, shall be construed in accordance with the terms set forth herein. 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. 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.

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.

19.2.1.1.2 Applications received after June 20th will not be paid until the second week of July and applications received after December 12th will not be paid until the first week of January.

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 an 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 any of the following:

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 a 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 Allowing an unregistered subcontractor, as described in Labor Code section 1725.5, to engage in the performance of any work under this Contract.

19.4.1.16 Failure to properly maintain or clean up the Site.

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

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

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

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

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

19.4.1.22 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 and Record Specifications

20.2.2.2.1 Contractor shall provide exact Record Drawings of the Work ("As-Builts") and Record Specifications upon completion of the Project and as a condition precedent to approval of final payment.

20.2.2.2.2 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.

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

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 without District's prior written approval. 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 District 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, and 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 District's 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 District's 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 00 65 19.26, "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, which must be approved by the District.

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 by the Architect of the Application and 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 corrected, replaced, and/or recovered 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 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 District's 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 Request for Assurances

If District at any time reasonably believes Contractor is or may be in default under this Contract, District may in its sole discretion notify Contractor of this fact and request written assurances from Contractor of performance of Work and a written plan from Contractor to remedy any potential default under the terms of this Contract that the District may advise Contractor of in writing. Contractor shall, within ten (10) calendar days of District's request, deliver a written cure plan that meets the District's requirements in its request for assurances. Contractor's failure to provide such written assurances of performance and the required written plan, within the (10) calendar days of request, will constitute a material breach of this Contract sufficient to justify termination for cause.

24.2 District's Right to Terminate Contractor for Cause

24.2.1 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 any of the following:

24.2.1.1 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

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

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

24.2.1.4 Contractor persistently refuses 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

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

24.2.1.6 Contractor persistently disregards laws, or ordinances, or instructions of District; or

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

24.2.1.8 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.

24.2.2 **Notification of Termination**

24.2.2.1 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 and/or the Contractor's right to perform the Work of the Contract shall cease and terminate. Upon termination, Contractor shall not be entitled to receive any further payment until the entire Work is finished.

24.2.2.2 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:

24.2.2.2.1 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

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

24.2.2.3 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.

24.2.2.4 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.

24.3 Termination of Contractor for Convenience

24.3.1 District in its sole discretion may terminate the Contract in whole or in part upon three (3) days' written notice to the Contractor.

24.3.2 Upon notice, Contractor shall:

24.3.2.1 Cease operations as directed by the District in the notice;

24.3.2.2 Take necessary actions for the protection and preservation of the Work as soon as possible; and

24.3.2.3 Terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

24.3.3. Within 30 days of the notice, Contractor submit to the District a payment application for the actual cost for labor, materials, and services performed, including all Contractor's and Subcontractor(s)' mobilization and/or demobilization costs, that is unpaid. Contractor shall have no claims against the District except for the actual cost for labor, materials, and services performed that are adequately documented through timesheets, invoices, receipts, or otherwise. District shall pay all undisputed invoice(s) for work performed until the notice of termination.

24.3.4 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.

24.4 Effect of Termination

24.4.1 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 to the District by reason of the Contractor's failure to complete the Contract.

24.4.2 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.

24.4.3 In the event termination for cause is determined to have not been for cause, the termination shall be deemed to have been a termination for convenience effective as of the same date as the purported termination for cause.

24.4.4 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.

24.4.5 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.

24.4.6 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 its 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.

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

24.5 Emergency Termination of Public Contracts Act of 1949

24.5.1 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.

24.5.1.1 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.

24.5.1.2 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.

24.5.2 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.

24.6 Suspension of Work

24.6.1 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.

24.6.1.1 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:

24.6.1.1.1 That performance is, was or would have been so suspended, delayed or interrupted by another cause for which Contractor is responsible; or

24.6.1.1.2 That an equitable adjustment is made or denied under another provision of the Contract; or

24.6.1.1.3 That the suspension of Work was the direct or indirect result of Contractor's failure to perform any of its obligations hereunder.

24.6.1.2 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 PROCESS

25.1 Obligation to File Claims for Disputed Work

25.1.1 Should Contractor otherwise seek extra time or compensation for any reason whatsoever ("Disputed Work"), then Contractor shall first follow procedures set

forth in the Contract Documents including, without limitation, Articles 15, 16 and 17. A Notice of Potential Change or Proposed Change Order are less formal procedures that proceed the formal claim and do not constitute a Claim. A Claim also does not include correspondence, RFIs, vouchers, invoices, progress payment applications, or other routine or authorized form of requests for progress payments in compliance with the Contract. If a dispute remains, then Contractor shall give written notice to Owner that expressly invokes this Article 25 within the time limits set forth herein.

25.2 Duty to Perform during Claim Process

Contractor and its subcontractors shall continue to perform its Work under the Contract including the disputed work, 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.

25.3 Definition of Claim

25.3.1 Pursuant to Public Contract Code section 9204, the term "Claim" means a separate demand by the Contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:

25.3.1.1 A time extension, including without limitation, for relief of damages or penalties for delay assessed by the District under the Contract;

25.3.1.2 Payment by the District of money or damages arising from work done by, or on behalf of, the Contractor pursuant to the Contract and payment of which is not otherwise expressly provided for or to which Contractor is not otherwise entitled to; or

25.3.1.3 An amount of payment disputed by the District.

25.4 Claims Presentation

25.4.1 Form and Contents of Claim

25.4.1.1 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 thirty (30) days after the event giving rise to the Claim, give notice of the Claim in writing specifically identifying Contractor is invoking this Article 25 Claims Presentation.

25.4.1.2 The Claim shall include an itemized statement of the details and amounts of its Claim for any increase in the Contract Price of Contract Time as provided below, including a Time Impact Analysis and any and all other documentation substantiating Contractor's claimed damages:

25.4.1.2.1 The issues, events, conditions, circumstances and/or causes giving rise to the dispute, and shall show, in detail, the cause and effect of same;

25.4.1.2.2 Citation to provisions in the Contractor Documents, statute sections, and/or case law entitling Contractor to an increase in the Contract Price or Contract Time;

25.4.1.2.3 The pertinent dates and/or durations and actual and/or anticipated effects on the Contract Price, Contract Schedule milestones and/or Contract Time adjustments;

25.4.1.2.4 The Time Impact Analysis of all time delays that shows actual time impact on the critical path; and

25.4.1.2.5 The line-item costs for labor, material, and/or equipment, if applicable, for all cost impacts priced like a change order according to Article 17 and must be updated monthly as to cost and entitlement if a continuing claim.

25.4.1.3 The Claim shall include the following certification by the Contractor:

25.4.1.3.1 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.

25.4.1.3.2 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 including, without limitation, cumulative impacts. Contractor may not separately recover for overhead or other indirect costs. Any costs, expenses, damages, or time extensions not included are deemed waived.

25.4.2 Contractor shall bear all costs incurred in the preparation and submission of a claim.

25.4.3 Failure to timely submit a claim and the requisite supporting documentation shall constitute a waiver of Contractor's claim(s) against the District and Contractor's claims for compensation or an extension of time shall be forfeited and invalidated.

25.5 Claim Resolution pursuant to Public Contract Code section 9204

Contractor may request to waive the claims procedure under Public Contract Code section 9204 and proceed directly to the commencement of a civil action or binding arbitration. If Contractor chooses to proceed, Contractor shall comply with the following steps:

25.5.1 STEP 1:

25.5.1.1 Upon receipt of a Claim by registered or certified mail, return receipt requested, including the documents necessary to substantiate it, the District shall conduct a reasonable review of the Claim and, within a period **not to exceed 45 days**, shall provide the Contractor a written statement identifying what portion of the Claim is disputed and what portion is undisputed. Upon receipt of a Claim, the District and Contractor may, **by mutual agreement, extend the time period** to provide a written statement. If the District needs approval from its governing body to provide the Contractor a written statement identifying the disputed portion and the undisputed portion of the Claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of Claim sent by registered mail or certified mail, return receipt requested, the District shall have **up to three (3) days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension**, expires to provide Contractor a written statement identifying the disputed portion and the undisputed portion.

25.5.1.1.1 Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the District issues its written statement. Amounts not paid in a timely manner as required by this section, section 25.4, shall bear interest at seven percent (7%) per annum.

25.5.1.2 Upon receipt of a Claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable. In this instance, District and Contractor must comply with the sections below regarding Public Contract Code section 20104 et seq. and Government Code Claim Act Claims.

25.5.1.3 If the District fails to issue a written statement, or to otherwise meet the time requirements of this section, this shall result in the Claim being deemed rejected in its entirety. A Claim that is denied by reason of the District's failure to have responded to a Claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the Claim or the responsibility or qualifications of Contractor.

25.5.2 STEP 2:

25.5.2.1 If Contractor disputes the District's written response, or if the District fails to respond to a Claim within the time prescribed, Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the District shall schedule a meet and confer conference within 30 days for settlement of the dispute. Within 10 business days following the conclusion of the meet and confer conference, if the Claim or any portion of the Claim remains in dispute, the District shall provide the Contractor a written statement identifying the portion of the Claim that remains in dispute and the portion that is undisputed.

25.5.2.1.1.1 Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the District issues its

written statement. Amounts not paid in a timely manner as required by this section, section 25.4, shall bear interest at seven percent (7%) per annum.

25.5.3 STEP 3:

25.5.3.1 Any disputed portion of the Claim, as identified by Contractor in writing, shall be submitted to nonbinding mediation, with the District and Contractor sharing the associated costs equally. The District and Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the Claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the Claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the Claim remaining in dispute shall be subject to applicable procedures outside this section.

25.5.3.1.1 For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

25.5.3.2 Unless otherwise agreed to by the District and Contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Public Contract Code section 20104.4 to mediate after litigation has been commenced.

25.4.4 STEP 4:

25.5.4.1 If mediation under this section does not resolve the parties' dispute, the District may, but does not require arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program.

25.6 Subcontractor Pass-Through Claims

25.6.1 If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a District because privity of contract does not exist, the contractor may present to the District a Claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that Contractor present a Claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the Claim be presented to the District shall furnish reasonable documentation to support the Claim.

25.6.2 Within 45 days of receipt of this written request from a subcontractor, Contractor shall notify the subcontractor in writing as to whether the Contractor presented the Claim to the District and, if Contractor did not present the Claim, provide the subcontractor with a statement of the reasons for not having done so.

25.6.3 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 Government Code Claim Act Claim

25.7.1 If a claim, or any portion thereof, remains in dispute upon satisfaction of all applicable 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.

25.7.2 Contractor shall bear all costs incurred in the preparation, submission and administration of a Claim. Any claims presented in accordance with the Government Code must affirmatively indicate Contractor's prior compliance with the claims procedure herein of the claims asserted.

25.7.3 For purposes of those provisions, the running of the time within which a claim pursuant to Public Contract Code section 20104.2 only must be presented to the District shall be tolled from the time the claimant submits his or her written claim pursuant to subdivision (a) until the time that claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

25.8 Claim Resolution pursuant to Public Contract Code section 20104 et seq.

25.8.1 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 attempt to resolve all claims of three hundred seventy-five thousand dollars (\$375,000) or less which arise between Contractor and District by those procedures set forth in Public Contract Code section 20104, et seq., to the extent applicable.

25.8.1.1 Contractor shall file with the District any written Claim, including the documents necessary to substantiate it, upon the application for final payment.

25.8.1.2 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.

25.8.1.2.1 If additional information is required, it shall be requested and provided by mutual agreement of the parties.

25.8.1.2.2 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.

25.8.1.3 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.

25.8.1.3.1 If additional information is required, it shall be requested and provided upon mutual agreement of the District and the Contractor.

25.8.1.3.2 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.

25.8.1.4 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.

25.8.1.5 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.

25.8.1.6 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.

25.8.1.7 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.

25.8.1.8 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 due 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.

25.8.2 Contractor shall bind its Subcontractors to the provisions of this Section and will hold the District harmless against disputes by Subcontractors.

25.9 Claim Procedure Compliance

25.9.1 Failure to submit and administer claims as required in Article 25 shall waive Contractor's right to claim on any specific issues not included in a timely submitted claim. Claim(s) not raised in a timely protest and timely claim submitted under this Article 25 may not be asserted in any subsequent litigation, Government Code Claim, or legal action.

25.9.2 District shall not be deemed to waive any provision under this Article 25, if at Owner's sole discretion, a claim is administered in a manner not in accord with this Article 25. Waivers or modifications of this Article 25 may only be made by a signed change order approved as to form by legal counsel for both District and Contractor; oral or implied modifications shall be ineffective.

25.10 Claim Resolution Non-Applicability

25.4.5 The procedures for dispute and claim resolutions set forth in this Article shall not apply to the following:

25.4.5.1 Personal injury, wrongful death or property damage claims;

25.4.5.2 Latent defect or breach of warranty or guarantee to repair;

25.4.5.3 Stop payment notices;

25.4.5.4 District's rights set forth in the Article on Suspension and Termination;

25.4.5.5 Disputes arising out of labor compliance enforcement by the Department of Industrial Relations; or

25.4.5.6 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 Claim Resolution requirements provided in this Article.

25.11 Attorney's Fees

25.4.6 Should litigation be necessary to enforce any terms or provisions of this Agreement, then each party shall bear its own litigation and collection expenses, witness fees, court costs and attorney's fees.

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, 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 day's 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") electronically using DIR's eCPR System by uploading the CPRs by electronic XML file or entering each record manually using the DIR's iform (or current form) online on a weekly basis and within ten (10) days of any request by the District or Labor Commissioner at <http://www.dir.ca.gov/Public-Works/Certified-Payroll-Reporting.html> 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 the Labor Commissioner, these penalties shall be withheld from progress payments then due.

26.4.6 [RESERVED]

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, 9th floor, San Francisco, California 94102.

26.7 Non-Discrimination

26.7.1 Contractor herein agrees 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 (Lab. Code, § 6300 et seq.; 8 Cal. Code of Regs., § 330 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, which assignment shall be made and become effective at the time the awarding body tenders final payment to the Contractor, without further acknowledgment by the parties.

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 et seq. 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

Contractor is responsible for any or all damage or loss to shipments until delivered and accepted on Site 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, Contractor shall comply with those reporting requirements at the request of the District at no additional charge.

END OF DOCUMENT

SPECIAL CONDITIONS

1. Modernization Projects

A. 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.

B. Keys. Upon request, the District may, at its own discretion, provide keys 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 keys are lost or stolen, or if any unauthorized party obtains a copy of the key or access to the school.

C. 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.

D. 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.

E. 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.

F. 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 school operations and any use of school facilities by the public up to, and including,

G. Scheduling specific work activities, at no additional cost to District.

H. 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 or Federally-required tests.

2. 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.

A. Badges must be filled out in full and contain the following information:

2.1.1 Name of Contractor

2.1.2 Name of Employee

2.1.3 Contractor's address and phone number

B. 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.

C. Continued failure to display identification badges as required by this policy may result in the individual being removed from the Project or assessment of fines against the Contractor.

3. Fingerprinting

Contractor shall comply with the provisions of Education Code section 45125.2 regarding the submission of employee fingerprints to the California Department of Justice and the completion of criminal background investigations of its employees, its subcontractor(s), and its subcontractors' employees. Contractor shall not permit any employee to have any contact with District pupils until such time as Contractor has verified in writing to the governing board of the District, that such employee has not been convicted of a violent or serious felony, as defined in Education Code section 45122.1. Contractor shall fully complete and perform all tasks required pursuant to the Criminal Background Investigation/ Fingerprinting Certification.

4. Disabled Veteran Business Enterprises

This Project uses or may plan to use funds allocated pursuant to the State of California School Facility Program ("Program") for the construction and/or modernization of school buildings. Therefore, Section 17076.11 of the Education Code requires 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. The Contractor must submit the Disabled Veteran Business Enterprise Participation Certification to the District with its executed Agreement.

BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL

OXNARD UNION HIGH SCHOOL DISTRICT
SPECIAL CONDITIONS
00 73 13 -2

HAZARDOUS MATERIALS
PROCEDURES

1. Summary

This document includes information applicable to hazardous materials and hazardous waste abatement.

2. Notice of Hazardous Waste or Materials

- a. Contractor shall give notice in writing to the District, the Construction Manager, and the Architect promptly, before any of the following materials are disturbed, and in no event later than twenty-four (24) hours after first observance, of any:
 - (1) Material that Contractor believes may be a 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 laws and contractual 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, radioactive material, or other hazardous materials;
 - (3) The generation, processing, treatment, storage, transport, disposal, destruction, or other management of asbestos, PCB, lead, petroleum, radioactive material, 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 fullest 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

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

- C. The Work of this Contract consists of the following:

Selective demolition and construction necessary for the conversion of an existing auto shop in the southwest corner of existing school building "K" into a new Mechatronics Facility. Work will include adding a new roof over the existing outdoor yard immediately adjacent to and west of building "K", to increase useable lab space for equipment. Disciplines involved include architecture, and structural, plumbing, mechanical and electrical engineering work as indicated in the Drawings and Specifications.

1.03 CONTRACTS

- D. Perform the Work under a single, fixed-price Contract.

1.04 WORK BY OTHERS

- E. 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.

- F. Work on the Project that will be performed by others concurrent with the Work of this Contract:

- (1) _____
- (2) _____

1.05 CODES, REGULATIONS, AND STANDARDS

- G. 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.
- H. 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

- I. 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.
- J. Contractor shall store Record Documents separate from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples.
- K. Contractor shall record information concurrent with construction progress.
- L. 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

- M. Contractor shall be held to have examined the Project Site and acquainted itself with the conditions of the Site and of the streets or roads approaching the Site.
- N. 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.
- O. 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

- P. 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.
- Q. 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.
- R. Contractor shall not interfere with use of or access to occupied portions of the building(s) or adjacent property.
- S. Contractor shall maintain corridors, stairs, halls, and other exit-ways of building clear and free of debris and obstructions at all times.
- T. 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.
- U. The Contractor shall install the construction 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

- V. 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.

- W. 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

- X. 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.
- Y. 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

- Z. Contractor shall be responsible for and supervise each operation and work that could affect structural integrity of various building elements, both permanent and temporary.
- AA. 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

1. ALTERNATES

1. 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.

2. 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.

3. 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 item 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.

4. BASE BID

The Base Bid includes all work required to construct the Project completely and in accordance with the Contract Documents.

5. ALTERNATES

- A. Alternate 1: Provide 12" thick reinforced concrete mat slab in spaces 101 and 102, and in the western third (approximately) of space 105._____
- B. _____

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.
END OF DOCUMENT

01 26 00

CHANGES IN THE WORK

CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE PROVISIONS IN THE AGREEMENT, GENERAL CONDITIONS, AND SPECIAL CONDITIONS, IF USED, RELATED TO CHANGES AND/OR REQUESTS FOR CHANGES.

END OF DOCUMENT

**CONDITIONAL WAIVER AND RELEASE
ON PROGRESS PAYMENT
(CIVIL CODE SECTION 8132)**

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Through Date: _____

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check: _____

Amount of Check: \$ _____

Check Payable to: _____

Exceptions

This document does not affect any of the following:

- (1) Retentions.
- (2) Extras for which the claimant has not received payment.
- (3) The following progress payments for which the claimant has previously given a conditional waiver and release but has not received payment:

Date(s) of waiver and release: _____

Amount(s) of unpaid progress payment(s): \$_____

- (4) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

END OF DOCUMENT

**CONDITIONAL WAIVER AND RELEASE
ON FINAL PAYMENT
(CIVIL CODE SECTION 8136)**

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check: _____

Amount of Check: \$ _____

Check Payable to: _____

Exceptions

This document does not affect any of the following: _____

Disputed claims for extras in the amount of: \$ _____

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

END OF DOCUMENT

PROJECT MEETINGS

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; and
- B. Special Conditions.

1.02 PROGRESS MEETINGS:

- A. Contractor shall schedule and hold regular weekly progress meetings after a minimum of one week's prior written notice of the meeting date and time to all Invitees as indicated below.
- B. Location: Contractor's field office.
- C. The Contractor shall notify and invite the following entities ("Invitees"):
 - (1) District Representative.
 - (2) Contractor.
 - (3) Contractor's Project Manager.
 - (4) Contractor's Superintendent.
 - (1) Subcontractors, as appropriate to the agenda of the meeting.
 - (2) Suppliers, as appropriate to the agenda of the meeting.
 - (3) Construction Manager, if any.
 - (4) Architect
 - (5) Engineer(s), if any and as appropriate to the agenda of the meeting.
 - (6) Others, as appropriate to the agenda of the meeting.
- D. The District's and/or the Architect's Consultants will attend at their discretion, in response to the agenda.
- E. The District representative, the Construction Manager, and/or another District Agent shall take and distribute meeting notes to attendees and other concerned parties. If exceptions are taken to anything in the meeting notes,

those exceptions shall be stated in writing to the District within five (5) working days following District's distribution of the meeting notes.

1.03 PRE-INSTALLATION/PERFORMANCE MEETING:

- A. Contractor shall schedule a meeting prior to the start of each of the following portions of the Work: cutting and patching of plaster and roofing, and other weather-exposed and moisture-resistant products. Contractor shall invite all Invitees to this meeting, and others whose work may affect or be affected by the quality of the cutting and patching work.
- B. Contractor shall review in detail prior to this meeting, the manufacturer's requirements and specifications, applicable portions of the Contract Documents, Shop Drawings, and other submittals, and other related work. At this meeting, invitees shall review and resolve conflicts, incompatibilities, or inadequacies discovered or anticipated.
- C. Contractor shall review in detail Project conditions, schedule, requirements for performance, application, installation, and quality of completed Work, and protection of adjacent Work and property.
- D. Contractor shall review in detail means of protecting the completed Work during the remainder of the construction period.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

SCHEDULING 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;
- 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 issuance of the Notice to Proceed, 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.

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 of 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 an earlier completion date than the Contract Time.
 - (2) Contractor shall not be entitled to extra compensation in event agreement is reached on an earlier 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 District software. Such software shall be compatible with Windows operating system. Contractor shall transmit contract file to District on compact disk at times requested by District.
- F. 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 Analysis ("TIA") in accordance with Article 1.12 of this Section. The TIA 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.
 - (b) Include time for submittals, re-submittals and reviews by District. Coordinate with accepted schedule for submission of Shop Drawings, samples, and other submittals.
 - (c) 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.
 - (d) Include time for fabrication and delivery of manufactured products for the Work.
 - (e) 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.
- (2) Resources required (labor and major equipment) to perform each activity.
- (3) Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.
- (4) 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.
- (5) 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.
- (6) Interface with the work of other contractors, District, and agencies such as, but not limited to, utility companies.
- (7) 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.
- (8) Activity durations shall be in Work days.
- (9) 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:
 - (d) Accept schedule and cost and resource loaded activities as submitted, or
 - (e) 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 IMPACT ANALYSIS ("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 TIA 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 TIA'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 TIAs, and the process of incorporating them into the current schedule update. The Contractor shall provide District with four (4) copies of each TIA.
- D. Once agreement has been reached on a TIA, the Contract Time will be adjusted accordingly. If agreement is not reached on a TIA, 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 TIA, 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 the 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 TIA 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.
 - (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.
 - (f) 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.
 - (g) 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 man-hours 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 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. Also certify that Contractor-furnished equipment can be installed in allocated space. In event of any variance, Contractor shall specifically state in transmittal and on Shop Drawings, portions vary and require approval of a substitute. Submittals shall not be used as a means of requesting a substitution.
 - (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 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 "revise 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.
 - (4) Contractor may be assessed \$100 a day for each day it is late in submitting a shop drawing or sample. No extensions of time will be granted to Trade Contractor or any Subcontractor because of its failure to have shop drawings and samples submitted in accordance with the 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 dimensions, accuracy, proper fitting, construction of Work, furnishing of materials, or Work required by Contract Documents and not indicated on

Shop Drawings. The District's and/or Architect's review of Shop Drawings 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) Specification number and description.
 - (3) Architect's name and project number.
 - (4) Shop Drawing title, number, date, and scale.
 - (5) Names of Contractor, Subcontractor(s) and fabricator.

- (6) Working and erection dimensions.
 - (7) Arrangements and sectional views.
 - (8) Necessary details, including complete information for making connections with other Work.
 - (9) Kinds of materials and finishes.
 - (10) 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. Contract 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.
- E. Imported Materials Certification must be submitted at least ten (10) days before material is delivered.

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. Such resubmittal shall not delay the Work.
- 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 post: "Non-Smoking Area" in a highly visible location in each work area, staging area, and parking area. 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: Profanity or other unacceptable and/or loud language will not be tolerated, "Cat calls" or other derogatory language toward students, staff, volunteers, parents 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 mobile phones or other handheld communication 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 softscape 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 PA- 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, Licenses and Registrations and Work to Comply with All Applicable Laws and Regulations;
- B. Special Conditions; and
- 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 over 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").
 - (1) California Building Standards Administrative Code, Part 1, Title 24, CCR.
 - (2) California Building Code (CBC), Part 2, Title 24, CCR; (International Building Code volumes 1-2 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; (International Fire Code and California Amendments).
- (7) California Green Building Standards Code (CALGreen), Part 11, Title 24, CCR.
- (8) California Referenced Standards Code, Part 12, Title 24, CCR.
- (9) State Fire Marshal Regulations, Public Safety, Title 19, CCR.
- (10) Partial List of Applicable National Fire Protection Association (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.
- (11) California Division of the State Architect interpretation of Regulations ("DSA IR"), including, without limitation:
 - (a) DSA IR A-6 — Construction Change Document Submittal and Approval Processes.
 - (b) DSA IR A-7 — Project Inspector Certification and Approval.
 - (c) DSA IR A-8 — Project Inspector and Assistant Inspector Duties and Performance.
 - (d) DSA IR A-12 — Assistant Inspector Approval.
- (12) DSA Procedures ("DSA PR")
 - (a) DSA PR 13-01 – Construction Oversight Process
 - (b) DSA PR 13-02 – Project Certification Process

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) Deferred Approvals per section 4-317(g).
- (4) Verified reports per Sections 4-336 & 4-343(c).
- (5) Duties of the Architect & Engineers shall be per Sections 4-333(a) and 4-341.
- (5) Duties of the Contractor shall be per Section 4-343.
- (6) Duties of Project Inspector shall be per Section 4-334.
- (7) Addenda and Construction Change Documents per Section 4-338.

Contractor shall keep and make available all applicable parts of the most current version of Title 24 referred to in the plans and specifications 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) Contractor shall submit the following to Architect for review and endorsement:
 - (a) Product information on proposed material/system supplier.
 - (b) Drawings, specifications, and calculations prepared, signed, and stamped by an architect or engineer licensed in the State of California for that portion of the Work.
 - (c) All other requirements as may be required by DSA.
 - (2) Cost of preparing and submitting documentation per DSA Deferred Approval requirements including required modifications to Drawings and Specifications, whether or not indicated in the Contract Documents, shall be borne by Contractor.
 - (3) Contractor shall not begin fabrication and installation of deferred approval items without first obtaining DSA approval of Drawings and Specifications.
 - (4) Schedule of Work Subject to DSA Deferred Approval: Window wall systems exceeding 10 feet in span.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

QUALITY CONTROL

PART 1 - GENERAL

1.02 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 and Special Inspector(s) 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 operation of equipment as needed, 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) Tests and observations of welding and expansion anchors.
- D. The District may at its discretion, pay and then 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 TESTS AND INSPECTIONS

- A. Testing and inspection shall be in accordance with DSA Form 103 (or current version)
- B. Slump Test
ASTM C 143
- C. 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 twenty-eight 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.

D. Reinforcing, Steel

E. 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

1.02 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; and
- D. Construction Waste Management and Disposal.

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 shall pay for water used during the course of the Work. Contractor shall coordinate and pay for installation or use of water meter in compliance with local water agency requirements. 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), on the Site, or other location approved by the local water agency, 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 as required 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. Under no circumstance shall Contractor use District trash service.

H. Field Office:

- (1) If Contractor chooses to provide a field office, it shall be an acceptable construction trailer that is well-lit and ventilated. The construction trailer shall be equipped with shelves, desks, filing cabinet, chairs, and such other items of equipment needed. Trailer and equipment are the property of the Contractor and must be removed from the Site upon completion of the Work. Contractor may use the corridor adjacent to the construction area for an office area, if approved in writing by District.
- (2) Contractor shall provide any additional electric lighting and power required for the trailer. Contractor shall make adequate provisions for heating and cooling as required.

I. Temporary Facilities:

- (1)

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 workers. 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, or as denoted on the Plans.
 - (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:

- (1) 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 Design Professional; 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 Design Professional.

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) without the written permission of the District.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF DOCUMENT

CONSTRUCTION WASTE MANAGEMENT

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. 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 sixty-five percent (65%) 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 01 33 00.

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 measurement 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 01 50 00 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 01 50 00 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 DOCUMENT

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

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) Effects 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 District or other District contractor(s) 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

BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL

OXNARD UNION HIGH SCHOOL DISTRICT
CUTTING AND PATCHING
01 73 29 -6

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 and square or straight 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 and seal existing wood doors and shall trim and paint metal 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, in the area where the Work is performed.
- 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 in 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

01 77 00

CONTRACT CLOSEOUT & 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 all 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 and surrounding areas.

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 or by the change of season.
- 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 the need for such data becomes apparent during instruction.
- E. 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 with all required Operation and Maintenance Data at one time. Partial or piecemeal submissions of Operation and Maintenance Data will not be accepted.

PART 2 – PRODUCTS Not Used.

PART 3– EXECUTION Not Used.

END OF DOCUMENT

01 91 00

COMMISSIONING

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.
- C. Submittal Procedures: Procedures for submittal of product data and quality assurance submittals.
- D. Closeout Procedures: General closeout requirements.
- E. Sustainable Design Closeout Documentation: Closeout requirements relating to sustainable design certification.
- F. Appropriate Sections of Divisions 15 and 16 specify closeout and/or commissioning related requirements for specific pieces of equipment or building operating systems.

1.02 SECTION INCLUDES

- A. Equipment and system commissioning, including the following:
 - (1) Completion of commissioning procedures on specific equipment and systems as indicated under “Related Documents and Provisions” above.
 - (2) Verification of operational and functional performance of specific equipment and systems for compliance with the “Design Intent” as described in the “Related Documents and Provisions” indicated above.

1.03 REFERENCES

- A. [ASTM International (ASTM)]:
 - (1) [ASTM X000-00, Title of Standard].
 - (2) [ASTM X000-00, Title of Standard].
- B. [Name of Organization (Organization Acronym)]:

- (1) [Acronym, Standard or Document Number and Date of Issue, Title of Standard or Document].

1.04 DEFINITIONS

- A. Commissioning: The process of verifying that the installation and performance of selected building systems meet or exceed the specified design criteria and therefore satisfy the design intent.
- B. Deficiencies and Resolutions List: List of noted deficiencies discovered as result of commissioning process.
- C. Final Commissioning Report: Overall final commissioning document, prepared by the Systems Commissioning Authority, which details the actual commissioning procedures performed, inspection and testing results, and the final version of the deficiencies and resolutions list indicating that all issues discovered through the commissioning process have been verified as resolved.
- D. Functional Performance Testing Process: Documented testing of system parameters, under actual or simulated operating conditions.
- E. Pre-Commissioning Checklists: Installation and start-up items to be completed by the appropriate party prior to operational verification through functional testing.
- F. Physical Inspection Process: On-site inspection and review of related system components for conformance to the specifications.
- G. Systems Commissioning Authority (SCA): Independent entity under contract directly with the District or District's Representative responsible for performing the specified commissioning procedures.

1.05 DESCRIPTION OF CONSTRUCTION PHASE COMMISSIONING PROCESS

- A. As soon as practicable after the [bid award] [start of construction] the Systems Commissioning Authority (SCA) will conduct a pre-installation commissioning "kick-off" meeting with the contractors. Parties directly affected by the commissioning work will be required to attend. The SCA will explain the commissioning process in detail, and identify specific commissioning related responsibilities of the various parties.
- B. Commissioning status meetings will be scheduled to occur during construction to monitor progress and to help facilitate the commissioning process. Contractor representatives will be required to attend these meetings.
- C. Once contractors have provided the SCA with written verification indicating completion of installation and startup procedures, the SCA will conduct an on-site physical inspection of the specific systems and equipment.

- D. Upon confirmation of system readiness, the SCA will schedule with the contractors to perform functional compliance with the project specifications and drawings. The SCA will oversee the process and will provide the format and documentation for these tests.
- E. Deficiencies noted during these tests will be documented on the Deficiencies and Resolutions list. When corrected, issues will be resolved at the time of discovery. The responsible Contractor will resolve all other issues at a later date. All deficiencies will be noted by the SCA as either resolved or pending resolution.
- F. The construction commissioning process will be complete when all noted deficiencies have been corrected, proved to be compliance with the project specifications or otherwise resolved to the satisfaction of the District.

1.06 SYSTEMS COMMISSIONING AUTHORITY'S DUTIES AND RESPONSIBILITIES

- A. Meet and communicate with the District's representatives, Construction Manager, if any, Contractors, equipment manufacturers' representatives, Architect, Engineer and others as needed, to facilitate the commissioning process.
- B. Review commissioning related specifications, submittals and construction documents. Communicate noted deficiencies and concerns to the District, Architect and Engineer.
- C. Develop detailed and specific functional testing procedures for equipment and systems to be commissioned.
- D. Develop testing, adjusting and balancing (TAB) specifications. Oversee the TAB process.
- E. Perform site inspections and verify contractor readiness for the functional testing process. Document deficiencies for future resolution.
- F. Witness contractor performed functional testing process as appropriate to verify contractor compliance with the functional testing procedures. Document deficiencies for future resolution.
- G. Provide the District, Construction Manager, Contractor, Architect, and Engineer with a Final Commissioning Report to document the commissioning process and to verify that the commissioning process is complete.

1.07 DUTIES AND RESPONSIBILITIES OF OTHERS FOR COMMISSIONING

- A. The commissioning process will require the active participation of persons qualified to represent the District, Mechanical Engineer, Electrical Engineer, General Contractor, Equipment Manufacturers' Representatives, Mechanical Contractor, HVAC Contractor, Controls Contractor, TAB Contractor, Electrical Contractor, and other specific subcontractors, as deemed appropriate. The SCA will witness the final functional performance commissioning process.

Participants shall include in their contracts all costs necessary to participate in and complete the commissioning process.

- B. Contractor will assure the participation and co-operation of Subcontractors, as required to complete the commissioning process.
- C. The District will assure the participation of their chosen representatives as required to complete the commissioning process.
- D. The Architect will assure the participation of necessary representatives from the Design Team as required to complete the commissioning process. Design team members will provide prompt replies to requests for information issued during the commissioning process.
- E. It is the Contractor's specific responsibility to complete their respective start-up and checkout procedures, and to insure the complete readiness of equipment and systems, prior to the start of the functional performance testing phase. The SCA shall request written confirmation of system readiness for performance testing, from the appropriate subcontractor or Contractor. Once the SCA is provided with confirmation of all related systems completion, the actual date and times for the functional performance testing process will be confirmed. Contractors shall provide sufficient time, and qualified representatives, to complete this process.
- F. After a second failure of a system to successfully meet the criteria as set forth in the functional performance testing process, the Contractor shall reimburse the District for all costs associated with any additional re-testing efforts made necessary due to remaining Contractor related system deficiencies previously reported by the Contractor as corrected. These costs shall include salary, travel costs and per diem lodging costs (where applicable) for the SCA. Rates to be used:

Mileage: \$0.35/Mile
Per Diem Lodging: \$115.00/Day
Salary: \$100.00/Hour

- G. Training on related systems and equipment operation and maintenance shall only be scheduled to commence after final performance commissioning is satisfactorily completed, and systems are verified to be 100 percent complete and functional.

1.08 SUBMITTALS

- A. Submit under provisions of Document 01 33 00 Submittals.
- B. Pre-Commissioning Checklist Forms: Submit two (2) signed copies of the checklist forms to the SCA upon completion of all listed items.
- C. Equipment Manufacturer's Startup Forms: Submit two (2) completed copies of the installation and startup checklists provided by the equipment manufacturers to the SCA.

- D. Test Reports: Submit two (2) copies of test reports for equipment and systems to the SCA.
- E. Control Schematics: Submit two (2) copies of the control schematics for equipment, systems, and subsystems to the SCA.
- F. Inspection Records: Submit two (2) copies of the records of inspections for code compliance, and approved permits and licenses to operate the equipment and systems to the SCA.
- G. Operating Data: Submit two (2) copies of equipment and system operating data including all necessary instructions to facilitate operation to specified performance standards to the District.
- H. Maintenance Data: Submit two (2) copies of equipment and system maintenance data including all necessary information required to maintain the equipment and systems in continuous operation, such as the testing, balancing and adjusting report and the as-built drawings.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

SECTION 03 10 00

CONCRETE FORMWORK

PART 1 – GENERAL

- 1.1 SUMMARY: Division 1 applies to this Section. Provide forms for all Work constructed of cast-in-place concrete, complete, except as otherwise specified.
- A. Related Work Not In This Section:
1. Furnishing and placing reinforcing for cast-in-place concrete.
 2. Furnishing, placing, finishing, and curing of cast-in-place concrete.
 3. Placing of embedded anchor bolts and inserts.
 4. Screeds for slabs.
 5. Steel decking.
- 1.2 SUBMITTALS: Refer to Section 01 33 00 for procedures.
- A. Shop Drawings: Submit Shop Drawings showing form pattern layouts of all exposed exterior and interior concrete dimensioned to precisely locate grooves, form panel jointing, and similar features. Review and approval will not include form strength and adequacy.
- B. Product Data: Submit manufacturer's printed data and specifications for each of the following:
1. Form sealer.
 2. Form release compound.
 3. Form ties and spreaders.
- 1.3 QUALITY ASSURANCE: Construct forms conforming to tolerances specified in ACI 301, "Specifications for Structural Concrete for Buildings", as applicable, unless exceeded by requirements of regulatory agencies or otherwise indicated or specified.
- 1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING: Deliver materials for forms in timely manner to ensure uninterrupted progress. Store materials by methods that prevent damage and permit ready access for inspection and identification.

PART 2 – PRODUCTS

- 2.1 MATERIALS: Furnish materials conforming to following requirements:

Form lumber:	WCLIB "Construction" grade or better, WWPA No. 1 or better, or equal.
Form plywood:	PS 1-83, Group I, Exterior Grade B-B Plyform or better, minimum 5-ply and 5/8" thickness, grade marked, not mill oiled, Plywood having medium or high density overlay is acceptable.

Tube forms:	Sonoco "Seamless Sonotubes", Alton Building Products "Sleek Seamless Standard Wall", or equal, type leaving no marks in concrete, 1-piece lengths for full required heights.
Form ties:	Prefabricated rod, flat band, wire, internally threaded disconnecting type, or equal, not leaving metal within 1-1/2" of concrete surface.
Form coating:	Resin type coating free of oil, silicone, wax, and non-drying material, not grain-raising.

PART 3 – EXECUTION

- 3.1 FORM ERECTION AND REMOVAL: Conform to ACI 301 and ACI 347 "Recommended Practice for Concrete Formwork", and CCR 2606(a)(b)(c), except as exceeded by the requirements of Code, regulatory agencies, or herein.
- A. Construction: Coat forms with the specified resin coating, not form oil. Construct forms to exact shapes, sizes, lines, and dimensions required to obtain level, plumb, and straight surfaces. Provide openings, offsets, keys, reglets, anchorage, recesses, moldings, chamfers, blocking, screeds, drips, bulkheads, and all other required features. Make forms easily removable without hammering or prying against concrete. Space forms apart with metal spreaders. Construct forms to accurate alignment, location and grades, and provide against sagging, leakage of concrete mortar, or displacement occurring during and after placing of concrete. Coordinate installation of inserts and anchors in forms according to Shop Drawings and instructions of other trades.
 - B. Corners and Angles: Provide 3/4" by 3/4" beveled chamfer strips for all exposed concrete corners and angles unless otherwise indicated. Form concealed concrete corners and angles square unless otherwise indicated.
 - C. Camber: Place suitable jacks, wedges, or similar means to induce camber and to correct settlement in forms before and during concrete placing.
 - D. Reglets and Rebates: Form required reglets and rebates to receive frames, flashing, and other equipment. Obtain required dimensions, details, and precise positions from related trades and form concrete accordingly.
 - E. Form Joints: Fill joints to produce smooth surfaces, intersections, and arises. Use polymer foam or equivalent fillers at joints and where forms abut or overlap existing concrete to prevent leakage of mortar.
 - F. Recesses, Drips, and Profiles: Provide smooth milled wood or preformed rubber or plastic shapes of types shown and required.
 - G. Cleanouts and Cleaning: Provide temporary openings in all wall forms and other vertical forms for cleaning and inspection. Clean forms and surfaces to receive concrete prior to placing.
 - H. Re-Use: Clean and recondition form material before re-use.
 - I. Time of Form Removal: Do not remove concrete forms until concrete attains sufficient strength to support its own weight and superimposed loads. Minimum times for form removal after concrete placement are:

Beam sides but not shoring.....	3 days
Column forms and wall forms	5 days
Forms for slabs and beams but not shoring.....	15 days

1. Record: Maintain a form and shoring removal record.

3.2 EMBEDDED PIPING AND ROUGH HARDWARE: Consult with trades needing openings for passage of pipes, conduits, ducts, and other inserts in the concrete. All necessary pipe sleeves, anchors, or other required inserts shall be accurately installed by respective trades according to following requirements.

- A. Conduits or Pipes: Locate so as not to reduce strength of concrete; in no case place pipes or conduits in slabs or beams.
- B. Sleeves: Pipe sleeves may pass through slabs or walls if not exposed to rusting or other deterioration and are of galvanized iron or steel. Provide sleeves of diameter large enough to pass any hub or coupling on pipe, including pipe insulation if any. All sleeves through structural slabs and walls shall be specifically approved in writing by the Architect and Structural Engineer.
- C. Aluminum Inserts: Do not embed aluminum sleeves, conduit, or inserts in concrete unless effectively coated or covered to prevent any aluminum-concrete reaction or galvanic action between aluminum and steel.

3.3 MISCELLANEOUS CONCRETE WORK: Provide forms for all cast-in-place concrete areaways, valve boxes, pits, bases, and other miscellaneous concrete as shown and required to complete all Work. Conform to applicable requirements herein.

3.4 FIELD QUALITY CONTROL:

- A. Supervision: Perform Work of this Section under supervision of a capable concrete form superintendent.
- B. Inspection: Obtain inspection and approval of forms by Project Inspector before placing concrete.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.1 SUMMARY: Division 1 applies to this Section. Provide reinforcing steel bars and mesh, complete.

A. Section Includes:

1. Reinforcing bars and mesh for cast-in-place concrete.

1.2 REFERENCES: The Work shall conform to the reference standards and specifications of the issues listed below, to requirements indicated and specified, to required fire ratings, and to the pertaining regulatory requirements of authorities having jurisdiction. The specifications, codes, publications, and standards listed, but referred to hereafter by the basic designation only, form a part of this Section to the extent referenced herein:

A. American Concrete Institute (ACI):

- 117- Standard Tolerances for Concrete Construction and Materials.
- 315- Details and Detailing of Concrete Reinforcement.
- 318- Building Code Requirements for Reinforced Concrete.

B. American Society for Testing and Materials (ASTM):

- A82 Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement.
- A185 Specifications for Welded Steel Wire Fabric for Concrete Reinforcement.
- A615 Specifications for Deformed Billet-Steel Bars for Concrete Reinforcement.
- A706 Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

C. American Welding Society (AWS):

- A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- A5.1 Carbon Steel Electrodes for Shielded Metal Arc Welding.
- D1.4 Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute (CRSI):

- MSP-2 Manual of Standard Practice for Reinforced Concrete Construction
Recommended Practice for Placing Reinforcing Bars.
Reinforcing Bar Splices.

E. Western Concrete Reinforcing Steel Institute (WCRSI):

1. Manual of Standard Practice for Reinforced Concrete Construction.

1.3 SUBMITTALS: Refer to Section 01 33 00 for procedures.

- A. Shop Drawings: Prepare in accordance with the applicable requirements of ACI 315. Submit including complete layouts, sections, and details for congested conditions, and as required by the Architect, typical bending diagrams and offsets, splice lengths and locations, proposed layout where the vertical and horizontal bars interfere, and where welding is proposed, detailed to conform to AWS A2.4 and all Code requirements. Schedules of bar sizes, lengths, and standard bends or offsets are not required if in total accordance with the Drawings.
- B. Certificates: Submit copies of current AWS welding certificates for each welder operator performing Work of this Section. If requested by the Architect or Inspector, submit experience record for each welder operator.

1.4 DELIVERY, STORAGE, AND HANDLING:

- A. Storage and Care of Electrodes: Comply with combined recommendations of AWS and the electrode manufacturer. Use of electrodes that have been wetted is prohibited.
- B. Marking and Shipping Reinforcement: Bundle and tag reinforcing bars with suitable identification to facilitate sorting and placing, and transport to and store at the site off the ground to avoid damage to material. Deliver reinforcing materials in timely manner to ensure uninterrupted progress. Store materials by methods that prevent damage and permit ready access for inspection and identification. Keep a sufficient supply of tested and approved bars at site to avoid delays.

PART 2 – PRODUCTS

2.1 MATERIALS: Furnish materials meeting test requirements of Article "Source Quality Control" below, as applicable, and following requirements:

- Reinforcing bars: ASTM A615, Grades 40 and 60 as indicated or noted. For welding, conform to specified carbon equivalent or use bars conforming to ASTM A706.
Tie wire: Annealed copper-bearing steel, 16 gage minimum.
- Welding electrodes: AWS A5.1, low hydrogen electrodes, E9018 for Grade 60 steel, E70XX for other bars, all electrodes with minimum 60,000 psi yield strength.
- Chairs and supports: Standard manufactured products conforming to the CRSI Manual of Standard Practice, MSP-2. Use dense precast concrete bar supports with embedded wire ties for reinforcement placed on grade; elsewhere, support the bar reinforcement by wire bar supports of the following classes: Class B or C for concrete exposed in the Work; Class A at other concrete.

2.2 FABRICATION OF REINFORCING BARS:

- A. General: Except as modified by Drawings or specified, conform to the CRSI and WCRSI "Manual of Standard Practice for Reinforced Concrete Construction" for fabrication of reinforcing steel.

- B. Bending and Forming: Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Do not heat reinforcement for bending. Bend bars No. 6 size and larger in the shop only. Bars with unscheduled kinks or bends are subject to rejection. Use only tested and approved bar materials.
- C. Welding: Perform welding, where shown or approved, by the direct electric arc process in accordance with AWS D1.4 using specified low-hydrogen electrodes. Preheat 6" each side of joint. Protect joints from drafts during the cooling process; accelerated cooling is prohibited. Do not tack weld bars. Clean metal surfaces to be welded of all loose scale and foreign material. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts of welds found defective and replace with proper welding. Employ only experienced and certified welding operators. Prequalification of welds shall be in accordance with Code. Conform welding details to AWS D1.4, Figures 3.1, 3.5, 3.8.3, and 3.8.4 unless otherwise indicated. All reinforcing bars to be welded shall have a tested and certified maximum 0.75 carbon equivalent or conform to ASTM A706.
- D. Tolerances: Conform reinforcing fabrication to requirements of CRSI "Placing Reinforcing Bars" and CRSI and WCRSI "Manual of Standard Practice for Reinforced Concrete Construction".

2.3 SOURCE QUALITY CONTROL: Refer to Section 01 45 00 for general requirements and to following paragraphs for specific procedures. The Testing Laboratory shall perform the following conformance testing and select test samples of bars, ties, and stirrups from material at the site or from place of distribution, each sampling including at least two 18" long pieces, and perform the following tests according to ASTM A615 or ASTM A706, as applicable.

- A. Identified Bars: Contractor shall obtain mill reports for all types and sizes of reinforcing steel; the reports shall contain steel source, description, heat number, yield point, ultimate tensile strength, elongation percentage, bend test, and chemical analysis. For steel made in USA, no testing will be required if the reports show that material is satisfactory. For foreign steel, testing will be required. Certification from any other sources will not be acceptable. The Contractor shall ensure that material delivered for use is that represented by mill reports and obtain copies of the mill reports, examine them, certify whether material represented complies with requirements specified, and make distribution of reports as required. Report chemical composition of each heat, as determined by ladle analysis.
- B. Unidentified Bars: When positive identification of any reinforcing bars cannot be made and when random samples are obtained; perform the tests for each 5 tons or fraction thereof, one tensile and one bend test from each size of the unidentified bars. The full section of the bars as rolled shall be used for the tests; machined or reduced sections as specified in Section 9, "Test Specimens", of ASTM A615 are not acceptable. Include at least two samples, of sufficient length to allow tests to be made on the as-rolled bar.

PART 3 – EXECUTION

- 3.1 **INSTALLATION OF REINFORCING:** Provide additional reinforcing bars at wall and slab openings as required. Before placing bars, and again before placing concrete, clean bars of loose mill scale, oil, or any other coating that might destroy or reduce the bond. Conform to ACI 318, CRSI and WCRSI "Manual of Standard Practice for Reinforced Concrete Construction", CRSI "Recommended Practices for Placing Bar Supports", and the following.
- A. **Spacing of Reinforcement:** Space reinforcement to maintain proper distance and clearance between parallel bars and between bars and forms. Provide metal spreaders and spacers to hold horizontal steel in position in beams and girders, and elsewhere as necessary. Support steel at proper height on precast concrete members, galvanized "S" chairs, or "Support Bars" and galvanized "S" chairs, as necessary. Where "Support Bars" are used to hold the slab reinforcement in place, space chairs under the support bars not to exceed the distances specified below. Support slab reinforcement as follows:
 - 1. #3 bars at 2'-0" o.c. maximum.
 - 2. #4 bars at 3'-0" o.c. maximum.
 - 3. #5 bars at 4'-0" o.c. maximum.
 - B. **Splices:** Do not splice reinforcing bars except where indicated. Make bar laps in contact unless indicated otherwise at lapped splices (except for slab reinforcement) and firmly wire together before placing concrete. Lap the bars as indicated or, if not indicated, lap as noted on the typical details. Stagger the splices in horizontal wall reinforcement at least 10-feet longitudinally in alternate bars of opposite tiers. Extend stubs and dowels required to receive and engage subsequent Work a sufficient length to develop the strength of the bar. Place dowel and stub bars in forms and secure against displacement during placing of concrete.
 - C. **Securing in Place:** Accurately place bars and wire tie in precise position where the bars cross. Bend ends of wire ties away from forms. Wire tie bars to corners of ties and stirrups. Use approved accessories and chairs. Use precast concrete cubes with embedded wire ties to support the reinforcing bars in concrete placed on grade and in footings. Tie stirrups to bars at both top and bottom.
 - D. **Exposed Concrete Surfaces:** Provide stainless steel or exterior quality vinyl plastic tipped chairs, bolsters, and accessories where exposed on exterior or interior concrete surfaces not to be painted or permanently covered.
 - E. **Clearances:** Maintain minimum clear distances between reinforcing bars and between bars and face of concrete as indicated or directed.
 - F. **Field Welding of Bars:** As specified for fabrication in Part 2.
 - G. **Maintaining Bars In Position:** Assign a competent ironworker mechanic at every concrete placing location to inspect reinforcement and maintain all bars in the correct positions.
 - H. **Floor System Reinforcement:** Do not place until concrete in walls and columns is placed, concrete shrinkage has occurred, and forms and projecting steel have been thoroughly cleaned.

- I. Tolerances: Comply with ACI 117 except for references to pre-stressing steel and ducts.
- 3.2 MISCELLANEOUS CONCRETE WORK: Provide reinforcing bars and mesh for concrete pits, equipment bases, areaways, cast-in-place concrete valve boxes, splash blocks, and other miscellaneous concrete as shown and required to complete all Work. Conform to applicable requirements herein.
- 3.3 FIELD QUALITY CONTROL: Refer to Section 01 45 00.
 - A. Inspection: Obtain inspection and approval of reinforcing by Inspector before concrete is placed.
 - B. Welding Inspection. Whether welding is performed in the shop or at the site, perform welding of reinforcing bars under inspection of the Testing Laboratory Welding Inspector.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 SUMMARY: Provide the cast-in-place concrete as indicated and specified, complete.

A. Work Included:

1. Furnishing, placing, patching, and initial curing of cast-in-place concrete.
2. Grout and dry pack, except as otherwise specified.
3. Placing of embedded anchor bolts and inserts.
4. Vapor barrier under building floor slabs on grade.

B. Related Work:

1. Preparation and grading of earth sub-grade under concrete.
2. Furnishing, erection, and removal of forms.
3. Furnishing and placing reinforcing for cast-in-place concrete.
4. Finishing and final curing of cast-in-place concrete.

1.2 REFERENCES: The Work shall conform to the reference standards and specifications of the issues listed below, to requirements indicated and specified, to required fire ratings, and to the pertaining regulatory requirements of authorities having jurisdiction. The specifications, codes, publications, and standards listed, but referred to hereafter by the basic designation only, form a part of this Section to the extent referenced herein:

A. American Concrete Institute (ACI):

- 116-00(05)..... Cement and Concrete Terminology.
- 117-06 Standard Tolerances for Concrete Construction and Materials.
- 201.2R-01 Guide to Durable Concrete.
- 211.1 Recommended Practice for Selecting Proportions for Normal Weight Concrete.
- 212.3R..... Chemical Admixtures for Concrete.
- 212.4R..... Guide for Use of High-Range Water-Reducing Admixtures (Superplasticizers) in Concrete.
- 214 Recommended Practice for Evaluation of Strength Test Results of Field Concrete.
- 301 Specifications for Structural Concrete for Buildings.
- 302.1 Guide for Concrete Floor and Slab Construction.
- 303R..... Guide to Cast-in-Place Architectural Concrete Practice.
- 304R..... Guide for Measuring, Mixing, Transporting and Placing Concrete.
- 304.2R..... Placing Concrete by Pumping Methods.

305R..... Hot Weather Concreting.

American Concrete Institute (ACI) - Continued:

306.1 Cold Weather Concreting.
308 Standard Practice for Curing Concrete.
309 Guide for Consolidation of Concrete.
309.1R..... Behavior of Fresh Concrete During Vibration.
309.3R..... Guide to Consolidation of Concrete in Congested Areas.
311.1R..... Guide for Concrete Inspection
311.5R..... Batch Plant Inspection and Field Testing of Ready-Mixed Concrete.
318 Building Code Requirements for Structural Concrete.
323.2R..... Use of Fly Ash in Concrete.

B. American Society for Testing and Materials (ASTM):

C31..... Standard Method of Making and Curing Concrete Test Specimens in the Field.
C33..... Specifications for Concrete Aggregates.
C39..... Standard Method of Testing for Compressive Strength of Cylindrical Concrete Specimens.
C40..... Test Method for Organic Impurities in Fine Aggregates for Concrete.
C42..... Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
C88..... Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
C94..... Specifications for Ready-Mixed Concrete.
C117..... Test Method for Material Finer Than 75-um (No. 200) Sieve in Mineral Aggregates by Washing.
C125..... Terminology Relating to Concrete and Concrete Aggregates.
C131..... Test Method for Resistance to Degradation of Small-Size Coarse Aggregate and Impact in the Los Angeles Machine.
C136..... Test Method for Sieve Analysis of Fine and Coarse Aggregates.
C138..... Unit Weight, Yield and Air Content (Gravimetric) of Concrete.
C143..... Slump of Portland Cement Concrete.
C150..... Portland Cement.
C157..... Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
C172..... Sampling Fresh Concrete.
C192..... Practice for Making and Curing Concrete Test Specimens in the Laboratory.
C227..... Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method).
C230..... Specification for Flow Table for Use in Tests of Hydraulic Cement.
C231..... Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
C260..... Air-Entraining Admixtures for Concrete.
C289..... Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
C309..... Liquid Membrane-Forming Compounds for Curing Concrete.

- C330 Standard Specification for Lightweight Aggregates for Concrete
- C342..... Test Method for Potential Volume Change of Cement-Aggregate Combinations.
- C404..... Aggregates for Masonry Grout.

American Society for Testing and Materials (ASTM) - Continued:

- C494..... Chemical Admixtures for Concrete.
- C618..... Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
- C881..... Specification for Epoxy-Resin-Base Bonding System for Concrete.
- C989..... Specification for Ground Iron Blast-Furnace Slag for Use in Concrete and Mortars.
- C1017..... Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- C1064..... Test Method for Temperature of Freshly Mixed Portland Cement Concrete.
- D75..... Practice for Sampling Aggregates.
- D1751..... Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- D1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- E11..... Wire-Cloth Sieves for Testing Purposes.
- E329..... Specifications for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

1.3 SUBMITTALS

- A. Product Data: Submit copies of manufacturer's latest published literature for materials specified herein for approval; obtain approval before materials are delivered to the site. Include waterproofing joint filler manufacturer's detailed preparation and installation instructions, with manufacturer's standard detail sheets covering each condition required for the Work.
- B. Shop Drawings: Submit for structural concrete and concrete slabs showing details and dimensioned locations for each type of construction and expansion joint. For waterproofed walls and slabs below grade, show details for installation of waterproofing construction joint filler.
- C. Samples: Conform to requirements specified in Section 01 33 00.
- D. Mix Design Report Submittal: Submit the Testing Laboratory concrete mix designs and test reports, with standard deviation analyses, required curves, and sieve analyses of fine and coarse aggregates at least 10 working days before the initial placement of concrete occurs.
- E. Certifications: Submit the following:
 - 1. Submit a certificate attesting concrete material samples submitted to Testing Laboratory are representative of the materials to be furnished for concrete for the Work.
 - 2. Submit certification of conformance of admixtures and the chloride ion content of admixtures from each admixture manufacturer prior to mix designs.

- F. Non-corrosive, Non-chloride Accelerator: Submit admixture manufacturer's long term non-corrosive test data from independent testing laboratory using an acceptable accelerated corrosion test method (electrical potential measures).
- G. Concrete Uniformity: Submit evidence from the ready-mix concrete producer of the uniformity of its concrete, as determined by the coefficient of variation established for the plant by a recognized agency.
- H. Pumping Equipment: Submit a description of the concrete pumping equipment proposed for use, accompanied by copies of field service records demonstrating satisfactory performance.
- I. Other Submittals: As specified elsewhere in this Section.

1.4 QUALITY ASSURANCE

- A. Allowable Tolerances: Construct concrete conforming to the tolerances specified in ACI 301, "Specifications for Structural Concrete for Buildings", as applicable, unless exceeded by requirements of regulatory agencies or otherwise indicated or specified.
- B. Source Quality Control: Refer to Section 01 45 00 regarding general testing requirements and to the following paragraphs for specific procedures. Testing Laboratory shall perform following conformance testing.
 - 1. Portland Cement: Furnish a Mill Certificate for each shipment of the portland cement used in the Work, acceptable to the State and Project Inspector, showing conformance with requirements specified; otherwise, Testing Laboratory shall test cement in accordance with CBC Section 1916A.1.
 - 2. Aggregate: Furnish aggregates conforming to ASTM C136 and ASTM C138 for normal weight concrete and aggregate conforming to ASTM C330 for lightweight concrete. Test aggregates before concrete mixes are designed and repeat tests whenever character of the aggregate varies or source of material is changed, and when directed by Architect. Obtain samples of aggregates at source of supply or at ready-mix concrete plant in accordance with ASTM D75 and perform tests for the following properties:

Sieve analysis:	ASTM C136
Specific gravity:	ASTM C138
Organic impurities:	ASTM C40, fine aggregate color not darker than reference standard color.
Soundness:	ASTM C88, loss after 5 cycles not more than 8% of coarse aggregate or 10% of fine aggregate.

Abrasion: ASTM C131, weight loss not more than 10-1/2% after 100 revolutions, 42% after 500 revolutions.

Deleterious materials: ASTM C33.

Materials finer than 200 sieve: ASTM C117, not more than 1% for gravel, 1.5% for crushed No. aggregate, per ASTM C33.

Reactivity potential: ASTM C227, C289, and C342, ratio of silica released to reduction in alkalinity not to exceed 1; expansion no greater than 0.10% at 6 months per ASTM C227 test (State 2603(d); include full report for Architect's evaluation.

Sand equivalent: ASTM D2419, California Sand Equivalent values not below 80 percent.

Combined grading Of aggregates: Conforming to State 2603, Table 26I.

3. Concrete Batch Plant Inspection: Conform to 1704A4.2; continuous batch plant inspection is required for structural concrete, performed by a specially qualified inspector approved by OSHPD. As allowed by 2628(e)(f), bonded deputy weighmaster affidavit is acceptable for non-structural concrete and for slabs on grade; the weighmaster shall sign all load tickets and furnish legible copies for the State, Project Inspector, and OSHPD.

C. Color Control for Integrally-Colored Concrete: Coloring admix and color control procedures of the L.M. Scofield Company, Los Angeles, California, or of Admixtures, Inc., Irwindale, California are specified to establish the standard of quality for all integrally colored concrete. Color admix manufacturer shall furnish the services of its technical representatives equipped with wet-batch color control test devices at ready-mix plant and the site as required to assure concrete of uniform color matching approved Samples, at no extra cost to Owner.

1.5 CONCRETE MIX DESIGNS: Testing Laboratory shall design concrete mixes for normal weight and for lightweight concrete using ACI-318 section 5.3. The concrete mix design should be signed by a California registered civil engineer per section 1905A.2 CBC 2019. The location for using a particular mix design and the design method utilized shall be clearly stated on the mix design. Contractor shall bear all costs for concrete mix designs.

A. Reports: In each mix design report, Testing Laboratory shall show results of sieve analysis, complete mix design information including the proportions of all materials, and results of compressive strength and shrinkage tests. Make test specimens from at least 3 batches of each mix design. In the test reports, include test results showing the concrete covered by the mix designs meets the drying shrinkage test requirements specified herein or include certified test reports showing conformance as furnished by the ready-mix concrete manufacturer.

B. Costs: The Contractor shall bear all costs for concrete mix designs and related testing, including concrete shrinkage testing, performed by the Testing Laboratory.

- C. Strength Requirements: Design mixes for structural concrete for minimum 28-day compressive strengths required by Drawings and Specifications. The trial batch strength for each mix shall exceed indicated or specified strength by 750 psi or a lesser amount based on the standard deviations of strength test records according to ACI 318.
- D. Normal Weight and Lightweight Concrete Mix Designs: Design all mixes for workability and durability of concrete. Control mixes in accordance with CCR 1905A.3, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete, and Chapter 4, ACI 318, Building Code Requirements for Reinforced Concrete. Make adjustments in cement content required for concrete strengths at Contractor's expense and do not exceed absolute water-cement or cement plus flyash ratio by weight shown on the drawings. Formed concrete shall contain an air-entraining agent producing air content of 3.5% to 6.5% by volume adjusted for weather conditions; air entrainment is not required for foundations. Do not use calcium chloride or any admix containing such material. Admixtures containing a material releasing nitrates in solution are limited to 0.06% by weight for the chloride ion. Concrete that will be exposed to freezing and thawing, in the presence of moisture, with or without deicing chemicals being present, shall comply with 1904A.4.
- E. Admixtures: Admixtures shall be included in the concrete mix designs as follows:
1. Normal weight concrete shall contain a water reducing admixture.
 2. Concrete slabs placed at an air temperature below 50°F shall contain a non-corrosive, non-chloride accelerator.
 3. Air-entraining agent may be used in normal weight concrete to improve concrete workability. Total calculated air content shall conform to Table 4.2.1 of ACI 318, volume determined by direct measurement or by ASTM C138.
 4. Where hardener finish is required for floor slabs, the maximum air content shall be 3%.
 5. Retarding and/or accelerating admixture may be used for cold or hot weather concreting.
- F. Maximum Aggregate Sizes: Not exceeding 3/4 of minimum clear space between bars and between bars and forms, nor larger than 1/5 of least dimensions between the forms. Design the mixes with 3/4" maximum size, except maximum 1-1/2" size for foundations, and maximum 3/8" size at congested reinforcing or thin sections only by specific approval from the State.
- G. Pumped Concrete: Design concrete mixes specifically for pump placing with dry loose volume of fine aggregates not more than 47% of total aggregates; limit air entrainment to 5% maximum.

- H. Concrete Shrinkage Tests: As part of mix design procedures, the Testing Laboratory shall perform shrinkage tests for all structural and slab concrete. Prepare a trial batch of each applicable mix design, using the same aggregates, cement, and admixtures (if any) proposed for use in the Work. Prepare at least 3 specimens for determining the "drying shrinkage" of each mix design.
1. Test Specimens: Drying shrinkage specimens shall be 4" by 4" by 11" prisms, made, cured, dried, and measured as specified in ASTM C157. Measure and report separately for 7, 14, 21 and 28 days of drying, following 7 days of moist curing; use 10" effective specimen gage length.
 2. Test Results: Average drying shrinkage after 28 days of drying shall not exceed 0.05% for all tested concrete specimens.
- I. High Early Strength Concrete: Intent to use high early strength concrete (Type I or II portland cement plus non-corrosive and non-chloride accelerator or Type III cement) shall be submitted for consideration prior to submission of mix designs.
- J. Fiber Secondary Reinforcement: If used, fibers shall be 3/4" in length and used at the dosage rate of 5.0 million fibers per cubic yard.
- 1.6 DELIVERY, STORAGE AND HANDLING: Materials shall be delivered to the site in original unopened containers, clearly indicating manufacturer's name, brand name, model or lot number, and other identifying information. Replace damaged materials and equipment at no cost to extra Owner. Protect and store concrete materials in accordance with ACI 301, Section 2.5. Store materials in a dry location, off the ground, and in such a manner as to prevent damage or intrusion of foreign matter.
- 1.7 PROJECT/SITE CONDITIONS:
- A. Environmental Conditions: Do not place concrete during rain or adverse weather conditions without means to prevent all damage. Conform to ACI 305 for hot weather concreting and ACI 306 for cold weather concreting as required; do not use calcium chloride or any type of accelerator. When strong winds occur, set up temporary wind screens to prevent too rapid drying of freshly placed or green concrete slabs.
 - B. Coordination: Examine Drawings and other Sections to ensure completeness of the Work required under this Section. Provide supplementary Work required to complete the concrete, though not specifically shown on Drawings or specified herein. Verify measurements and dimensions at the site, and cooperate in the coordination and scheduling of the Work of this Section with the Work of related trades, with particular attention given to the installation of items embedded in concrete so as not to delay job progress.

PART 2 – PRODUCTS

- 2.1 BASIC MATERIALS: Furnish materials meeting the requirements of Article "Source Quality Control" below, as applicable, and following requirements:

**BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL**

**OXNARD UNION HIGH SCHOOL DISTRICT
CAST IN PLACE CONCRETE
03 30 00 -7**

Portland cement: ASTM C150, Type II, low alkali, for general use; Type III or Type I or II with a non-corrosive non-chloride accelerator for High Early Strength. Do not change the brand without prior approval.

Stone aggregates: ASTM C33, and CCR 1903A.5 Maximum Size Coarse Aggregate, aggregate sizes conforming to concrete mix designs, from approved pits, free of vegetable matter, opaline, feldspar. or siliceous magnesium substances.

Fine:..... Hard strong durable natural sand, containing maximum 1% by weight of clay, shale, mica, coated grains, coal, or other lightweight matter. passing a 3/8" mesh sieve, uniformly graded from coarse to fine, with not less than 95% passing No. 4 sieve, and not to exceed 2% passing a No. 200 sieve. If the sieve analysis shows a deficiency of fines or gradation non-uniformity, use combination of the fine aggregates and sand in proportions to produce the required results.

Coarse:..... Clean, hard, fine-grained, sound gravel or crushed stone containing a maximum of 0.5% by weight of clay, shale, mica, coal, or other lightweight material, and a maximum of 5% by weight of flat, thin, elongated, friable, or laminated pieces. If one dimension exceeds 2-1/2 times its average thickness, the pieces are considered flat or elongated. Furnish coarse aggregates in two gradations, measured separately and introduced into the mix.

Fiber reinforcement: Collated and fibrillated polypropylene fibers for the secondary reinforcement of concrete, "Fiber Mesh" by Fibermesh Inc., "Forta CR" by Forta Corp.

Pozzolan: ASTM C618, Class N natural pozzolan, Class F Fly Ash, 100 pounds maximum per cubic yard; use pozzolan only in concrete for foundation walls and columns.

Air entraining admix:..... CCR 1904A.4.1 ASTM C260, one of the following:
 -- Air Mix by The Euclid Chemical Co.
 -- NIBVR by Master Builders, Inc.
 -- Darex AEA by W.R. Grace & Co.
 -- Sika AER by Sika Chemical Corp.

Admixtures: ASTM C494, containing not over 0.05% chloride ions.

Water reducing:..... -- Eucon WR-75 by Euclid Chemical Co.
 -- Pozzolith 200N by Master Builders, Inc.
 -- PlastoCrete 160 by Sika Chemical Corp.
 -- WRDA Hycol by W.R. Grace & Co.

Water reducing and retarding: -- Eucon Retarder 75 by Euclid Chemical Co.
 -- Pozzolith 100XR by Master Builders, Inc.
 -- Plastiment by Sika Chemical Corp.
 -- Darataro by W.R. Grace & Co.

High range water reducing -- Eucon 37 by Euclid Chemical Co.
 (Superplasticizer) -- WDRA 19 or Daracem by W.R. Grace & Co.
 -- Sikament by Sika Chemical Corp.
 -- Rheo Build by Master Builders, Inc.

Accelerator: -- Accelguard 80 by The Euclid Chemical Co.
 -- Pozzolith High Early by Master Builders, Inc.
 -- Daraset by W.R. Grace & Co.

Prohibited: Admixtures containing calcium chloride, thiocyanates, or admixtures containing more than 0.05% chloride ions.

Reinforced paper: Two-ply with asphaltic adhesive, one of following:

- -- Sisalkraft SK10 by St. Regis Laminated and Coated Products
- Div., St. Regis Paper Company.
- -- Grade A by Glas Kraft, Inc.
- -- Tuff-Champ by Ludlow Corp.
- Water: From potable domestic source.
- Joint filler: ASTM D1751, and D1752 Type I, as specified.
- Joint sealant; As specified in Section 07 92 00, including all accessory materials.
- Curing compound: ASTM C309, fugitive dye self-dissipating type.
- Curing sheet: ASTM C171, non-staining white types.
- Evaporation retardant
- and finishing aid: Master Builders "Confilm".
- Non-shrink grout: Conforming to U.S. Army CE CRD-C 621, non-gas-forming type grout
- free of oxidizing catalysts and inorganic accelerators, non-staining non-
- rusting type in exposed areas. For drypack and grout, use one of the
- following, subject to above usage requirements:
- -- Masterflow 713 or Embeco 153 by Master Builders.
- -- Five Star Grout by U.S. Grout Corp.
- -- Fondag Nonshrink Grout by Specrete Products, Ltd.
- -- Firmix or Euco NS by the Euclid Chemical Co.
- -- Ferrolith GDS or Sonogrout by Sonneborn.
- -- Vibrofoil or Horngrout by A.C. Horn.
- Vapor barrier: ASTM D2103 or NBS Voluntary Product Standard PS 17-69, poly-
- ethylene sheeting, 15 mil thickness, with minimum 2" wide waterproof
- plastic self-adhering tape, one of the following:
- -- Stego Wrap by Stego Industries, LLC
- -- Polyfilm by Dow Chemical Co.
- -- Zendel Natural by Union Carbide Corp.
- -- Visqueen by Ethyl Corp.
- Waterproofing joint filler: Cetco "Waterstop-RX", complete with manufacturer's adhesive and
- accessory materials.
- Bonding compound: Polyvinyl acetate rewettable type, one of the following:
- -- Euco-Weld by the Euclid Chemical Co.
- -- Weldcrete" by The Larsen Company.
- Epoxy adhesive: Two-component, 100% solids, 100% reactive compound, for use on
- dry or damp surfaces, one of the following:
- -- Hilti HIT HY150 by Hilti, Inc.
- -- Simpson SET-XP by Simpson Strong-Tie, Inc.
- -- Simpson SET-3G by Simpson Strong-Tie, Inc.
- -- Euco Epoxy #463 or #615 by the Euclid Chemical Co.
- -- Thiopoxy by W.R. Grace & Co.
- -- Sikadur Hi-Mod by Sika Chemical Corp.
- Epoxy bonding agent: For topping slabs and applied cement finish, ASTM C881 and ACI 503;
- 2-component, 100% solids, 100% reactive, moisture insensitive, for use on
- dry or damp surfaces, viscosity grades and pot life best suited for intended
- use, one of the following:
- -- Euco 462 Epoxy System or "Euco epoxy LPL by Euclid Chemical.
- -- Sikadur 35 Hi-Mod, Sikadur 32 Hi-Mod LPL, by Sika Chemical.
- Patching mortar: One of the following:
- -- Euco Thin Coat by the Euclid Chemical Co.
- -- Sikatop 121 by Sika Chemical Corp.
- Surface retarder One of the following:

- -- Concrete Surface Retarder Formula F by the Euclid Chemical Co.
- -- Concrete Surface Retarder Formula S by the Euclid Chemical Co.
- -- Rugasol S by Sika Chemical Corp.

2.2 CONCRETE MIXING: Furnish ready-mixed concrete from approved commercial off-site ready-mix concrete plant equipped with automatic batching and recording devices for all ingredients. Use transit mixer trucks equipped with automatic devices for recording number of revolutions of the drum. Conform mixing and delivery to and applicable requirements of this Section. If referenced specifications, this Section, or Building Code conflict, comply with the most restrictive requirement. Measure and mix concrete in accordance with ACI 304, except as modified herein. For ready-mix concrete, Sections 1 through 10 of ASTM C94 apply. Ready-mix concrete shall conform to materials, testing, and mix design requirements specified herein.

- A. Proportioning: For each batch, weigh the fine and coarse aggregate separately, measure the cement and water separately, and introduce separately into the mix so the proportions are accurately controlled and easily checked.

- B. Changing Proportions: Do not change concrete proportions established by mix designs without written approval.
 - 1. Cement: If any concrete mix develops less than the required minimum 28-day compressive strength, adjust mix proportions and increase amount of cement as necessary, at no extra cost to the State.
 - 2. Water: Do not exceed predetermined amount of mix water because of slowness of discharge from the mixer or for any other reason, but reduce water to minimum necessary to produce concrete that will work readily into corners and angles of forms and around reinforcements, without segregation of materials and without free water collecting on the surface.
 - 3. Aggregates: Reasonable variations in grading will be allowed by the State because of the characteristics of available materials and the need for workability and strength.

- C. Limitation of Mix Water: Do not deliver ready-mixed concrete to the site with total amount of mixing water included. Withhold 1-1/2 gallons of water per cubic yard at the plant, then add to mix before concrete is discharged from the mixer truck under supervision of Inspector. Each mixer truck shall arrive at the site with full water tank; if the tank is not full and concrete tests to a slump greater than specified, entire load is subject to rejection.

- D. Slump: Adjust quantity of water so concrete at time of placing does not exceed the following slumps when tested according to ASTM C143. Slumps may be increased when concrete contains superplasticizing admixture, subject to prior approval of the Structural Engineer. Use minimum water needed for workability required by part of structure being cast.

<u>Part of Structure</u>	Maximum Slump <u>Inches</u>
Footings, foundation walls, and mass concrete not reinforced	4
Slabs on grade (containing no admixture)	3
Slabs on grade (containing admixture)	3-4
Reinforced concrete over 8" thick	4
Reinforced concrete 8" or less thick.....	5
Reinforced concrete slabs including concrete on steel decking.....	3
Slabs to receive floor hardener	4

Note: Above slumps may be increased if the concrete contains a high range water reducing type (superplasticizer) admixture, amount of increase as allowed by the State in advance of concrete mixing.

- E. Batch Tickets: Furnish a bonded weighmaster's certified batch ticket with each transit mixer truck of concrete delivered to the site stating quantities of each material placed in the mixer as listed below, time water is added to mix, and certifying these quantities conform to the applicable mix design. Deliver batch tickets to Inspector at the site at time concrete is delivered. The batch delivery tickets shall show:
1. Source of concrete (name of batch plant).
 2. Cubic yards of concrete delivered.
 3. Pounds of cement per cubic yard of concrete.
 4. Weights of cement, sand, and stone/gravel per truckload.
 5. Gallons of water added or to be added.
 6. Admixtures and amount of same.
 7. Time and date of delivery, and time of first mixing, truck numbers and Inspector's name.
 8. Location in the project.
- F. Charging: Remove water remaining in the ready-mix truck drum completely before ingredients for the following loads are introduced into drum.
- G. Retempered Concrete: Do not use concrete which has not been placed 30 minutes after leaving the mixer, or concrete not placed within 60 minutes after water is added to the mix. Retempering of concrete will not be allowed. Maximum number of revolutions of ready mix truck should be 300.

PART 3 – EXECUTION

- 3.1 EXAMINATION: Refer to Section 01 71 00 and report to the State in writing all conditions that interfere with or prevent correct installation of Work of this Section. Do not proceed with installation of concrete in the affected areas until source is changed, in accordance with ASTM C33. Include sieve analysis and report on unit weights, deleterious or adverse conditions are eliminated or corrected. Examine conditions at the job site where Work of this Section is to be performed to ensure proper arrangement and fit of the Work. Start of Work of this Section implies acceptance of job site conditions.
- 3.2 PREPARATION FOR CONCRETE PLACING: Remove all free water from forms before concrete is deposited. Remove hardened concrete, debris, and foreign materials from forms and from surfaces

of mixing and conveying equipment.

- A. Wetting: Wet wood forms sufficiently to tighten up any cracks. Wet other materials sufficiently to reduce suction and maintain concrete workability.
- B. Earth Subgrade: Lightly dampen 24 hours before placing concrete but do not muddy. Re-roll where necessary for smoothness and remove loose material.
- C. Vapor Barrier: Place 15 mil vapor barrier over 4" crushed rock. Lap joints 6" in the direction of concrete spreading and tape seal. Seal the joints at walls and around penetrations with tape. Cover barrier with a second 2" layer of clean sand.
- D. Screeds: Set screeds at walls and maximum 8-foot centers between. Set to provide level floor. Check with an instrument level, transit, or laser during placing operation to maintain level floor.
- E. Screeds Over Vapor Barrier: Use weighted pad or cradle type screeds and do not drive stakes through the vapor barrier. Check with an instrument level, transit, or laser.
- F. Anchors: Set embedded bolts for the materials and equipment attached to concrete to template, layouts, and the Shop Drawings of related trades. Verify size, length, and location of electric conduit at equipment supports.

- G. Waterproofing Joint Filler: Install the filler in vertical and horizontal construction joints of waterproofed walls and slabs. Coordinate location of grooves and rebates to receive joint filler with form construction. Conform installation of joint filler to manufacturer's instructions including preparation of surfaces, application of primer and/or adhesive, and placement of joint filler material.

3.3 CONCRETE PLACING: Conform to applicable provisions of ACI 302.1 and 303R. Protect the waterproofed surfaces from damage. Do not place concrete when the ambient temperature is above 85°F or below 40°F at time of concrete placing, or if it is likely to go above 85°F or below 40°F before the concrete has taken initial set unless special precautions are taken.

- A. Construction Joints In Concrete: Locate joints only where approved, and obtain prior approval for points of stoppage of any pour. Clean and roughen the surface of construction joints by removing the entire surface and exposing 1/4" amplitude of clean aggregate solidly embedded in mortar matrix by sandblasting, chipping, use of an approved surface retarder, or equivalent method. Water and keep the hardened concrete wet for not less than 24 hours and slush with portland cement slurry just before placing the joining concrete. Cover horizontal surfaces of existing or previously placed and hardened concrete with 2" thick layer of fresh concrete less 50% of coarse aggregate just before balance of concrete is placed and as per 1905.10.
- B. Construction Joint Location: Place concrete continuously for each piece of the Work. If interruptions are necessary, provide a construction joint. Obtain approval of layout showing

proposed location of construction joints before proceeding. Except where indicated, locate construction joints to least impair strength and appearance of structure. Conform to approved submittal.

- C. Joints in Slabs: Locate construction joints in supported floor slabs only in middle third, in either direction of spans, and do not make construction joints continuous for more than 40% of the overall dimension of the building in either direction. Off-set construction joints at least 5 feet with a minimum of two offsets. Allow a proper time lapse in placing of floor sections adjoining prior placings, as approved.
- D. Conveying and Placing: Do not place concrete until the reinforcing steel, forms, or metal decking have been approved by Inspector and other authorities having jurisdiction. Do not use aluminum tubing or any aluminum equipment for pumping, chuting, or placing concrete. Do not allow concrete to free fall from point of release at mixer, hoppers, tremies, or conveying equipment more than 6 feet for concealed concrete and 3 feet for exposed concrete. Provide tremies or plastic elephant trunks with hopper heads spaced at no more than 10 foot centers for the entire length of wall being placed in any one day. Carry concrete up uniformly for length of wall being placed to reduce lateral flow of concrete to 5-foot maximum. Deposit concrete so that the surface is kept level throughout, a minimum being permitted to flow from one portion to another. Place concrete in horizontal layers not more than 18" thick within 60 minutes after water is first added to the batch. Place concrete by methods that prevent segregation of materials. Do not use the reinforcing or forms to support conveying and placing equipment.
- E. Vertical Elements: Allow concrete in vertical elements to be in place at least 2 hours and until vertical shrinkage has ceased before placing concrete for floor framing. Beams, girders, and brackets are part of floor systems.
- F. Limitation: Limit continuous concrete placement for walls to 80 lineal feet. Walls longer than 80 lineal feet may be placed in two or more sections but sections of the same day's concrete shall not be in contact with each other.
- G. Pumping Concrete: Intent to place concrete by pumping shall be indicated in writing and the proposed design mix, as well as method of pumping, shall be submitted for approval before any pumping will be permitted. The pump must be suitable for pumping concrete at a maximum slump of 8" with the high range water reducing admixture (superplasticizer). The design mix, as previously specified, shall have a slump (at the nozzle) not in excess of that specified for normally placed concrete. Grout used to lubricate piping prior to pumping shall not be placed in the Work without prior approval. Water used to clean out pipes shall not be allowed to run into the forms or contact freshly placed concrete. Pumped concrete may contain one of the specified high range water reducing admixtures (superplasticizer). The mix design shall not be modified without approval.
 - 1. Pumping shall be done only with equipment that is in good condition and by methods which are considered good practice. Excessive stoppage due to breakdown of equipment or plugged lines, or need to frequently adjust mix water, will be considered just causes for the Architect or Inspector to direct that the pumping be stopped and other methods of placement be used.

2. The use of aluminum pipes and equipment for conveying pumped concrete is prohibited.
 3. Pumping shall conform to ACI 304 (Chapter 9).
 4. Use pump equipment having a demonstrated capacity to deliver at least 22 cubic yards of concrete per hour to the forms of the mix designs required and at the required slumps.
 5. Support equipment and hoses and do not allow to bear on the forms, reinforcing, or subgrade.
 6. Frequently check slump at both pump and point of discharge; conform to a maximum 1" slump difference with discharge slump governing.
 7. Maintain standby pumping equipment at the site or available within a 30 minute delivery time in event of primary pumping equipment failure.
- H. Vibration: Use and type of vibrators used to consolidate concrete shall conform to ACI 309, Recommended Practice for Consolidation of Concrete. Each layer of concrete shall be compacted as placed using mechanical vibrators or equivalent equipment. Transmit vibration directly to concrete and in no case through the forms unless approved. Accomplish thorough compaction. Supplement by rodding or spading by hand adjacent to forms. Compact concrete into corners and angles of forms and around reinforcement and embedded fixtures. Recompact deep sections with congestion due to reinforcing steel. Furnish not less than one vibrator at each placing location, and maintain a standby vibrator at the site.
1. Operation of Vibrators: Do not transport concrete in the forms with vibrators nor allow vibrators to contact forms or reinforcing. Push vibrators vertically into the preceding layers that are still plastic and slowly withdraw, producing the maximum obtainable density in concrete without creating voids or segregation. In no case disturb concrete that has stiffened or partially set. Vibrate at intervals not exceeding two-thirds the effective visible vibration diameter of submerged vibrator. Avoid excessive vibration causing segregation.
 2. Re-Vibration: Place concrete containing a retarding admixture by a schedule that allows the layers of concrete to be in place and compacted for at least 30 minutes before next layer of concrete is placed. Remove bleed water on concrete surface and from forms and re-vibrate concrete down as far as concrete is plastic before placing the next layer of concrete.
- I. Vertical Elements: Allow concrete in vertical elements to be in place at least 2 hours and until vertical shrinkage has ceased before placing concrete for floor framing. Beams, girders, and brackets are part of floor systems.
- J. Correction of Segregation: Before placing next layer of concrete, and at top of last placement for vertical elements, remove concrete containing excess water or fine aggregate or showing deficiency of coarse aggregate and fill the space with compacted concrete of correct proportions.
- K. Footings: Immediately prior to placing concrete, the bearing surface at bottom of excavation

must be given final approval by the public authority having jurisdiction.

L. Slabs: Strike off excess concrete with manual or powered screed to bring surface to required plane. Move screeds across the concrete in a sawing motion as the screed is advanced. Use wood bull floats or darbies following screeding to eliminate high or low areas. Compact and tamp concrete and to bring 1/8" to 3/16" of coarse mortar to the surface; avoid tamping that brings up an excess of fines. Wood float to straightedges and screeds at the required planes. Do not use steel or plastic floats of any kind for the initial screeding and floating operations. Do not apply slab finish until surface water disappears and surface is sufficiently hardened. Remove bleed water and laitance as it appears. Check the level with an instrument level, laser, or transit during concrete placing to maintain a level slab.

M. Slab Joints:

1. On-Grade Slabs: Place with maximum 40-foot edge dimension. Generally locate joints on column lines, exact locations as shown, directed, or approved.
2. On-Grade Slab Construction and Contraction Joints: Use standard types equal to "Key-Kold" construction joint at column lines, "Kwik-Joint" contraction joint at intermediate spacings. Machine saw cut 1/8" by 1" deep control joints where indicated or approved. Conform to approved submittal.
3. Expansion Joints: Conform to details and approved submittal. Provide expansion joint filler finished flush with slab surface except for those joints shown to be sealed with sealant. Use rubber type expansion joint filler where sealant sealed joints occur. Conform to Section 07 92 00 for sealant sealed joints are shown or specified, including the polymer joint filler, backing, and bond breaker. Thickness of filler shall exceed joint width by at least 25% and shall fill joint. Where sealing compound is required, install filler up to depth required for the compound used.

3.4 CURING FORMED CONCRETE: Keep forms containing concrete in a wet condition until removed. Keep concrete continuously moist for not less than 7 days after placement. Keep concrete moist with a fine fog water spray until protected by curing media. During times of dry or excessive winds, high ambient temperature, low humidity, or other ambient conditions causing rapid drying, use specified evaporation retardant and finishing aid material according to the manufacturer's instructions and cure concrete with a fine fog spray of water, or equal, applied both during and after finishing and continued until final curing operations are started. Use water curing, curing sheet material, or a clear liquid membrane-forming curing compound except as otherwise specified. Do not use any type of finishing or curing materials or methods that interfere with the correct application or bonding of subsequent materials; verify exact requirements with all applicable trades.

- 3.5 PATCHING FORMED CONCRETE: Remove fins, projections, and offsets. Cut out rock pockets, honeycomb, and all other defects to sound concrete, with edges of cuts straight and back-beveled. Dampen cut-outs and edges, and scrub with neat portland cement slurry just before patching, or apply approved epoxy concrete adhesive. Pull form ties from the unexposed face where possible. Saturate form holes with water and fill voids, holes, and patches with flush smooth-finished mortar of same mix as concrete (less coarse aggregate), cure, and dry.
- 3.6 FINISHING EXPOSED FORMED CONCRETE: As specified in Section 03 35 00.
- 3.7 SLAB FINISHING AND CURING: As specified in Section 03 35 00.
- 3.8 GROUTING AND DRYPACKING: Install as indicated or required except for the items grouted by other trades.
- A. Structural Steel Base Plates: Prior to grouting base plates, consult with DSA as to method and procedure.
 - B. Mixing: Mix the approved non-shrink grout material with sufficient water per manufacturer's recommendations, so it flows under its own weight for grout, and to just moisten and bind the material together for drypack.
 - C. Placing and Curing: Install drypack by forcing and rodding to fill voids and provide complete bearing under plates. Place fluid grout from one side only and puddle, chain, or pump for complete filling of voids; do not remove the dams or forms until grout attains initial set. Finish exposed surfaces smooth and damp cure for at least 3 days.
- 3.9 MISCELLANEOUS CONCRETE WORK: Provide areaways, cast-in-place valve boxes, pits, splash blocks, bases, and other miscellaneous concrete as indicated and required to complete all Work. Conform to applicable requirements herein.
- 3.10 FIELD QUALITY CONTROL: Refer to Section 01 45 00.
- A. Supervision: Perform Work of this Section under supervision of a capable concrete superintendent.
 - B. Level of Floors: Continuously monitor concrete placing to maintain level floors by the use of an instrument level, transit, or laser.
 - C. Continuous Inspection: Construct all structural concrete under continuous inspection of Inspector. Obtain inspection and approval of concrete forms and reinforcing by Building Department, as required, and by Inspector before placing structural concrete.
 - D. Field Facilities: Contractor shall provide and maintain for use by the Testing Laboratory adequate facilities for safe storage and proper field curing of concrete test cylinders on site as required by ASTM C31.

- E. Testing of Concrete: Testing Laboratory will perform following tests:
1. Compressive Strength Tests: Cast one set of three or more cylinders from each day's placing and each 50 cubic yards, or fraction thereof, of each strength of structural concrete. Date cylinders, assign record number, and tag showing the location in the project from which sample was taken. Also record slump test result of sample. Do not make more than two series of tests from any one location or batch of concrete.
 2. Test Cylinders: Cast cylinders according to ASTM C31 24 hours later, store cylinders under moist curing conditions at about 70°F. Test according to ASTM C39 at 7 and 28 day ages.
 3. Control Test Cylinders: Cast a set of two or more cylinders for each day's placing of concrete for slabs supported on shoring or steel decking. Set test cylinders on slabs represented by the cylinders and cure the same as slabs. Test cylinders to determine proper times for removal of shores and reshoring, or loading slabs on steel decking.
- F. Shrinkage Tests: Testing Laboratory will take drying shrinkage specimens of each class of concrete during construction to ensure the continued compliance with the requirements of this Section, at least one set of 3 specimens from each 500 cubic yards of concrete placed and taken from the same concrete used for preparing compression test specimens. Testing shall be as specified above for the mix design process.
- G. Quality Assurance During Placing: Testing Laboratory will perform sieve analysis of the aggregate being used, check compliance with mix design and the cement being used against mix design; check that water has been removed from the drum before adding mix ingredients for the following load, and witness the loading of mixing trucks. Testing Laboratory will send a written report of each inspection to the State indicating compliance with this Section.
- H. Core Tests: If tests show the compressive strength of any concrete falls below the required minimum, additional testing of concrete which unsatisfactory tests represent may be required. Testing Laboratory shall take and test drilled cores as directed in accordance with ASTM C42. Contractor shall refill core holes with drypack concrete of the same compressive strength required for cored concrete. If core tests results are unsatisfactory, Contractor shall furnish required labor, equipment, and weights, and the Testing Laboratory shall conduct load testing on the involved parts of building or structure as directed. Contractor shall bear additional curing and test costs, including Testing Laboratory costs, for concrete not meeting required compressive strength at 28 day age even if testing demonstrates that concrete has eventually attained the required minimum compressive strength, and all costs for required corrections or removals and replacements as directed and required for approved construction.

3.11 CLEANING: Clean up and remove from the site all waste, debris, surplus materials, and disused

equipment and supplies resulting from Work of this Section, and remove all equipment as soon as no longer needed for the Work. Clean up and remove all soil contaminated with concrete or by the washing out of transit mixer trucks.

END OF SECTION

BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL

OXNARD UNION HIGH SCHOOL DISTRICT
CAST IN PLACE CONCRETE
03 30 00 -18

SECTION 03 35 00

CONCRETE FINISHING

PART 1 – GENERAL

1.1 SUMMARY: Division 1 applies to this Section. Perform and provide all concrete finishing required to complete the work, except for concrete finishing specified to be performed under other Sections.

A. Work Included:

1. Samples and submittals.
2. Finishing of exposed formed concrete.
3. Final slab finishing and curing.

B. Related Work:

1. Furnishing, erection, and removal of forms.
2. Furnishing, placing, patching, and initial curing of cast-in-place concrete unless otherwise specified.

1.2 SUBMITTALS: Refer to Section 01 33 00 for procedures.

A. Product Data: Submit for the following:

1. Curing-sealer-hardener.
2. Acrylic sealer.
3. Color hardener and color curing wax.

PART 2 – PRODUCTS

2.1 MATERIALS: Furnish finishing materials conforming to Section 03 30 00, as applicable, and following requirements.

Acrylic curing-sealer-Hardener:.....Standard product acrylic type curing-sealer-hardener meeting requirements of ASTM C309, by Burke, Sonneborn, or Dayton Superior.

Acrylic sealer:.....Clear non-yellowing acrylic base sealer manufactured for use on exterior concrete and masonry, by Rohloff & Co., L.M. Scofield, or Sonneborn, gloss finish unless otherwise directed; for use on exposed aggregate.

PART 3 – EXECUTION

- 3.1 EXAMINATION: Report to the State in writing all conditions which interfere with or prevent correct installation of Work of this Section. Do not proceed with installation in affected areas until adverse conditions are eliminated or corrected.
- 3.2 FINISHING EXPOSED FORMED CONCRETE: Surface patching and initial curing of formed concrete are specified in Section 03 30 00. Rub surfaces with a carborundum brick or equal until smooth and free of form marks, offsets, and other defects, and in uniform planes. Wet rubbed surface and then brush coat with cement grout consisting of 1 part light-colored portland cement to 2 parts fine aggregate and mixed with water to the consistency of thick paint. Cork or wood float grout to fill all pits, air bubbles, and surface holes. Scrape off excess grout and rub surface with burlap or equal to remove all grout film. After grout sets, again coat with same grout, cure, then brick and burlap rub as necessary to eliminate remaining defects and blemishes, and damp cure surfaces for not less than 3 days or longer if required for complete curing of concrete. Finish, clean, and cure each surface as a continuous operation. Produce uniformly plane smooth surfaces free of grout film, grout or rubbing marks, defects, or blemishes after painting or covering with a flexible type finish material. Unless otherwise indicated or specified, apply this finish on exposed formed concrete.
- A. Surfaces Excepted: Rubbed and grouted finish is not required on following surfaces:
1. Permanently concealed concrete.
 2. Concrete exposed in mechanical, electrical, utility, storage, shaft, and similar non-public rooms and areas.
 3. Wall and ceiling surfaces in interior parking areas, except the heads, jambs, and sills of openings in exterior walls shall be finished.
- 3.3 SLAB FINISHES: Produce finish slab surfaces level or sloped as shown with maximum deviation of 1/8" from a 10-foot straightedge. Keep surface moist with a fine fog spray of water as necessary. Dusting with dry cement or sand during finishing operations is not permitted. Finish all slab edges and joints with an edging tool. Apply the following finishes as indicated, specified, directed, and applicable.
- A. Rough Slab Finish: After initial set, coarse broom the slab surfaces and expose coarse aggregate. Apply on slabs to receive deferred mortar setting beds or cementitious toppings or slabs.
- B. Monolithic Trowel Finish: For slab and flatwork surfaces not indicated or specified to receive another finish. After surface water disappears and floated surfaces are adequately hardened, steel trowel and re-trowel concrete to a smooth surface. After concrete has set sufficiently to ring the steel trowel, re-trowel to a smooth uniform finish free of trowel marks and blemishes. Avoid excessive re-troweling which produces burnished areas.

C. Steel Float Finish: Same as for monolithic trowel finish except omit the second retroweling. Apply on following areas and surfaces:

1. Resilient floor covering areas.
2. Carpeted areas.
3. Elastomeric coating areas.
4. Thin-set tile areas.
5. Slabs to receive membrane waterproofing.
6. Slabs to receive fluid-applied waterproofing.

D. Medium Broom Finish: Same as for monolithic steel trowel finish less the second retroweling. When ready, apply approved coarse texture finish by sliding a wire or stiff bristle broom in one direction along a straightedge guide set at right angles to the direction of traffic. At walking areas, smooth finish 1" wide at edges, expansion joints, and scoring. Apply on following surfaces:

1. Exterior vehicle traffic slabs.
2. Exterior concrete walks.
3. Other slabs where indicated or directed.

E. Scoring: Provide where shown or directed, using tool of approved size and profile. Run score lines straight and of uniform appearance. If scoring is not indicated, obtain the State's instructions not less than two working days before the day slab concrete is placed.

3.6 SLAB CURING: Cure interior slabs by keeping wet for 7 days or keep wet 3 days and then apply liquid compound in accordance with manufacturer's published application rates; apply 2 spray coats, with second coat at right angle to first coat. Cover adjoining surfaces. Equip spray nozzles with a wind-shield suitable for wind conditions.

A. Curing Period and Protection: Maintain all curing media intact and sealed for 10 days minimum after application. Keep foot traffic off the curing surfaces to minimum possible and completely off liquid compound cured surfaces; vehicular traffic is not permitted on the surfaces until curing is completed. Immediately restore all damaged or defective curing media.

- B. Restriction: Do not apply liquid membrane-forming curing compounds on any concrete to receive or bond to concrete or mortar, or on any surfaces to receive subsequent material or finish unless such use and the specific compound used are approved by manufacturer of the material or finish to be applied, and verify all such use with related trades. Do not apply curing compounds on slabs to receive elastomeric or bituminous type coatings.
- C. Liquid Membrane-Forming Curing Compound: Use on exterior slabs and paving but subject to above restriction. Do not use on interior slabs.
- D. Sheet Curing: Use the specified curing sheet material. Seal all laps and edges with plastic pressure-sensitive tape, and immediately repair tears during the curing period. Verify that surfaces remain damp for the full curing period; if necessary, lift sheet, wet surfaces with clean water, then replace and reseal the sheeting. Use on surfaces where curing compound is not permitted.
- E. Water Curing: Option to either liquid membrane-forming curing compound or sheet curing method. Keep concrete continuously wet for entire curing period.
- F. Acrylic Curing-Sealer-Hardener: On interior slabs to remain exposed, apply acrylic curing-sealer-hardener immediately after slab finishing is completed, one coat spray applied according to manufacturer's directions. Just before inspection for Substantial Completion, clean slabs of dirt, dust, oil, grease, and all other deleterious substances, and spray apply a second coat of acrylic curing-sealer-hardener to uniform coverage recommended in manufacturer's specifications for the slab texture. Acrylic curing-sealer-hardener may be used to cure interior slabs to receive resilient floor covering or carpet, subject to requirements of Paragraph "Restriction" above, and to cure all exterior slabs and paving. Verify the acrylic curing-sealer-hardener is compatible with integrally-colored concrete prior to use. Apply on following surfaces:
1. Exterior concrete walking slabs.
 2. Exterior vehicle traffic slabs.
 3. Concrete loading dock slab.
 4. Concrete stair treads and landings.
 5. Interior slabs to remain exposed.
 6. Other interior slabs as specified.

END OF SECTION

SECTION 03 39 00

CONCRETE CURING

PART 1 – GENERAL

1.1 SUMMARY

- A. Initial and final curing of horizontal and vertical concrete surfaces.
- B. Related Sections:
 - 1. Section 03 30 00 - Cast-In-Place Concrete.
 - 2. Section 03 35 00 - Concrete Finishing.

1.2 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 302 - Recommended Practice for Concrete Floor and Slab Construction.
- C. ACI 308 - Standard Practice for Curing Concrete.
- D. ASTM C171 - Sheet Materials for Curing Concrete.
- E. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- F. ASTM D2103 - Polyethylene Film and Sheeting.
- G. California Building Code (CBC) with state amendments, California Code of Regulations, Title 24, Part 2, Volume 2.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 - Submittals.
- B. Product Data: Provide data on curing compounds, compatibilities, and limitations.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301.

1.5 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with Chapter 19A, "Concrete", of the California Building Code with State Amendments.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products under provisions of Section 01 66 00 – Materials and Equipment.
- B. Deliver curing materials in manufacturer's packaging including application instructions.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Membrane Curing Compound: ASTM C309 Type 1.
- B. Water: Potable, not detrimental to concrete.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to be cured.

3.2 EXECUTION - HORIZONTAL SURFACES AND VERTICAL SURFACES

- A. Concrete shall be maintained above 50°F and in a moist condition for at least the first 7 days after placing, except that high early strength concrete shall be maintained in such a condition for at least the first 3 days.
- B. Before applying curing paper, interior floor treated with colored hardener shall be given a heavy protective coat of colored wax left unpolished, and then immediately covered with paper. If wax is not applied within two hours after final troweling, concrete shall be sprayed with a fine water mist and kept continuously moist until wax is applied, unless spraying is not recommended by hardener manufacturer. After all other work, including plastering and painting has been completed, curing paper shall be removed and waxed floors cleaned of protective wax coating. Clean all floors to their original condition.
- C. Forms containing concrete, top of concrete between forms, and all exposed concrete surfaces after removal of forms shall be maintained in a thoroughly wet condition for not less than 7 consecutive days after placing.
- D. If weather is hot or surface has dried out, spray surface of concrete slabs and paving with fine mist of water, starting not later than 2 hours after final troweling and continuing until sunset. Surface of finish shall be kept continuously wet until curing medium has been applied.
- E. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

3.3 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01 77 00 - Contract Closeout and Final Cleaning.
- B. Do not permit traffic over unprotected floor surface.

3.4 SCHEDULES

- A. Storage Area Slabs: Absorptive mats, burlap-polyethylene type.
- B. Retaining Walls: Membrane curing compound, acrylic type, clear color.
- C. Concrete Pavement: Membrane curing compound, opaque color.
- D. All Other Floor Areas: Membrane curing compound, acrylic type, translucent color.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL

PART 1 – GENERAL

1.1 SUMMARY: Division 1 applies to this Section. Provide all structural steel and related items, complete.

A. Work Included:

1. Structural steel framing.
2. Steel pipe and tube framing.
3. Shop priming and field touch-up to extent specified.
4. Furnishing and delivery to related trades for installation the anchor bolts and loosebearing and setting plates for structural steel.

B. Related Work:

1. Setting of anchor bolts and inserts in concrete.
2. Grouting of base and bearing plates.
3. Reinforcing steel.
4. Fireproofing for structural steel.
5. Field painting except as specified herein.
6. Miscellaneous metal fabrications including steel stairs.
7. Lightgage metal framing.
8. Rough carpentry.

1.2 REFERENCES: The Work shall conform to the reference standards and specifications of the issues listed below (refer to Section 01 42 00 if issue date is not listed), to requirements indicated and specified, to required fire ratings, and to the pertaining regulatory requirements of authorities having jurisdiction. The specifications, codes, publications, and standards listed, but referred to hereafter by the basic designation only, form a part of this Section to the extent referenced herein:

A. American Institute of Steel Construction (AISC):

Code of Standard Practice for Steel Buildings and Bridges.
Specification for Design, Fabrication and Erection of Structural Steel for Buildings. Steel Construction Manual.

- B. American Society for Testing and Materials (ASTM):
 - A36 Carbon Structural Steel.
 - A53 Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and seamless.
 - A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - A307 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - A325 Specifications for Structural Joints using ASTM A325 and A490 bolts.
 - A490 Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
 - A500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - A563 Carbon and Alloy Steel Nuts.
 - A572 High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 - F436 Hardened Steel Washers.
 - F1554 Standard Specifications for Anchor Rods Grade 58
- C. American Welding Society (AWS):
 - A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 - D1.1 Structural Welding Code - Steel.
- D. Steel Structures Painting Council (SSPC):
 - SP6 Commercial Blast Cleaning.
- E. Military Specification (DOD and MIL):
 - DOD-P-21035A Paint, Zinc-Rich, Galvanizing Repair.

1.3 SUBMITTALS: Refer to Section 01 33 00 for procedures.

- A. Shop Drawings and Erection Diagrams: Submit detailing of all the structural steel including cuts, copes, welding, accessories, connections, fastenings, and holes including any required hole reinforcement. Detail minor connections and fastenings not indicated or specified to meet the required conditions. Include detailed sequence plan for both shop and field welding that minimizes locked-in stresses and distortion. Make erection diagrams as complete as possible before first submittal and base on "Erection and Bracing Plan and Procedure" below. If more than one submittal is required, the later submittals shall clearly identify material added or revised subsequent to previous submittal. Indicate shop and field welds according to AWS A2.4, "Standard Symbols for Welding, Brazing, and Nondestructive Examination".
- B. Proof of Materials Compliance: Submit mill test reports for structural steel. Refer to Article "Source Quality Control" below for unidentified steel.
- C. Certificate: Upon completion of structural steel erection, Contractor's Surveyor shall deliver to Architect a signed certificate stating the installed structural steel framing conforms to the Drawings and the reference standards listed above.

1.4 QUALITY ASSURANCE:

- A. Reference Standards: Conform Work of this Section to following reference standards except where otherwise indicated or specified. Structural steel shall be as defined and enumerated in Section 2 - Definition of Structural Steel, of AISC Specifications and Code of Standard Practice, unless designated otherwise on the Drawings or specified otherwise herein.
 - 1. AISC Standards: The Code of Standard Practice for Steel Buildings and Bridges; Specification for Design, Fabrication and Erection of Structural Steel for Buildings; Steel Construction Manual; and amendments and supplements to date. References in AISC Standards to Owner approvals are hereby deleted; all such approvals shall be by the Architect or Structural Engineer.
 - 2. AWS Standards: AWS D1.1, Structural Welding Code.
- B. Qualifications of Fabricator: Fabricate structural steel in the shop of a licensed fabricator approved by DSA.
- C. Requirements of Regulatory Agencies: Conform to Code and Title 8, CCR.

1.5 DELIVERY, STORAGE, AND HANDLING: Protect structural steel members and other materials from damage during shipping, handling, and storage. Steel items showing dents, creases, deformations, weathering, or other defects are not acceptable. Deliver welding electrodes to the site in unbroken packages bearing the manufacturer's label identifying contents. Deliver anchor bolts and other devices to be embedded in concrete or masonry to the site in time to be installed. Unless installed when delivered, store steel members at the site above ground on platforms, skids, or other approved supports and protect from corrosion. Store other materials in weathertight and dry place until installed.

1.6 PROJECT/SITE CONDITIONS: Use caution to protect floor slabs and adjacent Work from damage. Do not overload floors. Use rubber tired equipment to handle and move steel. Do not set steel members directly on floor; use timber pads or similar material for cushioning.

- A. Temporary Flooring: Provide temporary planking, scaffolding, and flooring for erection of structural steel or support of erection machinery. Use of temporary floors or steel decking to conform to CBC Code.

PART 2 – PRODUCTS

2.1 BASIC MATERIALS: Furnish materials conforming to the following:

- Steel shapes: ASTM A992 except for angles and channels shall be of ASTM A36. Steel tubing: ASTM A500 Grade B. Steel pipe shall be ASTM A53 grade B.
- Bolts and nuts: ASTM A307.
- Electrodes: AWS D5.1, E70XX Series as required for intended use.
- Primer: Metal primer conforming to AQMD requirements; compatible with the primer requirements of Section 09 90 00 where indicated, scheduled, or specified to be finish painted.

2.2 GENERAL FABRICATION REQUIREMENTS: According to approved submittals, reference standards as applicable, and requirements herein. Fabricate and form the work to meet actual installation conditions verified at the site; refer to Section 01 71 00 regarding verification of conditions.

- A. Cleaning and Straightening: Thoroughly wire brush steel materials, clean of loose mill scale and rust, and straighten by methods that will not injure the steel prior to fabrication. Remove twists or bends after punching or working a component part of a member before parts are assembled. Produce finished members free from twists, bends, and open joints when erected.
- B. Contact: Pin components parts of built-up members and maintain in close contact using clamps or temporary bolting during welding operations. Accurately mill compression bearing surfaces of joints depending on contact bearings or saw cut square to axis, or as detailed. Cut other joints straight and true.
- C. Joining: Provide members of the sizes, weights, shapes, and arrangements indicated, closely fitted and finished true to line and in precise position as necessary to allow proper joining of parts at site. Drifting to enlarge unfair holes is not allowed without prior approval.
- D. Drilling, Punching, and Reaming: Prepare required holes in structural steel members for attachment or passage of Work of other trades. Where allowed, steel may be punched 1/16" larger than the nominal diameter of the bolt when the steel thickness is equal to or less than diameter of the bolt plus 1/8". Where the steel is thicker than the diameter of the bolt plus 1/8", the holes shall be drilled or sub-punched and reamed. Diameter of sub-punched holes, and the drill for sub-drilled holes, shall be 1/16" smaller than the nominal diameter of bolt to be installed. Precisely locate finished holes to ensure passage of all bolts through steel assemblies without drifting. Enlarge holes only by reaming. Poor matching of holes is cause for rejection.
- E. Holes For Anchor Bolts: Punch and drill or ream holes in base and bearing plates. Do not make or enlarge the holes by burning.
- F. Base Plates: Press or mill steel column base plates 4" thick or less for straight contact bearing between plate and column.
- G. Gas Cutting: Use of a cutting torch is allowed where the metal being cut is not stressed during the operation, and provided stresses are not transmitted through a flame-cut surface. Make all gas cuts with a smooth regular contour. Deduct 1/8" from width of gas cut edges to determine effective width of gas cut members. Make radius of reentrant gas cuts as large as possible, 1" minimum.
- H. Exposed Structural Steel: On structural steel members to remain exposed, grind cut ends and other cuts smooth with rounded corners and edges. Grind flat surfaces to remove defects that will show through galvanizing, and peen welds to eliminate spikes and sharpness. Exposed fasteners and washers on these members shall be galvanized.

2.3 CONNECTIONS:

- A. Common Bolts: Make connections with A307 bolts unless otherwise indicated.

2.4 WELDING:

Conform shop and field welding to AWS D1.1, as modified by the referenced AISC Standards, and as shown or noted on the Drawings. Employ certified welding operators thoroughly trained

and experienced in arc welding who produce uniformly reliable groove and fillet welds in the flat, vertical, and overhead positions, and who make neat and consistent welds. Weld structural steel joints by shielded electric-arc method unless otherwise shown or specified. Conform to inspection and testing of welds required in Article "Field Quality Control". Detail and execute welds in accordance with AWS requirements as modified by AISC Standards or as detailed and noted on the Drawings. In event of a conflict between the Drawings, the notes and details on the Drawings shall take precedence.

- A. Structural Welding: Perform by one of the following processes:
 - 1. Shielded Metal Arc Welding Process.
 - 2. Gas-Metal Arc and Flux-Cored Arc Welding.
 - 3. Submerged Arc Welding.
- B. Operators Qualifications: Employ thoroughly trained welding operators and experienced in arc welding of structures, capable of making uniformly reliable butt and fillet welds in flat, vertical, and overhead positions and of producing neat, consistent welding in actual operation, certified in accordance with AWS requirements. Contractor is responsible if recertification is required.
- C. Storage and Care of Electrodes: Coatings of low-hydrogen type electrodes shall be fully dry when used. Use electrodes as taken from hermetically sealed packages within 4 hours of the time the package is opened. Electrodes not used within this 4 hour period, and electrodes that have been exposed more than one hour to air having relative humidity of 75% or greater, shall be dried for at least two hours at a temperature of 200-250°F before they are used, or be reconditioned according to combined recommendations of AWS and manufacturer. Electrodes so dried or reconditioned and not used within 4 hours after drying is completed shall be re-dried before use. Electrodes of any class that have been wet shall not be used under any conditions.
- D. Preparation: Clean steel to be welded of paint, grease, oil, mill scale, and foreign matter. Clean weld each time the electrode is changed. Chip full surface of hand guided and controlled flame cut edges before welding. Surfaces prepared with automatic or mechanically guided and controlled equipment need not be ground or chipped before welding. Preheat in accordance with Table 4.2 of 1976 "Revisions to Structural Welding Code AWS D1.1".
- E. Lamination Check: Ultrasonically test all steel column materials greater than 1-1/2" thick for laminations within 12" (6" on each side) of direct groove welds at column splices and girder flange connections to columns before welding. Conform to the ultrasonic testing procedure specified in Article "Field Quality Control" hereinafter.
- F. Procedures: During assembling and welding, hold components of a built-up member with adequate clamps or other means to keep parts straight and in close contact. Do not perform welding in wind until adequate protective screening is set up. Cut out defective welds or parts of welds with a chisel or air arc and replace with proper welding.
- G. Tack Welds: Are subject to the same quality requirements as final welds except that:

1. Preheat is not mandatory for single pass welds which are re-melted and incorporated into continuous submerged arc welds.
 2. Defects such as undercut, unfilled craters, and porosity need not be removed before the final submerged arc welding.
 3. Remove tack welds not incorporated into final weld. Clean tack welds incorporated into final welds. Multiple pass tack welds shall have cascaded ends.
- H. Peening: Peening according to AWS Article 309 is allowed at fabricator's option.
- I. Ultrasonic Inspection of Welded Connections: Refer to the Article "Field Quality Control" hereafter.
- J. Weld Characteristics: Clean and wire brush all welds. Visual inspection of finished welds must show uniform section, smoothness of welded metal, feather edges without undercuts or overlays, freedom from porosity and inclusions, and good fusion and penetration into base metal at edges and ends of fillet welds.
- K. Weld Finishing: Grind permanently exposed welds to smooth surfaces free of holes, slag, or other defects, flush with the adjoining surfaces. No finish treatment is required for permanently concealed welds.
- 2.5 SHOP PRIMING: Clean surfaces according to AISC Specifications. Apply one shop coat of specified metal primer to minimum 1 mil dry film thickness. Work primer into joints. Do not prime the following:
- A. Steel surfaces embedded in concrete or masonry.
 - B. Permanently concealed structural steel surfaces.
 - C. Surfaces to receive directly-adhered fireproofing.
 - D. Hot-dip galvanized steel surfaces.
- 2.6 SOURCE QUALITY CONTROL: Refer to Section 01 45 00, including costs for the following conformance testing.
- A. Identified Structural Steel: Tests are waived for steel identified by the heat number, accompanied by mill analyses and mill test reports, and tagged with Identification Certificates so as to be readily identified for conformance with applicable ASTM. Deliver copy of each mill test report, coordinated to members on the building, to Architect and Structural Engineer for record purposes, and furnish to Architect an acceptable affidavit to confirm the materials conform to requirements of this Section. In case of controversy, tension and bend tests of the materials, either locally or at the mill, as required for unidentified steel will be required. If local stock structural steel can be identified by the heat or melt number and it is accompanied by mill analysis and test report, such stock may be used provided one tension and one bend test is performed for each 100 tons, or fractional part thereof, of each shape, heat, or melt of such stock as may be used in the Work.

- B. Unidentified Structural Steel: If any steel cannot be identified or its source is questionable, perform not less than one tension and one bend test for each 5 tons, or fractional part thereof, of each shape, heat, or melt of such stock as may be used in the Work. Additional tests may be required if deemed necessary by the State, or DSA.
- C. Inspection: Complete 4-sided surface inspection may be required for steel materials at no extra cost to the State.
- D. High-Strength Steel: Each piece of high-strength, unidentifiable local stock steel shall be tested and stamped.
- E. Test Specimens: Taken under the direction of the Testing Laboratory and machined to dimensions required by the applicable ASTM standard.

PART 3 – EXECUTION

- 3.1 EXAMINATION: Refer to Section 01 71 00 and report to the State in writing all conditions which interfere with or prevent correct installation of Work of this Section. Do not proceed with installation in affected areas until adverse conditions are eliminated or corrected. Take field measurements pertaining to structural steel as required. Report any major discrepancy between Drawings and field dimensions to the State.
- 3.2 ERECTION: Brace and secure structural steel members until the permanent connections are completed. Provide accessories and fasteners to secure steel in place as shown and required. Conform to Code, AISC Standards, and erection and bracing plan and procedure.
 - A. General: Employ qualified riggers and plan the structural steel erection to require minimum cutting. Erect members plumb, true to line and level, and in precise positions. Provide temporary bracing and guying to resist stresses and loads to which the structure may be subjected, including those due to erection equipment and its operation.
 - B. Damaged Members: During erection, straighten or replace members which are bent, twisted, or damaged as directed. If heating is required, perform heating by methods that ensure a uniform temperature throughout the entire member. When directed, remove members damaged to an extent impairing appearance, strength, or serviceability and replace with new members at no extra cost to the State.
 - C. Anchor Bolts: Furnish and deliver anchor bolts with setting drawings and templates. Verify position of anchor bolts prior to delivery of steel; report errors or deviation for correction. Setting anchor bolts in hardened concrete, necessitated through error or oversight, or in existing concrete, shall be under direction of the Architect in suitable drilled holes solidly grouted in place, or embedded in an approved structural epoxy.
 - D. Steel Columns: Set column bases in precise position for alignment, plumb and straight, supported on adjustable bolt supports or shims until the grout has set. Place center of base true to column center within 1/16" and adjust column height exactly within +1/32" tolerance. Maintain bases at exact position and level during grouting performed under Section 03 30 00; ensure entire grout space is filled solid with non-shrink grout.

- E. Connections: Hold structural steel in correct position during welding and bolting, and provide for dead and wind loads, and all erection stresses. Do no welding or final bolting until members have been aligned and plumbed.
 - 1. Field Welding: Same as specified in Part 2 of this Section.
 - 2. Common Bolts: Tighten and upset bolt threads to preclude loosening or use approved self-locking nuts.
 - F. Tolerances and Survey of Erected Structural Steel:
 - 1. Tolerances: Tolerances for structural steel shall conform to Section 1.23.8.1 of AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", and AISC "Code of Standard Practice for Steel Buildings and Bridges", except that maximum deviation of exterior columns toward the building line shall not exceed 1/2" and tolerances for elevator shafts shall meet the requirements of the elevator manufacturer.
 - 2. Survey: Contractor's Surveyor (refer to Section 01 72 00), during the structural steel erection, shall continually check and verify that the lines and levels of installed structural steel conform to above AISC tolerances, including base plate elevations, column plumbness, framing alignment, floor levels, and other specific features indicated. In the event of non-conformance with these requirements, Contractor shall immediately take necessary corrective measures, or obtain written approval from the State stating that the discrepancy is acceptable. All costs for the surveying and necessary corrective measures shall be borne by the Contractor. All measurements of erected structural shall be included in the Record Drawings.
- 3.3 FIELD TOUCH-UP PAINTING: After structural steel erection and connections are completed and approved, clean connections to be painted and damage to shop painted surfaces, and apply touch-up coat of same primer used for shop coat.
- 3.4 FIELD QUALITY CONTROL: Refer to Section 01 45 00.
- A. Inspection: In accordance with Reference Standards. The Inspector shall visually inspect all welds, shall be present to inspect and approve all groove, multi-pass, and penetration welding, inspect high-strength bolting performed in fabricator's shop or at the site, and inspect erection including grouting under base plates.
 - B. Tests of Welding and Bolting: Testing Laboratory shall inspect all shop and field welding and high-strength bolting, conform to testing requirements of Code and Building Department, and certify in writing, after completion of the Work, that all welding and high-strength bolting have been performed in accordance with the Drawings, Specifications, and Code.
 - C. Inspection and Testing of Welded Stud Connectors: As specified in Section 05 09 50 including pre-production testing and production inspection and testing.
 - D. Inspection of Groove Welding: Testing Laboratory shall inspect all groove welded connections of column to column, column to girder, girder to girder, and like connections by ultrasonic or other approved non-destructive testing method. Conform to DSA requirements for re-inspection of welds following installation. All defective welds shall be repaired and the costs for retesting defective welds shall be paid by the

Contractor.

1. Ultrasonic Testing: A Testing Laboratory specially trained and fully qualified technician shall operate ultrasonic testing equipment, examine welds, and maintain a record of welds examined, defects found, and disposition of each defect. Technicians shall calibrate instrumentation to evaluate quality of welds in accordance with AWS D1.1, Sections 5 and 6. Include the entire weld volume in search pattern. All welds shall be considered "tension welds" for testing. Also conform to requirements noted on Structural Drawings.
2. Rate of Testing: 100% ultrasonic inspection is required for all shop and field full or partial penetration and groove welds, with exceptions as may be noted on the Structural Drawings.
3. Backing Strips: Remove backing strips whenever ultrasonic indications arising from weld roots can be interpreted as either a weld defect or a backing strip, and retest weld if no root defect is visible. If no defect is disclosed by retest and no significant amount of the base and weld metal is removed, joint needs no further repair or welding.
4. Repairs: Repair all defects disclosed by tests. The Contractor shall bear the cost of removals, repairs, retesting, and additional testing ordered by Architect because of defects disclosed by tests.

END OF SECTION

**BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL**

**OXNARD UNION HIGH SCHOOL
STRUCTURAL STEEL
05 12 00 -9**

SECTION 05 31 20

METAL DECKING ROOF

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Steel roof deck and accessories.
- B. Ridge, valley plates and sump pans.
- C. Framing for openings.
- D. Bearing plates and angles.

1.2 REFERENCES

- A. ASTM A36 - Structural Steel (UNO on plans).
- B. ASTM A446 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural(Physical) Quality.
- C. ASTM A525 - Steel Sheet, Zinc-Coated, Galvanized by the Hot-Dip Process.
- D. AWS D1.3 - Structural Welding Code, Sheet Steel.
- E. CBC Chapter 22, Division V - Design Standard for Specification for the Design of Cold-Formed Steel Structural Members.

1.3 TESTS AND INSPECTIONS

- A. In accordance with the requirements of Section 01 45 00 Quality Control.

1.4 SUBMITTALS

- A. Submit Shop Drawings: Indicate decking plan, support locations, projections, openings and reinforcement, pertinent details and accessories. Indicate temporary shoring of decking where required.
- B. Submit Product Data: Provide deck profile characteristics and dimensions, structural properties and finishes. Indicate that materials are free of lubricants or oils which will impair adhesion of spray-applied fireproofing materials.

1.5 QUALIFICATIONS

- A. Installer: Company specializing in performing the work of this Section with minimum five years' experience.
- B. Welding: Performed by welders holding current certificate required for light gage

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steelwelders. Continuous inspection required.

1.6 STORAGE AND HANDLING

- A. Store and protect products.
- B. Separate sheets and store decking on dry wood sleepers; slope for positive drainage.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Products of the following manufacturers form the basis for design and quality intended.
 - 1. Verco Manufacturing Co. Phoenix, AZ.
 - 2. BHP/Steel Building Products, West Sacramento, CA. (Note: To select "BHP/ASC", the general contractor is required to notify Project Structural Engineer in advance and obtain approval in writing.)
- B. Or equal as approved in accordance with Section 01 77 00 for substitutions. (see note on A-2 above)

2.2 MATERIALS

- A. Sheet Steel: CBC Standard No. 22-1 and ASTM A446, Grade A Structural Quality or higher; with G60 galvanized coating conforming to ASTM A525. Conform to the minimum section properties specified on the drawings.
- B. Bearing Plates: ASTM A36 steel, unfinished (UNO on plans).
- C. Touch-Up Primer: Zinc chromate type.
- D. Welding Materials: AWS D1.3 and CBC Chapter 22, Division V.

2.3 FABRICATION

- A. Metal Decking: Sheet steel. Conform to gage dimensions and minimum properties.
- B. Metal Closure Strips, Wet Concrete Stops, Cover Plates and Related Accessories: 24 gage galvanized sheet steel; of profile and size as required.
- C. Install 16 gage closures at insulating concrete decks, fabricate roof sump pan of 14

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gagethick sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

- A. Check alignment of supports before starting erection. Deck shall be placed with corrugations perpendicular to supports.
- B. Bear decking on steel supports with 2 inch minimum bearing. Align and level. End laps shall be centered over supports only.
- C. Fasten deck to steel support members at ends and intermediate supports with fusion welds or stud anchors.
- D. Weld in accordance with AWS D1.3 and CBC Chapter 22, Division V. Use electric arc welding only. Welding equipment: Approved by the welding inspector and provided with suitable devices to regulate the speed and to manually adjust the operating amperage and voltage.
- E. Reinforce steel deck openings.
- F. Install 6 inch minimum wide sheet steel cover plates, of same thickness as decking where deck changes direction. Fusion weld 12 inches or maximum.
- G. To contain wet concrete, install stops at roof edge upturned to top surface of slab. Provide stops of sufficient strength to remain stationary under wet concrete without distortion.]
- H. Install sheet steel closures and angle flashings to close openings between deck and walls, columns and openings.
- I. Position roof sump pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
- J. Immediately after welding deck and other metal components in position, coat welds, burned areas and damaged surface coating with touch-up prime paint. [Coating not required where covered with insulating concrete.

END OF SECTION

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**OXNARD UNION HIGH SCHOOL
METAL DECKING ROOF
05 31 00 -3**

SECTION 05 50 00

METAL FABRICATIONS

PART 1 – GENERAL

- 1.1 SUMMARY: Division 1 applies to this Section. Provide miscellaneous metal fabrications as indicated, specified, and required.
- A. Work Included:
1. Steel ladders.
 2. Steel pipe or tubing columns.
 3. Above-ceiling supports.
 4. Countertop supports.
 5. Non-standard steel connectors for wood framing.
 6. Gratings and frames.
 7. Pipe railings.
 8. Mechanical screen.
 9. Other miscellaneous metal fabrications required to complete the Work.
- B. Related Work Not In This Section:
1. Finish painting.
 2. Setting of anchor bolts and inserts in concrete.
 3. Chain link fencing.
 4. Metal roof.
 5. Steel backing plates on steel stud walls.
- 1.2 SUBMITTALS: Refer to Section 01 33 00 for procedures.
- A. Shop Drawings: Submit Shop Drawings fully detailing Work of this Section, including accessories, fastenings, and welding. Include minor connections and fastenings not indicated or specified to meet required conditions; indicate in detail on Shop Drawings.
- B. Submit material cost data for all materials required to construct the Work of this section in place. The cost data should be as marked up to the General Contractor. If the Work is self-performed, the material cost shall reflect the actual cost of material without mark up.
- C. Submit manufacturer's information/data sheets or a letter from the manufacturer indicating the amount of recycled content, post consumer and post industrial in the product. It may not be possible to get recycled content information for all metal fabrications. If it is not possible, then the LEED default metric may be used in

calculating recycled content.

- 1.3 QUALITY ASSURANCE: Conform to Code, Titles 8 and 24 CCR, and AISC Code of Standard Practice for Steel Buildings and Bridges; AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings; AISC Steel Construction Manual; and AWS D1.1, Structural Welding Code.
- 1.4 PRODUCT DELIVERY AND HANDLING: Protect items from damage during shipping, handling and storage. Work showing dents, creases, deformations, weathering, or other defects is not acceptable. Deliver welding electrodes to site in unbroken packages bearing manufacturer's name and contents identification.
- 1.5 PROJECT/SITE CONDITIONS: Verify field measurements prior to fabrication of items. Use caution to protect concrete floor surfaces and adjacent Work from damage.

PART 2 – PRODUCTS

- 2.1 BASIC MATERIALS: Furnish materials conforming to the

following: Steel shapes, plates, bars: ASTM A36.
Steel plates to be bent or cold-formed: ASTM A283, Grade C.
Checkerplate: Raised diamond safety pattern, minimum 3/16" thick.
Steel tubing: All pipe shall be ASTM A-53, Grade "B"
All tubular steel sections shall conform to ASTM A-500 Grade "B" (FY=46 KSI)

Bar-size shapes: ASTM A306, Grade 65.
Cold-finished steel bars: ASTM A108.
Cold-rolled carbon steel sheets: ASTM A336.
Galvanized steel sheets: ASTM A526, G90 coating.
Gray iron castings: ASTM A48, Class 10.
Malleable iron castings: ASTM A47.
Stainless steel: ASTM A167, Type 302 or 304, 18-8.
Aluminum: ASTM B221, 6063-T5 or T6 alloy.
Bolts and nuts: ASTM A307, Grade A with bolt head and nut dimensions conforming to ANSI B18.2.1.

Electrodes: AWS D1.1, E70XX Series as required for intended use.
Primer: 10-99 Enamel Primer, Rustoleum No. 5769 Primer or equivalent. Galvanize items where specified or where permanently exposed to weather.
Non-shrink grout: Conforming to U.S. Army CE CRD-C 621, non-gas-forming type grout free of oxidizing catalysts and inorganic accelerators, non-staining non-rusting type in exposed areas, conforming to all current EPA and AQMD requirements.
Galvanizing: ASTM A123 hot dip, 2. ounces psf on actual surface and 1.8 oz psf minimum on any specimen, and as specified.
Galvanizing repair mtl: All States Galvanizing Powder or Drygalv by American Solder and Flux, hot applied repair material, or anodic zinc-rich galvanizing repair paint conforming to Mil Spec DOD-P-21035.

- 2.2 GENERAL FABRICATION REQUIREMENTS: Conform to approved submittals, Article "Quality Assurance" above as applicable to the Work, and requirements herein. Fabricate and form the work to meet actual installation conditions as verified at the site. Obtain necessary templates and information and provide all holes and drilling indicated or required for securing Work of other trades to metal fabrications.
- A. Welding: Conform to AWS D1.1, as modified by referenced AISC Standards, and as indicated or noted on Drawings. Unless otherwise indicated or specified, weld joints by the shielded electric-arc method. Grind exposed welds to smooth surfaces free of holes, slag, or other defects, flush with adjoining surfaces. No finishing treatment is required for concealed welds. Cut out all defective welding and replace.
 - B. Shop Priming: Clean metal surfaces according to SSPC SP6-82 Commercial Blast Cleaning for metal items to remain exposed and finish painted; according to SSPC SP3-82 Power Tool Cleaning or SP7-82 Brush-Off Blast. Cleaning for metal items to be concealed. Promptly apply shop coat of metal primer to minimum 1 mil dry film thickness. Work primer into joints. Do not prime metal surfaces embedded in concrete or masonry. Shop prime all ferrous metal items not to be galvanized unless otherwise indicated or specified.
 - C. Galvanizing: Galvanize specified items after fabrication is completed and produce coatings free of roughness, whiskers, unsightly spangles, icicles, runs, barbs, sags, droplets, and other surface blemishes.
 - D. Miscellaneous Items: Fabricate items not specifically mentioned according to the Drawings, approved Shop Drawings, and as required to complete the entire Work. Galvanize exterior items and shop prime interior items unless otherwise shown or specified.

PART 3 – EXECUTION

- 3.1 INSPECTION: Report to the State in writing those conditions that prevent or interfere with correct installation of Work of this Section.
- 3.2 GENERAL INSTALLATION REQUIREMENTS:
- A. Grouting: Provide grouting for Work of this Section as shown, specified, and required. Use non-shrink grout and conform to manufacturer's directions.
 - B. Galvanizing Repair: Wire brush welds and damaged coating to clean bright metal. Apply one coat of galvanizing repair paint where surfaces are concealed or are to be finish painted. Use the specified hot-applied galvanizing repair compound where surfaces remain exposed and unpainted.
 - C. Shop Prime Coat Repair: Do not apply metal primer in wet weather unless steel is protected from dampness and is dry. Clean field welds, field bolts, and all damaged shop primer after erection and apply a spot coat of the same primer used for the shop coat.
 - D. Fasteners: Provide fasteners and connectors of approved types as required for the installations, whether or not indicated. Provide galvanized fasteners for galvanized items and for exterior use.

3.3 SCHEDULE OF ITEMS

- A. General: Following list of specific items is not necessarily complete. Check Drawings, other Sections, and with other trades, and provide miscellaneous metal fabrications as required to complete the entire Work.
- B. Specific Items:
1. Steel Ladders: Construct as shown and according to Code, Title 8 CBC, OSHA, and ANSI A14.3. Continuously weld all joints and grind welds smooth and flush, and provide required brackets and attachments. Galvanize exterior ladders only.
 2. Steel Pipe Columns: ASTM A53 Grade B steel pipe; use only seamless type pipe where to remain exposed. Provide fully welded base plates and caps, drilled for connectors except where welded in place. Galvanize exterior pipe columns.
 3. Above-Ceiling Supports: Provide steel hangers, supports, attachments, and other framing for support of ceiling-hung items such as toilet compartments. Conform to approved Shop Drawings of related trades.
 4. Non-Standard Connectors for Wood Framing: Fabricate as detailed or required. Deliver to carpentry trade for installation.
 5. Countertop Supports: Provide supports for toilet room countertops, joints full welded and ground smooth; coordinate with Section 06 20 00.
 6. Pipe Railings: Standard weight steel pipe, joints mitered at angles and coped at intersections unless otherwise shown, and continuously welded, all welds ground smooth and flush. Provide cast malleable steel brackets with mounting plates for railings on walls. Return exposed rail ends to within 1/2" of walls unless otherwise shown. Galvanize exterior railings only.
 7. Embedded Steel Items: Provide miscellaneous embedded steel shapes, angles, and channels, complete with welded anchors and galvanized.
 8. Miscellaneous Framing and Supports: Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of necessary dimensions to receive adjacent Work retained by framing. Except as otherwise indicated, space anchors 2 feet on center, and provide minimum anchor units of 1-1/4 inch x 1/4 inch x 8 inch steel straps.

3.4 INSTALLATION

- A. Steel Thresholds: Fabricate channel or angle thresholds of rolled steel sections of size indicated, galvanized after fabrication. Anchor into concrete with countersunk expansion anchor bolts, unless otherwise indicated.
- B. Steel Ladders: Provide at locations indicated, fabricated as detailed. Ladders shall be anchored to concrete or masonry with 1/2 inch expansion anchor bolts. Ladders secured to a wood framed wall shall be anchored with 1/2 inch lag screws. Provide

provisions for anchoring ladders before lath is applied to plastered walls.

3.5 ADJUSTING

A. Touch Up Damaged Surfaces:

1. Shop Painted Finishes: Comply with SSPC-PA-1 for touch-up; apply with brush to produce a minimum 2 mil dry film thickness.
2. Galvanized Surfaces: Clean field welds, connections and damaged areas. Repair galvanized finishes in accordance with ASTM A780.

3.6 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.7 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 05 41 00

STRUCTURAL METAL STUD FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Load-bearing metal stud systems.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 41 00 – Regulatory Requirements
3. Section 05 12 00 - Structural Steel.

1.2 SUBMITTALS

A. Shop Drawings: Submit drawings showing framing, connection details, accessories and anchorage. Indicate location of assemblies, size and spacing of framing components.

B. Product Data: Submit manufacturer's catalog data for each item proposed for installation.

C. Certificates: Furnish manufacturer's certification that materials meet or exceed Specification requirements.

1.3 QUALITY ASSURANCE

A. Comply with following as a minimum requirement:

1. AISI - Specifications for Design of Cold Formed Steel Structural Members.
2. Welds shall be performed by AWS certified welders. Welding shall be performed in accordance with requirements of American Welding Society (AWS) Structural Welding Code-Steel D1.1 and D1.3. Structural welding Code-Sheet Steel.
3. Welding shall be inspected by a special inspector, approved by DSA to inspect Work of this section. The Project Inspector shall be responsible for monitoring work of special inspector to ensure that inspection program is satisfactorily completed.
4. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by Hot Dip Process.
5. ASTM A924 – Standard Specification for General Requirements for Steel Sheet Metallic-Coated by Hot-Dip Process.

6. ASTM A1003 – Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
7. ASTM A1008 – Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability.
8. ASTM C954 – Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks) and Bracing or Bridging for Screw Application of Gypsum Panel Products and Plaster Bases.
9. ASTM C955 – Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
10. ASTM C1007 – Standard Specification for Installation of Structural (Axial and Transverse) Steel Framing Members and Accessories.
11. ASTM E488 – Standard Test Methods of Strength Anchors in Concrete and Masonry.
12. ASTM E1190 – Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.
13. Manufacturer shall be a member of the Steel Stud Manufacturers Association (SSMA).

- B. Tolerances: Install walls and partitions on straight lines, plumb, free of twists or other defects, and contacting a 10-foot straight edge for its entire length at any location within a 1/8 inch tolerance. Install horizontal framing level within a tolerance of 1/8 inch in 12 feet in any direction.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered in their original unopened packages and stored protected from damage. Do not store material directly on grade. Provide adequate support to prevent bowing of material prior to installation.
- B. Store welding electrodes in accordance with AWS D12.1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide studs, tracks, joists, header, and accessories manufactured by one of following:
 1. ClarkWestern Building Systems.
 2. Dietrich Industries, Inc.
 3. Marino/WARE.

- 4. Cemco.
 - 5. Equal.
 - B. Special Connection Accessories: Products manufactured by The Steel Network, Inc., or equal.
- 2.2 MATERIALS
- A. Light Gage Metal Framing:
 - 1. Metal framing shall be formed from corrosion resistant-steel conforming to requirements of ASTM A653, 50 ksi minimum.
 - 2. Metal framing shall be zinc coated in conformance to requirements of ASTM A926, G60.
 - 3. Metal framing shall be manufactured in conformance to ASTM C955.
 - 4. Install metal framing per ASTM C1007, Standard Specification for Installation of Load-Bearing (Transverse and Axial) Steel Studs and Related Accessories.
 - B. Gages and properties of studs shall be as indicated on Drawings.
 - C. Mechanical anchors to concrete and masonry shall be metal cinch at least 3/8 inch in diameter threaded bolt head type. Anchor bolts to be installed in concrete shall be hook type 1/2 inch diameter or more. Unless otherwise indicated.
 - D. Mechanical anchors to metal framing shall be No. 10 self-tapping and self-drilling wafer-head screws.
 - E. Accessories: Special top tracks, angles, fasteners, and strips of gypsum wallboard, as required for fire rating assembly required at each condition.
 - F. Mineral Wool Safing Insulation: 4.0 pcf density. Thermafiber, Fibrex, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install plumb and true. Install necessary accessories for proper installation.
- B. Anchor top and bottom runner track to ceiling or roof structure overhead and to floor structure below.
- C. Install studs squarely in top and bottom runner track with firm abutment against track webs.
- D. Align and plumb studs, and fasten to flanges of both top and bottom runner tracks.

- E. Provide three studs minimum at corners of stud walls. Locate so as to provide surfaces for attachment of interior and exterior facing materials.
- F. Members not indicated to be welded together shall be attached with manufacturer recommended screws with minimum one screw at each flange of stud to top and bottom track. Wire tying of framing members is not permitted.
- G. Provide lateral bracing and bridging in accordance with manufacturer's written recommendations or as required by CBC.
- H. Intersecting walls and partitions, whether load-bearing or not, shall be connected.
- I. Splices in axially loaded studs are not permitted.
- J. Splice or butt weld butt joints in runner tracks. No splices are permitted in tracks over lintels, diaphragm sheathing, or diagonal bracing.
- K. Weld connections by fillet welds or plug welds in accordance with AWS recommended procedures and practices.
- L. Touch-up field abrasions and welds with galvanizing touch-up material.
- M. Studs that frame door openings shall be clipped to floor with 14 gage angle clips. Each clip to have two fasteners into studs and two fasteners into floor.
- N. Provide additional joists or blocking adjacent to exterior and interior walls, openings and elsewhere as required to provide support for indicated ceiling construction.
- O. Provide an additional joist under parallel partitions where partition length exceeds $\frac{1}{2}$ joist span and around floor and roof openings which interrupt one or more spanning members.

3.2 CONNECTIONS TO METAL DECKING

- A. Provide premolded neoprene filler strips matching flute profile for non-fire-rated walls and partitions covered on one or both sides up to metal decking.
- B. Top runner track of fire-rated partitions shall be a minimum of 36 mils (20 gage), unless noted otherwise, and attached to metal deck with required fasteners at spacing required for fire rating, but in no case over 16 inches on center. Areas above runner shall be friction fit with a minimum depth of 2 $\frac{1}{2}$ inches of 4 pounds per cubic foot density mineral wool insulation. A minimum of $\frac{1}{2}$ inch of firestopping compound shall be installed to each side of mineral wool insulation for a one-hour system, and one inch of firestopping for a two-hour system. Install required special tracks, angles, fasteners and strips of gypsum wallboard to provide required fire resistance rating.
- C. Fire-rated top tracks shall be installed in accordance with manufacturer's recommendations and fire rating approval requirements.

3.3 QUALITY CONTROL

A. Welding Inspection:

1. Inspection of field welding operations shall be performed by special inspector.
2. The special inspector shall inspect material, equipment, procedures, welds, and welder qualifications.

3.4 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.5 PROTECTION

- A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 – GENERAL

- 1.1 WORK INCLUDED
 - A. Rough carpentry.
- 1.2 REFERENCES
 - A. Chapter 23, CBC.
 - B. PS 1 - Product Standard for Construction and Industrial Plywood
 - C. WWPA - Western Lumber Grading Rules 88, July 1988 Edition, by Western WoodProducts Association.
 - D. APA - American Plywood Association Design/Construction Guide.
 - E. AQMD - Local Air Quality Management District Regulations.
 - F. AWPA - American Wood Preservers Association - Manual of Recommended Practice, C-1.
 - G. WCLIB - West Coast Lumber Inspection Bureau Standard Grading Rules No. 17.
- 1.3 QUALITY ASSURANCE
 - A. Rough Carpentry Lumber: Visible grade stamp on all products required.
 - B. Grade Stamp: Association under whose rules it was graded, or official grade mark of other recognized grading agencies using grading rules, equivalent to WWPA orWCLIB.
 - C. Association performing grading and grade marking of lumber shall be approved bythe State.
 - D. Nailing guns and nails shall be approved by the DSA.
- 1.4 SUBMITTALS: Refer to Section 01 33 00 for requirements.
 - A. Submit product data and current ICC Evaluation Reports for framing anchors.
- 1.5 DELIVERY, STORAGE AND HANDLING
 - A. Do not deliver rough carpentry items until site conditions are adequate to receive the work. Protect items from weather while in transit.
 - B. Store lumber and plywood at the site under cover or otherwise protected againstexposure to weather, raise above ground and out of contact with damp or wet surfaces. Stack lumber and plywood and provide for air circulation within andaround stacks and under temporary covers. For pressure treated lumber andplywood, provide spacers between courses to permit air circulation.

1.6 PROJECT CONDITIONS

- A. Cooperate with other trades in coordinating their work with the work of this section. Provide wood grounds, blocking and nailer where indicated or as required for work of other trades.

PART 2 – PRODUCTS

2.1 ROUGH CARPENTRY MATERIALS

- A. Lumber: Graded in accordance with WWPA or WCLIB; maximum moisture content of 19 percent at time of installation. Provide Douglas Fir Larch for structural and framing lumber, surfaced four sides to standards of the grading association unless otherwise indicated on drawings, use the following grades:
 - 1. Joists, rafters, beams, lintels, horizontal framing, posts, studs and vertical framing: No. 1 unless otherwise indicated or noted on drawings.
 - 2. Non-bearing studs and plates, non-structural furring, concealed blocking, stripping and miscellaneous nailers and backing: No. 2.
 - 3. Structural drawings take precedence for lumber grades.
- B. Douglas Fir Plywood Sheathing: Section 2306.2.1, CBC, PS 1-83, APA structural I rated sheathing, exposure 1, thickness as indicated, span rating sized for spacing.
- C. Nails, Spikes and Staples: Section 2311A, CBC Galvanized for exterior applications, high humidity locations and treated wood; plain finish for other interior locations; size and type to suit application. Comply with Table 2304.9, CBC U.N.O. Use common nails only.
- D. Bolts, Nuts, Washers, Lags, Pins and Screws: Section 2304.9, CBC, sized to suit application, galvanized for exterior locations, high humidity locations and treated wood, plain finish for other interior locations.
- E. Fasteners: Expansion type or powder actuated type for anchorage to solid masonry or concrete. Refer to 01 45 00 for acceptable types and required testing.
- F. Stock Framing Connectors: Simpson types (or equal) indicated on drawings, galvanized, with nails fully driven in all holes in each face of connector.
 - 1. Manufacturers: Simpson Strong Tie Co., Inc., San Leandro, CA, equal products by Harlen Metal Products, Compton, CA, Silver Metal Products, Livermore, CA, Teco Co., Germantown, MD, or K.C. Metals, Riverside, CA, may be submitted for approval or equal as approved in accordance with Section 01 60 00 for substitutions.
- G. Non-Stock Framing Connectors: Conform to details.

- H. Preservative (Pressure) Treated Lumber: Section 2303.1.8, CBC Conform to AWPA manual of recommended practice. Use preservative complying with C-2 and C-9. Conform to AQMD, Local Regulations.
 - 1. Douglas Fir Larch, used as required by Section 2303.1.8.1, CBC, shall conform to the following:
 - a. Lumber shall be WWPA or WCLIB grade stamped.
 - b. Lumber shall be No. 1 grade or better unless indicated otherwise on drawings.
- I. Waterproof Membrane: ASTM D4601; 25 or 28 lb asphalt saturated glass felt.
- J. Fire-Retardant Lumber: Chemically treated and pressure impregnated, as defined in Section 2303.2 CBC. Lumber shall be grade stamped by an approved agency at the factory, and shall bear identification indicating the fire performance rating thereof.

PART 3 – EXECUTION

3.1 FRAMING, FURRING AND STRIPPING

- A. Erect wood framing, furring, stripping and nailing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch in 10 feet, non-cumulative.
- B. Construct members of continuous pieces of longest possible lengths.
- C. Construct and erect required headers and lintels.
- D. Double wall framing jamb members at openings over 10 ft. wide. Space short members above and below openings in same manner as for walls.
- E. Provide double joist headers at joist ends and around openings unless otherwise indicated on drawings. Bridge joists and rafters to conform with Section 2306A.7 CBC and as noted on plans. For pre-manufactured joists, provide bridging in accordance with manufacturer's recommendations.
- F. Construct walls with studs of size and spacing indicated. Install single sill member at bottom and double plates at top. Stagger upper and lower members of double plates with joints not less than 4 feet o.c. or as indicated on drawings. Where sill or any wood member contacts concrete or masonry, install preservative treated lumber.
- G. Provide one row of solid blocking not less than 2 inch nominal thickness and same width of stud at ceiling and floor lines and at spacing not to exceed 8 feet on center vertically. Fit snugly and attach with not less than two 16d nails.
- H. Install 3 studs at corners.
- I. Conform to Section 2303.9.8, CBC, where pipes penetrate sills or plates.
- J. Cutting and Notching: Conform to Section 2308.8.2 and 2308.10.4.2, CBC.

- K. Bored Holes: Conform to Section 2308.8.2 and 2308.10.4.2, CBC.
- L. Conform to Section 708A, California Building Code for fire blocks and draft stops.

3.2 PLYWOOD SHEATHING

- A. Thickness as indicated on the drawings.
- B. Boundary Nailing: Not less than 3/8 inch from edge, spaced not more than 6 inches on center, unless noted otherwise on drawings.
- C. Blocking: Panel edges shall bear on framing members or solid blocking.
- D. Minimum Size Vertical Panel: 16 inches wide.
- E. Minimum Size Horizontal Panel: 24 inches wide.

3.3 FOUNDATION FRAMING, PLATES, SILLS AND SLEEPERS

- A. Preservative treated wood required.
- B. End And Side Clearance for Lumber Entering Concrete: 1/2 inch minimum.

3.4 HORIZONTAL FRAMING

- A. Bearing: 1-1/2 inch minimum on wood or metal, 3 inches on masonry. Lay framing members with crown up. Members with knots at bottom not permitted.
- B. Lateral Support: Use solid blocking, cross bridging or other approved means.
- C. Lap joists a minimum of 3 inches when framed from opposite sides of a beam. Do not run joists continuous beyond one span unless indicated otherwise on drawings.
- D. Openings: Double joists required for trimmer and headers for openings 4 ft. or larger unless indicated otherwise on drawings.
- E. Provide ties, and blocking in conformance with Section 2308.4.1, CBC.

3.5 BACKING

- A. Provide backing as indicated on drawings to support electrical fixtures, fixed equipment, cabinets, grab bars, door stops and plates. Fasten securely to framing.

END OF SECTION

SECTION 06 11 20

FRAMING AND SHEATHING

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes structural floor, wall, and roof framing; built-up structural beams and columns; diaphragm trusses fabricated on site; floor, wall, and roof sheathing; sill gaskets and flashings; preservative treatment of wood; fire retardant treatment of wood; miscellaneous framing and sheathing; telephone and electrical panel back boards; and concealed wood blocking for support of toilet and bath accessories, wall cabinets and woodtrim.

1.2 REFERENCES

- A. APA - American Plywood Association.
- B. AWWA - American Wood Preservers Association: C1 - All Timber Products – Preservative Treatment by Pressure Process.
- C. WCLIB - West Coast Lumber Inspection Bureau.
- D. WWPA - Western Wood Products Association.

1.3 QUALITY ASSURANCE

- A. Structural and framing lumber shall be graded in accordance with the "Standard Grading Rules" of the West Coast Lumber Inspection Bureau (WCLIB) or the "Western Lumber Grading Rules" of the Western Wood Products Association (WWPA) latest editions.
- B. Plywood shall conform to requirements of "Product Standard PS 1-95 issued by the U.S. Department of Commerce, and shall be grade marked by a recognized grading agency (APA and PTL).
- C. Preservative and fire treated lumber shall be identified by the Quality Mark of an approved inspection agency in accordance with the California Building Code, and Title 24.

1.4 REGULATORY REQUIREMENTS

- A. Conform to Chapter 23, of the California Code of Regulations, Title 24 - Building Standards, Part 2, California Building Code with State Amendments.

1.5 DELIVERY, STORAGE, AND PROTECTION

- A. Section 01 58 13 - Materials and Equipment: Transport, handle, store, and protect products.

PART 2 – PRODUCTS

2.1 LUMBER MATERIALS

- A. Lumber Grading Rules: WCLIB.
- B. Species: Douglas Fir and as indicated on Drawings.
- C. Sleeper Framing: As indicated on Drawings.
- D. Non-structural Light Framing: As indicated on Drawings.
- E. Miscellaneous Framing: As indicated on Drawings.

2.2 SHEATHING MATERIALS

- A. Plywood: APA Rated Sheathing, 1/2 inch thick, Structural I rated; Span Rating 24/16; Exterior Exposure, 4 ft. x8 ft. size sheet or as required to cover wall.

2.3 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Drywall Screws: Bugle head, hardened steel, power driven type, length to achieve full penetration of sheathing substrate.
 - 2. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
 - a. Use only common wire nails or spikes whenever indicated, specified or required.
 - b. Whenever necessary to prevent splitting, holes shall be prebored for nails and spikes.
 - c. Nails in plywood shall not be overdriven.
 - d. Machine Applied Nailing: Use of machine nailing is subject to a satisfactory jobsite demonstration for each project and approval by the District Representative and the Division of the State Architect. Approval is subject to continued satisfactory performance. Machine nailing will not be approved in 5/16" plywood. If nail heads penetrate outer ply more than would be normal for a hand hammer or if minimum allowable edge distances are not maintained, performance will be deemed unsatisfactory.
- B. Die Stamped Connectors: Hot dipped galvanized steel.

2.4 SHEATHING

- A. Install telephone and electrical panel back boards with plywood sheathing material where required. Size the back board by 12 inches beyond size of electrical panel.
- B. Plywood Floor Sheathing: APA Rated Sheathing, 1 inch thick Span Rating 54/32; Exterior Exposure; Durability 1; sanded, square edges, fire treated unless otherwise

indicated.

2.5 FACTORY WOOD TREATMENT

- A. Fire retardant: AWPA Treatment C20, Type, for interior wood components.
- B. Wood Preservative (Pressure Treatment): AWPA Treatment C1, for wood in contact with cementitious materials.

PART 3 – EXECUTION

3.1 FRAMING

- A. Set members level and plumb, in correct position.
- B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structuresafe, plumb, and in true alignment until completion of erection and installation of permanentbracing.
- C. Place horizontal members, crown side up.
- D. Construct load bearing framing and curb members full length without splices.

3.2 FIELD QUALITY CONTROL

- A. See Section 01 45 29: Testing and Inspection.

END OF SECTION

NOT USED

NOT USED

NOT USED

NOT USED

ROOFING

PART 1 - GENERAL

1.01 DESCRIPTION

A. General

To install a hybrid fully adhered and mechanically attached roof system with for increased wind resistance. System configuration shall have been tested and approved for the specified uplift resistance by FM Global prior to the time of the bid.

B. Specified Systems

Base specification shall consist of Sarnafil .060' Fleece Back G410 roofing membrane with flashings and other components to comprise a fully adhered roof system with mechanical enhancements by Sika-Sarnafil, Inc., Canton Massachusetts. Additional wind speed warranty endorsement of 90 miles per hour is required for the roofing system in addition to the twenty (20) year material and labor guarantee. Roof system weight 3.7 lbs/s.f.

Equal system shall consist of Cooley .060" Fleece Back C-3 Reinforced, Adhered, Mechanically attached by Republic Coating & Single Ply, Inc. Additional wind speed warranty endorsement of 90 miles per hour is required for the roofing system in addition to the twenty (20) year material and labor guarantee.

Alternate systems, which meet or exceed those technical criteria, including wind enhancements with warranty and guarantee may be submitted for prior approval.

1.02 AGENCY REQUIREMENTS

A. General

The applicator shall submit evidence that the proposed roof system meets the requirements of the local building code, specified system requirements and has been tested and approved or listed by the following test organizations. These requirements are minimum standards and no roofing work shall commence without written documentation of the system's compliance, as required in the "Submittals" section of this specification.

B. Testing Agencies

Factory Mutual Research Corporation (FM) - Norwood, MA

- 1. Class 1-90

Underwriters Laboratories, Inc. - Northbrook, IL

- 1. Class A assembly

American Society of Civil Engineers (ASCE)

- 1. ASCE -07 90 miles per hour pressures

Federal Government Department of Energy

- 1. Energy Star designation

State of California

- 1. Cool Roof Rating Council compliance

- 2. California Title 24 energy requirements, 1 October 2005.

1.03 RELATED WORK

A. Specified Elsewhere:

1. See Summary of Work & Technical Specifications

B. Specified System Requirements

The work includes but is not necessarily limited to the installation of:

1. Air Barrier
2. Specialty Wood Blocking (not shown in Rough Carpentry)
3. Insulation
4. Separation Layers
5. Adhesive
6. Fasteners
7. Roof Membrane
8. Roof Membrane Flashings
10. Clad Metal Flashings
11. Sealants Incorporated Into Roofing
12. Substrate Preparation

1.04 QUALITY ASSURANCE

A. This roofing system shall be applied only by a Roofing Contractor authorized by the specified or approved manufacturer prior to the bid date.

B. The Roofing Contractor shall have successfully completed five installations of similar size and system configuration within the previous five years.

B. Upon completion of the installation and the delivery to the Manufacturer by the Applicator of a certification that all work has been done in strict accordance with the contract specifications and Manufacturer's requirements, an inspection shall be made by a Technical Representative of the Manufacturer and the District Representative to review the installed roof system.

C. Upon successful completion of work the following warranties may be obtained:

1. Manufacturer's Standard 20 Year No Dollar Limit Roofing Warranty
2. Manufacturer's Special 90 mph Wind Warranty
3. Roofing Contractor Warranty

1.05 SUBMITTALS

A. Bid Submittals

At the time of bidding, the Applicator shall submit District specified bid submittal forms

B. Post Award Submittals

Samples of each primary component to be used in the roof system and the manufacturer's current literature for each component.

Written approval by the insulation manufacturer (as applicable) for use and performance of the product in the proposed system.

Sample copy of Manufacturer's guarantee and warranty.

Sample copy of Applicator's warranty.

Dimensioned shop drawings which shall include:

1. Outline of roof with roof size and elevations shown.
2. Profile details of flashing methods for penetrations.
3. Technical acceptance from the manufacturer.
4. Copy of manufacturer's accepted Request for Warranty.

Certifications by manufacturers of roofing and insulating materials that all materials supplied comply with all requirements of the identified ASTM and industry standards or practices.

Certification from the Applicator that the system specified meets all identified code and insurance requirements as required by the Specification.

Material Safety Data Sheets (MSDS)

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Containers

All products delivered to the job site shall be in the original unopened containers or wrappings bearing all seals and approvals.

B. Handling

Handle all materials to prevent damage. Place all materials on pallets and fully protect from moisture.

C. Storage

Membrane rolls shall be stored lying down on pallets and fully protected from the weather with clean canvas tarpaulins. Unvented polyethylene tarpaulins are not accepted due to the accumulation of moisture beneath the tarpaulin in certain weather conditions which may affect the ease of membrane weldability.

All adhesives shall be stored at temperatures between 40 degrees F (5 degrees C) and 80 degrees F (27 degrees C).

All flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.

All materials which are determined to be damaged the District's Representative or Manufacturer are to be removed from the job site and replaced at no cost to the District.

1.06 JOB CONDITIONS

- A. Materials may be installed under certain adverse weather conditions but only after consultation with Manufacturer and acceptance by the District's Representative, as installation time and system integrity may be affected.
- B. Only as much of the new roofing as can be made weathertight each day, including all flashing and detail work, shall be installed. All seams shall be cleaned and heat welded before leaving the job site that day.
- C. All work shall be scheduled and executed without exposing the interior building areas to the effects of inclement weather. The existing building and its contents shall be protected against all risks.
- D. All surfaces to receive new insulation, membrane or flashings shall be dry. Should surface moisture occur, the Applicator shall provide the necessary equipment to dry the surface prior to application.
- E. All new and temporary construction, including equipment and accessories, shall be secured in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.
- F. Uninterrupted waterstops shall be installed at the end of each day's work and shall be completely removed before proceeding with the next day's work. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with the finished roof as the installation progresses. Contaminated membrane shall be replaced at no cost to the District.
- G. The Applicator is cautioned that certain unbacked membranes are incompatible with asphalt, coal tar, heavy oils, roofing cements, creosote and some preservative materials. Such materials shall not remain in contact with specified membranes. The Applicator shall consult the manufacturer regarding compatibility, precautions and recommendations.
- H. Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is absolutely required, the Applicator shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas. A substantial protection layer consisting of plywood over felt or plywood over insulation board shall be provided for all new and existing roof areas, which receive rooftop traffic during construction.
- I. Prior to and during application, all dirt, debris and dust shall be removed from surfaces either by vacuuming, sweeping, blowing with compressed air and/or similar methods.
- J. The Applicator shall follow all safety regulations as required by OSHA and any other applicable authority having jurisdiction.
- K. All roofing, insulation, flashings and metal work removed during construction shall be immediately taken off site to a legal dumping area authorized to receive such materials. Hazardous materials,

such as materials containing asbestos, are to be removed and disposed of in strict accordance with applicable City, State and Federal requirements.

- L. All new roofing waste material (i.e., scrap roof membrane, empty cans of adhesive) shall be immediately removed from the site by the Applicator and properly transported to a legal dumping area authorized to receive such material.
- M. The Applicator shall take precautions that storage and/or application of materials and/or equipment does not overload the roof deck or building structure.
- N. Flammable non-VOC compliant adhesives shall not be used.
- O. All rooftop contamination that is anticipated or that is occurring shall be reported to the District's representative and manufacturer to determine the corrective steps to be taken.
- P. The Applicator shall verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Applicator shall report any such blockages in writing (letter copy to manufacturer) to the District's Representative for corrective action prior to installation of the roofing system.
- Q. Applicator shall immediately stop work if any unusual or concealed condition is discovered and shall immediately notify District of such condition in writing for correction (letter copy to manufacturer).
- R. Site cleanup, including both interior and exterior building areas which have been affected by the roof system installation, shall be completed to the District's satisfaction.
- S. All landscaped areas damaged by construction activities shall be repaired at no cost to the District.
- T. The Applicator shall conduct fastener pullout tests in accordance with the latest revision of the SPRI/ANSI Fastener Pullout Standard to help verify condition of deck/substrate and to confirm expected pullout values.
- U. The adhered and attached membrane shall not be installed under the following conditions without consulting Manufacturer's Technical Department for precautionary steps:
 - 1. The roof assembly permits interior air to pressurize the membrane underside.
 - 2. Any exterior wall has 10% or more of the surface area comprised of opening doors or windows.
 - 3. The wall/deck intersection permits air entry into the wall flashing area.

1.07 BIDDING REQUIREMENTS

A. Pre-Roofing Meeting:

A pre-bid meeting shall be held with the District's Representative and involved trades to discuss all aspects of the project. The Applicator's field representative or roofing foreman for the work shall be in attendance. Procedures to avoid rooftop damage by other trades shall be determined.

B. Plan Review:

Bidders shall review the plans and carefully examine areas in question as to conditions which may affect proper execution of the work. All dimensions and quantities shall be determined or verified by the contractor. No claims for extra costs will be allowed because of lack of full knowledge of the existing conditions unless agreed to in advance with the District or District's Representative.

1.08 WARRANTIES

A. Manufacturer's Membrane Warranty

Upon successful completion of the work to Manufacturer's satisfaction and receipt of final payment, the 20 Year No Dollar Limit Membrane Warranty shall be issued.

B. Manufacturer's Standard Warranty

Upon successful completion of the work to Manufacturer's satisfaction and receipt of final payment, the Manufacturer's Standard 20 Year No Dollar Limit Labor Warranty with special wind coverage shall be issued.

C. Applicator/Roofing Contractor Warranty

The Applicator shall supply the District with a separate workmanship warranty. In the event any work related to roofing, flashing, or metal is found to be within the Applicator warranty term, defective or otherwise not in accordance with the Contract Documents, the Applicator shall repair that defect at no cost to the District. The Applicator's warranty obligation shall run directly to the District, and a copy shall be sent to the Manufacturer.

E. District Responsibility

District shall notify both Manufacturer and the Applicator in a timely fashion of any leaks as they are discovered during the time period when both warranties are in effect.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The components listed in the specifications refer to Sarnafil as the manufacturer for purposes of illustration only, the minimum requirements for materials, components and systems of the listed or subsequent products submitted for approval shall meet or exceed those listed herein.
- B. Components to be used that are other than those supplied or manufactured by Sarnafil, Republic or approved manufacturer and may be submitted for review and acceptance by the specified Manufacturer. Acceptance of any other product is only for a determination of compatibility with Manufacturer's products and not for inclusion in the their warranty. The specifications, installation instructions, limitations, and/or restrictions of the respective manufacturers must be reviewed by the District's Representative for acceptability for the intended use with the specified products.

2.02 MEMBRANE

- A. Sarnafil G410 .060" fiberglass reinforced membrane with a lacquer coating, Republic Single Ply Cooley .060" reinforced fleece back C-3.
- B. Membrane shall conform to ASTM D4434-96 (or latest revision), "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type II, Grade I.

C. As manufactured, membrane shall conform to the following physical properties:

1. Color to be [By Architect / District]. (White color specified)
2. Thickness to be .060".

2.03 FLASHING MATERIALS

2.02 FLASHING MATERIALS

A. Wall/Curb Flashing

1. Sarnafil G410 Membrane

A fiberglass reinforced membrane adhered to approved substrate using Sarnacol adhesive. Consult Sarnafil Product Data Sheets for adhesive options and additional information.

2. Sarnafil G459 Membrane

An asphalt-resistant, fiberglass reinforced membrane adhered to approved substrate using Sarnacol adhesive. Consult Sarnafil Product Data Sheet for adhesive rates and additional information.

3. Sarnaclad

A PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Sarnaclad is a 25 gauge, G90 galvanized metal sheet with a 20 mil (1 mm) unsupported Sarnafil membrane laminated on one side. The dimensions of Sarnaclad are 4 ft x 8 ft (1.2 m x 2.4 m) or 4 ft x 10 ft (1.2 m x 3.0 m). Consult Sarnafil Product Data Sheet for additional information.

B. Perimeter Edge Flashing

1. Edge-Tite Flashing

A prefabricated perimeter edge attachment and fascia assembly provided by Sarnafil. Edge-Tite is made from three distinct parts. The (base) rail is made of formed 0.050 inch (1.3 mm) thick, 5052-H32 mill-finish alloy aluminum in 12 foot (3.6 m) lengths, provided with predrilled fastening holes. The spring clips are 6 inches (152 mm) wide and made from 0.020 inch (0.5 mm) stainless steel. The snap-on fascia is made from 24 gauge (0.6 mm) G90 steel or from 0.040 inch (1.0 mm) aluminum in 12 foot (3.6 m) lengths. Edge-Tite is available in a variety of fascia widths. Color and fascia metal shall be standard color and match roofing. Consult Sarnafil Product Data Sheet for additional information.

2. Anchor-Tite Flashing

A heavy-duty prefabricated perimeter edge attachment and fascia assembly provided by Sarnafil. Anchor-Tite is made of two distinct parts. The anchor bar is extruded 0.125 inch (3.0 mm) thick from 6063-T6 alloy aluminum in 12 foot (3.5 m) lengths, provided with predrilled fastening holes. Snap-on fascia covers are formed from either 24 gauge galvanized steel with Kynar or 0.40 inch (10 mm) aluminum with Kynar, anodized or mill finish. Anchor-Tite is available in a variety of fascia widths. Color and fascia metal type shall be as approved by the Architect.

3. Sarnaclad

A PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Sarnaclad is a 25 gauge, G90 galvanized metal sheet with a 20 mil (1 mm) unsupported Sarnafil membrane laminated on one side. The dimensions of Sarnaclad are 4 ft x 8 ft (1.2 m x 2.4 m) or 4 ft x 10 ft (1.2 m x 3.0 m). Consult Sarnafil Product Data Sheet for additional information.

4. Non-Typical Edge

Project-specific perimeter edge detail reviewed and accepted for one-time use by Sarnafil's Technical Department. Consult Regional Technical Manager prior to job start for review and consideration for acceptance.

C. Miscellaneous Flashing

1. Sarnaflash

A prefabricated expansion joint cover made from Sarnafil membrane. Sarnaflash is designed for securement to wall or horizontal surfaces to span and accommodate the movement of new and existing expansion gaps from 1 inch to 4-1/2 inches (25 mm to 114 mm) across. Available in 40-foot (12 m) rolls. Consult Sarnafil Product Data Sheet for additional information.

2. Sarnareglet

A heavy-duty, extruded aluminum flashing termination reglet used at walls and large curbs. Sarnareglet is produced from 6063-T5, 0.10 inch - 0.12 inch (2.5 mm - 3.0 mm) thick extruded aluminum. Sarnareglet has a 2-1/4 inch (57 mm) deep profile, and is provided in 10 foot (3 m) lengths. Use prefabricated Sarnareglet mitered inside and outside corners where walls intersect. Consult Sarnafil Product Data Sheet for additional information.

3. Sarnastack

A prefabricated vent pipe flashing made from 0.048 inch (48 mil/1.2 mm) thick Sarnafil G410 membrane. Available in five different sizes. Consult Sarnafil Product Data Sheet for sizes and additional information.

4. Sarnadrain-RAC

PVC-coated, heavy-duty aluminum roof drain insert that mechanically seals to the drainpipe interior. Sarnadrain-RAC is made of 0.080 inch (2 mm) thick 6063 aluminum with a urethane seal installed at the end of the drainpipe. The large 14 inch x 14 inch (0.36 m x 0.36 m) drain strainer is also made of 0.080 inch (2 mm) thick aluminum stock. The flange dimensions of Sarnadrain-RAC are 18 inches x 18 inches (0.46 m x 0.46 m). Consult Sarnafil Product Data sheet for sizes and additional information.

5. Sarnacircles-"G"

Circular 0.048 inch (48 mil/1.2 mm) thick G410 membrane patch welded over T-joints formed by overlapping thick membranes.

6. Sarnafiller

A urethane sealant used for pitch pocket topping. Sarnafiller is a two component sealant. Sarnafiller cures with excellent elasticity and adhesion to various surfaces. Consult Sarnafil Product Data Sheet for additional information.

7. Sarnacorners

Prefabricated outside and inside flashing corners made of 0.060 inch (60 mil/1.5 mm) thick membrane that are heat-welded to membrane or Sarnaclad base flashings. Sarnacorners are available in 2 outside sizes (5 inch and 8-1/2 inch diameter/127 mm and 215 mm) and 1 inside size. Consult Sarnafil Product Data Sheet for additional information.

8. Multi-Purpose Sealant

A proprietary sealant used at flashing termination's. Consult Sarnafil Product Data Sheet for additional information.

9. Sarnacol 2170 Adhesive

A solvent-based reactivating-type adhesive used to attach the membrane to the flashing substrate. Consult Product Data Sheets for additional information.

10. Sarnacol 2126 Adhesive

A water-based contact-type adhesive used to attach the membrane to the flashing substrate. Consult Product Data Sheets for additional information.

2.04 INSULATION/OVERLAYMENT/RECOVER BOARD

A. Sarnatherm Insulation

A rigid isocyanurate foam insulation with black mat facers. Sarnatherm is available in 4 ft x 4 ft (1.2 m x 1.2 m) or 4 ft x 8 ft (1.2 m x 2.4 m) sizes and various thickness. Tapered insulation required for crickets. Consult Sarnafil Product Data Sheet for additional information. 4" minimum total thickness required for project.

B. Dens-Deck

A siliconized gypsum, fire-tested hardboard with fiberglass-mat facers. Dens-Deck is provided in a 4 ft x 8 ft (1.2 m x 2.4 m) board size and in thickness of 1/2 inch (13 mm). Consult Sarnafil Product Data Sheet for size, thickness and additional information.

2.05 ATTACHMENT COMPONENTS

A. Membrane Adhesive

1. Sarnacol 2170 Adhesive:

A solvent-based reactivating-type adhesive used to attach the membrane to the substrate, either horizontally or vertically. Consult Product Data Sheets for additional information. Notes:

- a) Due to an increase in viscosity when outdoor temperatures during installation are below 40 degrees F (5 degrees C), add 0.5 gal/100 ft² (0.2 l/m²) to rate for estimating purposes. Do not install when air temperature is within 5 degrees F of dew point. Solvent evaporation time increases significantly when temperatures drop. Ensure first layer of Sarnacol 2170 is fully dry before second layer is applied to the back of the membrane for proper reactivation.
- b) Use a water-filled, foam-covered lawn roller to consistently and evenly press the membrane into the adhesive layer.

2. Sarnacol 2121 Adhesive:

A water-based adhesive used to attach the membrane to the horizontal or near-horizontal substrate. Consult Product Data Sheets for additional information.

Notes:

- a) There is a significant increase in drying time due to an increase in humidity and/or a decrease in temperature. Do not install when outdoor or substrate temperatures during drying period are expected to fall below 40 degrees F (5 degrees C).
- b) Do not allow Sarnacol 2121 adhesive to skin-over or surface-dry to installation of membrane.
- c) Use a water-filled, foam-covered lawn roller to consistently and evenly press the membrane into the adhesive layer.

B. Sarnaplate

Sarnaplate is used with various Sarnafasteners to attach insulation boards to the roof deck. Sarnaplate is a 3 inch (75 mm) square, 26 gauge stamping of SAE 1010 steel with an AZ 55 Galvalume coating. Consult Sarnafil Product Data Sheet for additional information.

C. Sarnaplate-HD/CD

Sarnaplate-HD/CD is used with Sarnafastener-HD or Sarnafastener-CD10 to attach insulation boards to the roof deck. Sarnaplate-HD/CD is a 3 inch (75 mm) round stamping of SAE 1010 steel with an AZ 66 Galvalume coating. Consult Sarnafil Product Data Sheet for additional information.

D. Sarnaplate-preassembled

Combination of a 3 inch round plate and a #12 fastener used to attach insulation boards to the steel or wood roof deck. Sarnaplate-preassembled consists of a 3 inch (75 mm) round, 26 gauge stamping of SAE 1010 steel with an AZ 55 Galvalume coating and Sarnafastener #12 with modified buttress thread. The fastener shank diameter is approximately 0.168 inch (4 mm) and the thread diameter is approximately 0.214 inch (5 mm). Consult Sarnafil Product Data Sheet for additional information.

E. Sarnabar

An FM-approved, heavy-duty, 14 gauge, galvanized or stainless, roll-formed steel bar used to attach membrane to the roof deck. The formed steel is pre-punched with holes every 1 inch (25 mm) on center to allow various Sarnafastener spacing options. Consult Sarnafil Product Data Sheet for additional information.

F. Sarnafastener #12

A #12 corrosion-resistant fastener used with Sarnaplates to attach insulation boards to steel roof decks. Sarnafastener #12 has a modified buttress thread. The shank diameter is approximately 0.168 inch (4 mm) and the thread diameter is approximately 0.214 inch (5 mm). The driving head has a diameter of approximately 0.435 inch (11 mm) and is #3 Phillips design for positive engagement. Consult Sarnafil Product Data Sheet for additional information.

2.06 WALKWAY PROTECTION

A. Sarnatred

A polyester reinforced, 0.096 inch (96 mil/2.4 mm), weldable membrane with surface embossment. Used as a protection layer from rooftop traffic. Sarnatred is supplied in rolls of 39.3 inches (1.0 m) wide and 32.8 feet (10 m) long. Consult Sarnafil Product Data Sheet for additional information.

B. Sarnapad

A 1/4 inch thick, injection-molded walkway pad with welding tabs made entirely of recycled PVC material. Used to install a continuous rooftop walkway network. Net dimensions are 1/4 inch thick x 24 inches long x 24 inches wide (6 mm x 0.6 m x 0.6 m). Consult Sarnafil Product Sheet for additional information.

C. Concrete Pavers

Normal weight concrete pavers specifically designed and produced for rooftop application. For large areas the use of paver pedestals or a drainage panel protection layer between the Sarnafil roof membrane and the pavers is required. For narrow walkways, a welded-in-place protection layer of Sarnafil membrane is required under the concrete pavers.

2.07 AIR BARRIER

A. Sarnavap-10

A 10 mil (0.25 mm) thick polyethylene vapor retarder/air retarder. Sarnavap-10 is supplied in a folded panel that is rolled onto a core. The core width is 5 feet (1.5 m). When unrolled off the core and unfolded, the sheet dimensions are 20 feet (6.9 m) wide by 100 feet (33 m) long. Consult Sarnafil Product Data Sheet for additional information.

2.08 MISCELLANEOUS ACCESSORIES

A. Aluminum Tape

A 2 inch (50 mm) wide pressure-sensitive aluminum tape used as a separation layer between small areas of asphalt contamination and the membrane and as a bond-breaker under the coverstrip at Sarnaclad joints.

B. Sealing Tape Strip

Compressible foam with pressure-sensitive adhesive on one side. Used with metal flashings as a preventive measure against air and wind blown moisture entry.

C. Sarnamatic 641mc

220 volt, self-propelled, hot-air welding machine used to seal long lengths of Sarnafil membrane seams.

D. Perimat Welder

120 volt, self-propelled, hot-air welding machine used to seal long lengths of Sarnafil membrane seams along perimeter details.

E. Sarnasolv

A high quality solvent cleaner used for the general cleaning of residual asphalt, scuff marks, etc., from the membrane surface. Sarnasolv is also used daily to clean seam areas prior to hot-air welding in tear off or dirty conditions or if the membrane is not welded the same day it is unrolled. Consult Sarnafil Product Data Sheet for additional information.

2.09 SEALANTS AND PITCH POCKET FILLERS

- A. Sarnafil Multi-Purpose Sealant (for termination details).
- B. Sarnafiller (two-part urethane filler for pitch pocket toppings).
- C. Depending on substrates, the following sealants are options for temporary overnight tie-ins:
 - 1. Type III hot asphalt conforming to ASTM D312 (latest revision)
 - 2. Sarnafiller
 - 3. Multiple layers of roofing cement and felt
 - 4. Spray-applied, water-resistant urethane foam
 - 5. Mechanical attachment with rigid bars and compressed sealant

2.10 MISCELLANEOUS FASTENERS AND ANCHORS

- A. All fasteners, anchors, nails, straps, bars, etc., shall be post-galvanized steel, aluminum or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1.25 inch (32 mm) and shall be approved for such use by the fastener manufacturer. All miscellaneous wood fasteners and anchors used for flashing shall have a minimum embedment of 1 inch (25 mm) and shall be approved for such use by the fastener manufacturer.

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION CONFERENCE

- A. The Applicator, District's Representative/Designer and Manufacturer(s) shall attend a pre-construction conference.
- B. The meeting shall discuss all aspects of the project including but not limited to:
 - 1. Safety
 - 2. Set up
 - 3. Construction schedule
 - 4. Contact conditions
 - 5. Coordination of the work

3.02 SUBSTRATE CONDITION

- A. Applicator shall be responsible for acceptance or provision of proper substrate to receive new roofing materials.

- B. Applicator shall verify that the work done under related sections meets the following conditions:
1. Roof drains and/or scuppers have been reconditioned and/or replaced and installed properly.
 2. Roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured and prepared to receive new roofing materials.
 3. All surfaces are smooth and free of dirt, debris and incompatible materials.
 4. All roof surfaces shall be free of water, ice and snow.

3.03 SUBSTRATE PREPARATION

The roof deck and existing roof construction must be structurally sound to provide support for the new roof system. The Applicator shall load materials on the rooftop in such a manner to eliminate risk of deck overload due to concentrated weight. The District's Representative shall ensure that the roof deck is secured to the structural framing according to local building code and in such a manner as to resist all anticipated wind loads in that location.

A. New Construction

1. Steel Deck:
 - a) FM approved steel deck - the roof deck shall be 22 gauge (minimum) grade E and shall conform and be installed to meet the latest revision of FM's Loss Prevention Data Sheet 1-28 and the local code's current requirements.
 - b) Non-FM approved steel deck - The roof deck shall be 24 gauge (minimum) grade D and shall conform and be installed to the local code's current requirements.

3.04 SUBSTRATE INSPECTION

- A. A dry, clean and smooth substrate shall be prepared to receive the Sarnafil Adhered roof system.
- B. The Applicator shall inspect the substrate for defects such as excessive surface roughness, contamination, structural inadequacy, or any other condition that will adversely affect the quality of work.
- C. The substrate shall be clean, smooth, dry, free of flaws, sharp edges, loose and foreign material, oil and grease. Roofing shall not start until all defects have been corrected.
- D. All roof surfaces shall be free of water, ice and snow.
- E. Sarnafil shall be applied over compatible and accepted substrates only.

3.05 AIR RETARDER INSTALLATION

General Criteria:

Interior and/or exterior conditions (inside temperature/relative humidity) may create a need for a vapor retarder. The design professional shall, based upon information supplied by the District, decide whether a vapor retarder is necessary. It is the design professional's responsibility to determine the type and location of a vapor retarder. If sealed properly, a vapor retarder can also

act as an air retarder (positive pressure) for roofs intended over air-permeable decks (steel, wood, precast, etc.). When reroofing over the existing asphalt roof, the old roof may be considered to be an adequate vapor retarder/air retarder if the details are properly sealed.

A. New Construction Vapor Drive Considerations

1. Steel Deck or Wood Deck:

For vapor drive leaving the building, the vapor retarder shall be laid directly over the deck or on a support board with all side and end joints sealed in accordance with the manufacturer's instructions. The vapor retarder shall be sealed to all penetrations and termination's. The vapor retarder may be loosely laid or adhered with an adhesive supplied or recommended by the same manufacturer. The insulation or recover board must be mechanically fastened in this case.

3.06 WOOD NAILER INSTALLATION (Include Necessary Nailers in Roofing)

- A. Install continuous wood nailers at the perimeter of the entire roof and around roof projections and penetrations regardless if shown on the Detail Drawings.
- B. Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches (0.3 m) on center or 16 inches (0.4 m) on center if necessary to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of each end. Two fasteners shall be installed at ends of nailer lengths. Nailer attachment shall meet this requirement and that of the current Factory Mutual Loss Prevention Data Sheet 1-49.
- C. Thickness shall be as required to match substrate or insulation height to allow a smooth transition.
- D. Any existing nailer woodwork which is to remain shall be firmly anchored in place to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction and shall be free of rot, excess moisture or deterioration. Only woodwork shown to be reused in Detail Drawings shall be left in place. All other nailer woodwork shall be removed.

3.07 INSULATION INSTALLATION

General Criteria:

- A. Insulation shall be installed according to insulation manufacturer's instructions. Voids and joints shall not exceed 1/4".
- B. Insulation shall be neatly cut to fit around penetrations and projections.
- C. Install tapered insulation in accordance with insulation manufacturer's shop drawings.
- D. Install tapered insulation around drains creating a drain sump.
- E. Do not install more insulation board than can be covered with Sarnafil membrane by the end of the day or the onset of inclement weather.
- F. Use at least 2 layers of insulation when the total insulation thickness exceeds 2.5 inches (64 mm). Stagger joints at least 12 inches (0.3 m) between layers.
- G. Mechanical Attachment:

1. Insulation shall be mechanically fastened to the deck with approved fasteners and plates at a rate according to the insulation manufacturer's, FM's and system recommendations for fastening rates and patterns. The quantity and locations of the fasteners and plates shall also cause the insulation boards to rest evenly on the roof deck/substrate so that there are no significant and avoidable air spaces between the boards and the substrate. Each insulation board shall be installed lightly against the adjacent boards on all sides.
2. Fasteners are to be installed consistently in accordance with fastener manufacturer's recommendations. Fasteners are to have minimum penetration into structural deck recommended by the fastener manufacturer and Sarnafil.
3. Use fastener tools with a depth locator and torque-limiting attachment as recommended or supplied by fastener manufacturer to ensure proper installation.

H. Additional 90 mph wind warranty enhancements.

1. Over the clean and properly prepared metal deck, install Sarnavap SA vapor barrier. The Sarnavap shall be installed/positioned parallel to the metal deck flutes, with all longitudinal laps being positioned at the top of the metal deck flutes (see attached PDS). Cooley C-3 RAM shall have a 10 mil air barrier in lieu of SA.
2. Install 1/2" Dens-Deck and/or Dens-Deck Prime barrier board. The Dens-Deck shall be installed directly over the Sarnavap SA vapor barrier and shall be mechanically attached into the metal deck using Factory Mutual approved attachment plates and fasteners at a rate of one fastener every 2 Ft² (perimeter and corner fastening shall be increased at 50% and 100%, respectively / Use standard FM formula to determine perimeter area/width). Cooley C-3 RAM shall have seam fastener plates installed in the listed configuration.
3. Install G410 Feltback membrane over Dens-Deck barrier board. The membrane shall be adhered to the Dens-Deck (Prime) substrate using Sarnacol 2121 adhesive at a rate of 1.5 to 1.75 gallons per square. Cooley C-3 RAM shall be installed in Geobond adhesive. Asphaltic adhesives shall not be allowed.
4. Over the finished membrane surface, install additional (horizontal) securement at 4 ft. and 8 ft. from the edge of the roof along the entire outside perimeter. Use 2 inch Sarnadisc and Sarnafastener XP, fastened at 12 inches on-center and coverstrip as required.

3.08 INSTALLATION OF SARNAFIL MEMBRANE

The surface of the insulation or substrate shall be inspected prior to installation of the Sarnafil roof membrane. The substrate shall be clean, dry, free from debris and smooth with no surface roughness or contamination. Broken, delaminated, wet or damaged insulation boards shall be removed and replaced.

A. Sarnacol 2170 Adhesive:

1. Over the properly installed and prepared substrate surface, Sarnacol 2170 adhesive shall be applied using solvent-resistant 3/4 inch (19 mm) nap paint rollers. The adhesive shall be applied to the substrate at a rate according to Sarnafil requirements. The adhesive shall be applied in smooth, even coating with no gaps, globs, puddles or similar inconsistencies. Only an area which can be completely covered in the same day's operations shall be coated with adhesive. The first layer of adhesive shall be allowed to dry completely prior to installing the membrane.

2. When the adhesive on the substrate is dry, the Sarnafil roof membrane is unrolled. Adjacent sheets shall be overlapped 3 inches (75 mm). Once in place, one-half of the sheet's length shall be turned back and the underside shall be coated with Sarnacol 2170 adhesive at a rate of 1/2 gallon per 100 ft² (0.2 liters/m²). When the membrane adhesive has dried slightly to produce strings when touched with a dry finger, the coated membrane shall be rolled onto the previously-coated substrate being careful to avoid wrinkles. Do not allow adhesive on the underside of the Sarnafil membrane to dry completely. The amount of membrane that can be coated with adhesive before rolling into substrate will be determined by ambient temperature, humidity and crew. The bonded sheet shall be pressed firmly in place with a water-filled, foam-covered lawn roller by frequent rolling in two directions. The remaining un-bonded half of the sheet shall be folded back and the procedure repeated.
 - a) Due to an increase in viscosity when outdoor temperatures during installation are below 40 degrees F (5 degrees C), add 0.5 gal/100 ft² (0.2 l/m²) to rate for estimating purposes. Do not install when air temperature is within 5 degrees F of dew point. Solvent evaporation time increases significantly when temperatures drop. Ensure first layer of Sarnacol 2170 is fully dry before second layer is applied to the back of the membrane for proper reactivation.
 - a) The Applicator shall count the amount of pails of adhesive used per area per day to verify conformance to the specified adhesive rate.
 - b) No adhesive shall be applied in seam areas. All membrane shall be applied in the same manner.

B. Sarnacol 2121 Adhesive:

1. Over the properly installed and prepared absorbent substrate, Sarnacol 2121 adhesive shall be poured out of the pail and spread using notched squeegees. The adhesive shall be applied at a rate according to Sarnafil requirements (no adhesive is placed on back of the membrane). The formation of a film on the surface of the adhesive shall not be allowed to occur. The membrane shall be carefully unrolled into the wet adhesive while the edges are overlapped 3 inches (75 mm). The membrane shall be pressed firmly into the adhesive layer with a water-filled, foam-covered lawn roller by frequent rolling in two directions.

Notes:

- a) Sarnacol 2121 shall not be used if temperatures below 40 degrees F (5 degrees C) are expected during application or subsequent drying time.
- b) No adhesive shall be applied in seam areas. All membrane shall be applied in the same manner.

3.09 HOT-AIR WELDING OF SEAM OVERLAPS

A. General

1. All seams shall be hot-air welded. Seam overlaps should be 3 inches (75 mm) wide when automatic machine-welding and 4 inches (100 mm) wide when hand-welding, except for certain details.

2. Welding equipment shall be provided by or approved by Sarnafil. All mechanics intending to use the equipment shall have successfully completed a training course provided by a Sarnafil Technical Representative prior to welding.
3. All membrane to be welded shall be clean and dry.

B. Hand-Welding

Hand-welded seams shall be completed in two stages. Hot-air welding equipment shall be allowed to warm up for a least one minute prior to welding.

1. The back edge of the seam shall be welded with a narrow but continuous weld to prevent loss of hot air during the final welding.
2. The nozzle shall be inserted into the seam at a 45 degree angle to the edge of the membrane. Once the proper welding temperature has been reached and the membrane begins to "flow," the hand roller is positioned perpendicular to the nozzle and pressed lightly. For straight seams, the 1-1/2 inch (40 mm) wide nozzle is recommended for use. For corners and compound connections, the 3/4 inch (20 mm) wide nozzle shall be used.

C. Machine Welding

1. Machine welded seams are achieved by the use of Sarnafil's automatic welding equipment. When using this equipment, Sarnafil's instructions shall be followed and local codes for electric supply, grounding and over current protection observed. Dedicated circuit house power or a dedicated portable generator is recommended. No other equipment shall be operated off the generator.
2. Metal tracks may be used over the deck membrane and under the machine welder to minimize or eliminate wrinkles.

D. Quality Control of Welded Seams

1. The Applicator shall check all welded seams for continuity using a rounded screwdriver. Visible evidence that welding is proceeding correctly is smoke during the welding operation, shiny membrane surfaces, and an uninterrupted flow of dark grey material from the underside of the top membrane. On-site evaluation of welded seams shall be made daily by the Applicator to locations as directed by the District's Representative or Sarnafil's representative. One inch (25 mm) wide cross-section samples of welded seams shall be taken at least three times a day. Correct welds display failure from shearing of the membrane prior to separation of the weld. Each test cut shall be patched by the Applicator at no extra cost to the District.

3.10 MEMBRANE FLASHINGS

All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the District's Representative and Sarnafil. Approval shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing, the affected area shall be removed and replaced at the Applicator's expense. Flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces. Use caution to ensure adhesive fumes are not drawn into the building.

A. Sarnacol Adhesive for Membrane Flashings

1. Over the properly installed and prepared flashing substrate, Sarnacol adhesive shall be applied according to instructions found on the Product Data Sheet. The Sarnacol adhesive shall be applied in smooth, even coats with no gaps, globs or similar inconsistencies. Only an area, which can be completely covered in the same day's operations shall be flashed. The bonded sheet shall be pressed firmly in place with a hand roller.
 2. No adhesive shall be applied in seam areas that are to be welded. All panels of membrane shall be applied in the same manner, overlapping the edges of the panels as required by welding techniques.
- B. Install Sarnastop/Sarnabar/Sarnacord according to the Detail Drawings with approved fasteners into the structural deck at the base of parapets, walls and curbs. Sarnastop is required by Sarnafil at the base of all tapered edge strips and at transitions, peaks, and valleys according to Sarnafil's details.
- C. Sarnafil's requirements and recommendations and the specifications shall be followed. All material submittals shall have been accepted by Sarnafil prior to installation.
- D. All flashings shall extend a minimum of 8 inches (0.2 m) above roofing level unless otherwise accepted in writing by the District's Representative and Sarnafil Technical Department.
- E. All flashing membranes shall be consistently adhered to substrates. All interior and exterior corners and miters shall be cut and hot-air welded into place. No bitumen shall be in contact with the Sarnafil membrane.
- F. All flashing membranes shall be mechanically fastened along the counter-flashed top edge with Sarnastop at 6-8 inches (0.15-0.20 m) on center.
- G. Sarnafil flashings shall be terminated according to Sarnafil recommended details.
- H. All flashings that exceed 30 inches (0.75 m) in height shall receive additional securement. Consult Sarnafil Technical Department for securement methods.

3.11 METAL FLASHINGS

- A. Metal details, fabrication practices and installation methods shall conform to the applicable requirements of the following:
1. Factory Mutual Loss Prevention Data Sheet 1-49 (latest issue).
 2. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - latest issue.
 3. National Roofing Contractors' Association Sheet Metal Manual (NRCA) - latest issue.
- B. Metal, other than that provided by Sarnafil, is not covered under the Sarnafil warranty.
- C. Complete all metal work in conjunction with roofing and flashings so that a watertight condition exists daily.
- D. Metal shall be installed to provide adequate resistance to bending to allow for normal thermal expansion and contraction.
- E. Metal joints shall be watertight.

- F. Metal flashings shall be securely fastened into solid wood blocking. Fasteners shall penetrate the wood nailer a minimum of 1 inch (25 mm).
- G. Airtight and continuous metal hook strips are required behind metal fascias. Hook strips are to be fastened 12 inches (0.3 m) on center into the wood nailer or masonry wall.
- H. Counter flashings shall overlap base flashings at least 4 inches (100 mm).
- I. Hook strips shall extend past wood nailers over wall surfaces by 1-1/2 inch (38 mm) minimum and shall be securely sealed from air entry.

3.12 SARNACLAD METAL BASE FLASHINGS/EDGE METAL

All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the District's Representative and Sarnafil. Acceptance shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Applicator's expense.

- A. Sarnaclad metal flashings shall be formed and installed per the Detail Drawings.
 - 1. All metal flashings shall be fastened into solid wood nailers with two rows of post galvanized flat head annular ring nails, 4 inches (100 mm) on center staggered. Fasteners shall penetrate the nailer a minimum of 1 inch (25 mm).
 - 2. Metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.
- B. Adjacent sheets of Sarnaclad shall be spaced 1/4 inch (6 mm) apart. The joint shall be covered with 2 inch (50 mm) wide aluminum tape. A 4 inch minimum (100 mm) wide strip of Sarnafil flashing membrane shall be hot-air welded over the joint.

3.13 EDGE-TITE METAL

- A. Position the Sarnafil membrane over the roof edge and down outside face of wall covering wood nailer(s) completely. Allow 1/2 inch (13 mm) excess membrane. Hot-air weld all seams making sure there are no voids in welds.
- B. Apply a 3/8 inch (10 mm) bead of Sarnafil sealant to the intersection of the right angle of the clean base rail. Install base rail from right to left as seen from rooftop, lapping joints 1 inch (25 mm).
- C. Fasten base rail into the side of the nailer 12 inches (0.3 m) on center using #12 x 1-5/8 inch corrosion-resistant fasteners provided with Edge-Tite. Field cut sections as necessary. A second row of fastening may be required based upon site conditions. Exercise caution at perimeter of roof. Workers shall follow OSHA safety procedures.
- D. Position spring clips at 6 foot (1.8 m) centers on base rail. Locate spring clips at fascia cover laps and at mid-span of fascia cover.
- E. Fascia covers are installed from right to left as seen from rooftop. Position fascia cover on top of base rail and overlap preceding panel by 1 inch (25 mm) at notches provided. Snap covers into place. Field cut where necessary. Exercise caution at perimeter of roof. Workers shall follow OSHA safety procedures.

3.14 ANCHOR-TITE METAL

- A. Position the Sarnafil membrane over the roof edge and down outside face of wall covering wood nailer(s) completely, allowing 1/2 inch (13 mm) excess membrane. Hot-air weld all seams making sure there are no voids in welds.
- B. Apply a 3/8 inch (10 mm) bead of Sarnafil sealant to the intersection of the right angle of the clean base rail. Install base rail from right to left as seen from rooftop, lapping joints 1 inch (25 mm).
- C. Fasten base rail into the side of the nailer at 12 inches (0.3 m) on center using #12 x 1-5/8 inch corrosion-resistant fasteners provided with Anchor-Tite. Field cut sections as necessary. A second row of fastening may be required based upon site conditions. Exercise caution at perimeter of roof. Workers shall follow OSHA safety procedures.
- D. Fascia covers are installed from right to left as seen from rooftop. Position fascia cover on top of base rail and overlap preceding panel by 1 inch (25 mm) at notches provided. Snap covers into place. Field cut where necessary. Exercise caution at perimeter of roof. Workers shall follow OSHA safety procedures.

3.15 WALKWAY INSTALLATION

A. Sarnatred Walkway

Roofing membrane to receive Sarnatred Walkway shall be clean and dry. Place chalk lines on deck sheet to indicate location of Walkway. Apply a continuous coat of Sarnacol 2170 adhesive to the deck sheet and the back of Walkway in accordance with Sarnafil's technical requirements and press Walkway into place with a water-filled, foam-covered lawn roller. Clean the deck membrane in areas to be welded. Hot-air weld the entire perimeter of the Walkway to the Sarnafil deck sheet. Check all welds with a rounded screwdriver. Re-weld any inconsistencies. Important: Check all existing deck membrane seams that are to be covered by Walkway with rounded screwdriver and reweld any inconsistencies before Walkway installation. Do not run Walkway over Sarnabars.

C. Sarnapad Walkway

Mark lines on the roof to determine location and direction(s) of Sarnapad Walkway network. The roof surface shall be clean. Apply Sarnacol adhesive to the roof surface and to the underside of the Sarnapad in accordance with the Sarnapad and Sarnacol Product Data Sheets. Weld the Sarnapad tabs to the roof membrane with a Sarnamatic 641 or 621 (or equivalent) heat-welder. Do not run Walkway over Sarnabars.

D. Concrete Pavers

Weld the edges of a protection layer of G410 membrane in place. Place normal weight concrete pavers on the protection membrane. In areas of high wind exposure the pavers shall be strapped together with stainless steel metal straps that are flush with the paver surface. Do not run walkway over Sarnabars.

3.16 COMPLETION

- A. Prior to demobilization from the site, the work shall be reviewed by the District's Representative and the Applicator. All defects noted and non-compliance with the Specifications or the recommendations of Sarnafil shall be itemized in a punch list. These items must be corrected immediately by the Applicator to the satisfaction of the District's Representative and Sarnafil prior to demobilization.

B. All Warranties referenced in this Specification shall have been submitted and have been accepted at time of contract award.

3.17 DETAILS

A. See Specified Manufacturer's detail drawings.

END OF SECTION

SECTION 07 60 00

FLASHING AND SHEET METAL

PART 1 – GENERAL

1.01 DESCRIPTION

A Division 1 applies to this Section. Provide flashing and sheet metal items, complete.

B. Work In This Section: Principal items include:

1. Sheet metal flashings in connection with roofing.
2. Reglet and counter-flashing assemblies.
3. Miscellaneous metal flashing and counter-flashing as required, except where provided under mechanical and electrical sections.

4. Coping caps.
5. Downspouts.
6. Scuppers.
7. Gutters.
8. Louvers with bird screens.
9. Drip flashings.
10. Shop priming and field touch-up.
11. Caulking.

C. Related Work Not In This Section:

1. Sheet metal in connection with Plumbing, Air Conditioning, and Electrical.
2. Metal accessories for drywall, lathing, and acoustical treatments.
3. Prefabricated equipment curbs.
4. Finish painting.
5. Sleeves for embedded items.
6. Metal decking.
7. Roof scuttles and safety post.

1.02 QUALITY ASSURANCE

A. Drawings and requirements specified govern. Conform to the current "Architectural Sheet Metal Manual" published by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), 1611 North Kent Street, Arlington, VA 22209 for conditions not indicated or specified and for general fabrication of sheet metal items.

1.03 SUBMITTALS

- A. Shop Drawings: Submit for fabricated sheet metal showing details, methods of joining, anchoring and fastening, thicknesses and gauges of metals, concealed reinforcement, expansion joint details, sections, and profiles.
- B. Samples: Submit (6) samples for each material or assembly requested.
- C. Product Data: Submit brochures of manufactured items.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Galvanized steel: ASTM A525, coating G90, mill phosphatized for paint adhesion, 22 gauge unless otherwise shown or specified.
- B. Solder: ASTM B32, B284.
- C. Solder flux: Standard brand non-corrosive acid-base type.
- D. Fasteners: Zinc or cadmium coated steel or stainless steel.
- E. Felt: ASTM D226, 15-pound type.
- F. Primer: Approved brand of zinc-dust zinc-oxide primer per Section 09900 with manufacturer's pretreatment materials.
- G. Sealant: Single component nonsag polyurethane, conforming to Section 07920.
- H. Building Paper: Fed. Spec. UU-B-790, Style 4, Grade B.

2.02 RELATED MATERIALS

- A. Reglets and Counterflashings: Fry Reglet Corp. flashing systems complete with unions and preformed corners of necessary types for particular locations, of 22 gauge galvanized steel, or approved equals by Metco Metal Products Co., Pacific Loxtite Flashing Co., National Cornice Works, Redco, Lane-Air, or equal. Use a single manufacturer's products, equivalent to Type MA at masonry, Type ST at plaster, or Type SM, as required by Drawings and details.
- B. Wall Louvers: Fabricated of aluminum alloy 6063-T5, frames of 0.125" thick, blades of 0.081 "thick. Blades shall be extruded into stormproof profile, riveted, and soldered. Blind reinforce frame corners and make watertight. Provide bird screens of 0.063" wire formed into 1/2" mesh and secured in 12 gauge extruded aluminum frame. Louvers shall have fluorocarbon paint finish specified in Section 05030. Louvers shall be Construction Specialties Model 6967, or equal by Aerolite.

2.03 GENERAL FABRICATION REQUIREMENTS

- A. Fabricate items to avoid distortion and overstressing of fastenings due to expansion and contraction. Provide expansion joints where necessary in continuous runs of sheet metal, constructed watertight and spaced 30-feet apart maximum. Lock and solder corners and blind hem exposed edges. Make joints with 4" lap and solder unless otherwise shown or

specified. Fill single lock seams with sealant where soldering is infeasible. Run flanges 4" minimum onto roof and wall surfaces. Fabricate sheet metal items in nominal 8-foot lengths unless otherwise shown or specified.

B. Soldering: All soldered joints shall be continuous. Do soldering slowly, immediately after application of flux, seams showing evenly flowed solder. Clean and neutralize finished soldering.

C. Shop Priming: Clean completed items, apply pretreatment, and prime all exposed surfaces with specified primer. B. Shop Priming: Clean completed items, apply pretreatment, and prime all exposed surfaces with specified primer.

2.04 FABRICATED ITEMS

A. Fabricated Items of 22 gauge galvanized steel unless otherwise indicated or specified.

B. Counter-flashing: Except where indicated or specified otherwise, insert counter-flashing in reglets and extend down vertical surfaces over upturned vertical leg of base flashings not less than 3 inches. Fold the exposed edges of counterflashings 1/2 inch. Provide end laps in counterflashings not less than 3 inches and make weathertight with single component, not sag urethane sealant, as specified in Section 07920. Lengths of metal counterflashings shall not exceed 10 feet. Form the flashings to the required shapes before installation. Factory form the corners not less than 12 inches from the angle. Secure the flashings in the reglets with soft metal wedges (no lead) and space not more than 18 inches apart; short runs, place wedges closer together. Fill caulked-type reglets or raked joints which receive counter-flashing with caulking compound as covered in Section 07920. Turn up the concealed edge of counterflashings built into masonry or concrete walls not less than 1/4 inch and extend not less than 2 inches into the walls. Install counter-flashing to provide a spring action against base flashing.

C. Coping Caps: Corner units having maximum 18" long legs and joints locked and soldered watertight, intermediate joints spaced at maximum 8-foot centers and equally spaced. Make intermediate joints of the flush butted type, edges spaced about 1/4" apart and centered over an 8" long backing plate of the same profile and gauge as the cap, set in a 1/2" wide bead of sealant. Secure both edges of caps with 1-1/2" wide 20 gauge galvanized steel cleats spaced at maximum 32" centers and locked into drip hem.

D. Drip Flashings: Provide at heads of windows and doors. Use material compatible with window and frame materials. Coordinate installation of flashing with that of windows and doors. Provide hemmed exposed edges, 1-piece lengths.

E. Scuppers: Line interior of scupper openings with sheet metal. Extend the lining through and project outside of the wall to form a drip on the bottom edge and form to return not less than one inch against the face of the outside wall at the top and sides. Fold outside edges under 1/2 inch on all sides. Provide the perimeter of the lining approximately 1/2 inch less than the perimeter of the scupper. Join the top and sides of the lining on the roof deck side to a closure flange by a locked and soldered joint. Join the bottom edge by a locked and soldered joint to the closure flange, where required form with a ridge to act as a gravel stop around the scupper inlet. Provide surfaces to receive the scupper lining and coat with bituminous plastic cement

F. Gutters, Downspouts and Accessories: Fabricated from 16 oz copper by Old World Distributors (269) 353-0726. Types, shapes and sizes shall be as indicated on Drawings, complete, including downspout elbows and offsets. Provide downspouts in approximately 10-foot lengths. Provide end joints to telescope not less than 1/2 inch and lock longitudinal joints. Provide wire ball strainers for each gutter outlet. Provide strainers to fit tightly into outlets, of the same material used for gutters. Keep downspouts not less than one inch away from walls. Fasten

downspouts to the walls at top, bottom, and at intermediate points not to exceed 5 feet on centers with leader straps or concealed rack-and-pin type fasteners. Form straps and fasteners of metal compatible with the downspouts.

G. Conductor Head: Of 20 gauge galvanized, top edge beaded for stiffening, outlet flange riveted and soldered. Provide a 1/4" mesh galvanized leaf strainer at top, secured in place but removable. Provide outlet tubes not less than 4 inches long. Seams shall be flat-lock solder type. Where conductor heads are used in conjunction with scuppers, set the conductor a minimum of 2 inches wider than the scupper. Attach conductor heads to the wall with suitable fasteners.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install metal items as indicated, according to approved submittals, and as required to complete the entire work. Securely fasten and assemble, and make watertight and weathertight. Provide manufactured joints in copper gutters and solder in place.

B. Coordination: Coordinate sheet metal items in connection with roofing for proper installation, and furnish in sufficient time to avoid delay in roofing construction. Install roofing sheet metal simultaneously with roofing.

C. Caulking: Provide sealant caulking as indicated and required to seal and complete work of this section. Conform to Section 07 90 00.

D. Protection from Contact with Dissimilar Materials:

1. Metal Surfaces: Paint surfaces in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

2. Wood or Other Absorptive Materials: Paint surfaces that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

E. Expansion and Contraction: Provide expansion and contraction joints at not more than 30-foot intervals. Where the distance between the last expansion joint and the end of the continuous run is more than half the required interval, an additional joint shall be provided. Space joints evenly.

3.02 COMPLETION

A. Examine installed sheet metal, water test if necessary or directed, and correct damaged or defective items.

END OF SECTION

SECTION 07 90 00

JOINT SEALERS

1.00 GENERAL

1.01 SECTION INCLUDES

- A. Preparing substrate surfaces.
- B. Sealant and joint backing.
- C. Work includes interior and exterior caulking and sealing, in not less than the following circumstances:
 - 1. Wherever expansion and contraction occurs.
 - 2. Between materials and products where infiltration of moisture, water, light or air blown particles may occur.
 - 3. Between materials and products in, or penetrating sound insulated walls, portion and related construction.
 - 4. Between exposed dissimilar materials.

1.02 REFERENCES

- A. ASTM C790 – Use of Latex Sealing Compounds.
- B. ASTM C804 – Use of Solvent-Release Type Sealants.
- C. ASTM C834 – Latex Sealing Compounds.
- D. ASTM C919 - Use of Sealants in Acoustical Applications.
- E. ASTM C920 – Elastomeric Joint Sealants.
- F. ASTM D41056 – Flexible Cellular Materials – Sponge or Expanded Rubber.
- G. ASTM D1565 – Flexible Cellular Materials – Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
- H. SWRI (Sealant, Waterproofing and Restoration Institute) – Sealant and Caulking Guide Specification.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations and color availability.
- C. Samples: Submit two samples, illustrating sealant colors for selection. Custom colors maybe required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform acoustical sealant application work in accordance with ASTM C919 and C1193.
- C. Comply with applicable codes and regulations of governmental agencies with ASTM C919 and C1193.
- D. Where provisions of applicable codes, regulations and standards conflict with the requirements of this Specification, comply with the more stringent provisions.
- E. Tests: Material for which physical characteristics have been stipulated shall have such characteristics independently confirmed by laboratory tests employing industry-recognized procedures. Both the laboratory performing the tests and the test methods employed will be subject to the approval of the Architect.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.
- B. Applicator: Company specializing in performing the work of this section with a minimum 5 years experience.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 COORDINATION

- A. Coordinate the work with all sections referencing this section.

1.08 WARRANTY

- A. Provide five year warranty under provisions of Section 01 77 00.
- B. Warranty: Include coverage for installed sealants and accessories which fail to achieve air tight seal and water tight seal, and exhibit loss of adhesion or cohesion, or do not cure.

2.00 PRODUCTS

2.01 SEALANT MATERIALS

- A. Polysulfide Sealant:
 - 1. Polysulfide base sealing compound. Sealant shall conform to performance standards of Thiokol Chemical Corp. and all containers of sealant delivered to project shall bear Thiokol "tested and approved" seal. Provide Type I (self-leveling) for joints in horizontal surfaces and Type II (non-sag) in joints vertical or overhead surfaces. Class A or Class B shall be used for structural movements subject to 25 percent or 50 percent joint elongation respectively.

- a. Two-part: FS TT S 00227.
- B. Polyurethane Sealant: Multi-part, selfleveling, FS TT S-00227, Type I, Class A. Equivalent to THC-900 by Tremco.
- C. Acrylic Terpolymer Sealant: One-part non-sag, FS TT S-00230. Equal to "Mono" by Tremco. Use for structural movement up to 150 percent of joint width.
- D. Laytex Acrylic Caulk: Elastoseal Latex manufactured by Pacific Polymers, or equal.
- E. Silicon: One-part, primerless, paintable and highly flexible, shrink and stain resistant, as manufactured by U.S.C., or equal.
- F. Custom colors may be required as determined by the architect.

2.02 BACK ROD

- A. Materials: Open or expended polyurethane, open or closed cell as recommended by sealant manufacturer, compatible with sealant.
- B. Non-Staining Primer: Type as recommended by manufacturer of sealant material.
- C. Bond Breaker: Pressure sensitive adhesive polythlene tape.
- D. Masking Tape: Pressure sensitive adhesive paper tape.

3.00 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

- A. Remove loose materials and foreign matter which might impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions.
- D. Protect elements surrounding the work of this section from damage or disfiguration.
- E. Mask areas adjacent to joints.

3.03 PRODUCT USAGE

- A. Exterior:
 - 1. Horizontal Traffic Bearing Joints: Multi-part polyurethane, self-leveling type.
 - 2. Exterior Vertical Joint: Multi-component, polysulfide type.
- B. Interior:

1. Interior Static Joints: Solvent release acrylic type.
- C. Standard or custom colors to match adjacent work as required by architect.
- D. Use only materials recommended by manufacturer for specific application.
- E. Apply sealant around, at laps, and/or mitered corners of all exposed flashing, metal reveals, louvers, coping, etc. and color sealant used shall match color of adjacent color.

3.04 APPLICATION

- A. Install backing material in joints using blunt instruments to avoid puncturing. Do not twist rod while installing. Install backing so that joint depth is 50 percent of joint width, but a minimum of ¼ inch deep.
- B. Install bond breaker where joint backing is not used.
- C. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- D. Apply sealant in joints using pressure gun with nozzle cut to fit joint width. Make sure sealant is deposited in uniform, continuous beads without gaps or air pockets. Replace where gaps or air pockets occur.
- E. Tool joints to required configuration within ten minutes of sealant application. If masking materials are used, remove immediately after tooling. Use an approved method of removing excess sealant where applies or where asked to have excess sealant removed by the Architect.

3.05 CLEANING

- A. Remove excess materials adjacent to joints by mechanical means or with xylol (xylene) or mineral spirits as work progresses to eliminate evidence of spillage or damage of adjacent surfaces.
- B. Leave finished work in neat, clean condition with no evidence of spill over onto adjacent surfaces.
- C. All exposed sealants used shall be of a type that can receive any of all paint as specified under the painting section if required.

3.06 PROTECTION OF FINISHED WORK

- A. Protect finished installation under provision of Section 01 66 00.
- B. Protect sealants until cured.

END OF SECTION

SECTION 09 25 00

GYPSUM WALLBOARD

PART I -GENERAL

1.01 DESCRIPTION

A. General Conditions and Division 1 applies to this section. Provide gypsum wallboard, complete.

B. Work In This Section: Principal items include:

1. Gypsum wallboard finish on walls and ceilings.
2. Acoustic rated gypsum wallboard partitions.
3. Acoustic and air-sealing work of this section.
4. Joint, edge, corner, and fastener finishing.

C. Related Work:

1. Metal support framing.
2. Exterior gypsum sheathing.
3. Wall backer-board
4. Thermal and Acoustical insulation.
5. Painting.
6. Access panels in gypsum wallboard construction.

1.02 QUALITY ASSURANCE

A. Finishes: Gypsum wallboard finish shall conform to requirements of GA 214, and as specified herein. Levels used on the project are described as follows:

LEVEL	JOINTS	INTERIOR ANGLES	ACCESSORIES	FASTENERS	SURFACES
1	Tape set in compound	Tape set in compound			Tool marks and ridges acceptable
4	After taping, cover with 2 separate coats of joint compound	After taping, cover with one separate coat of joint compound	Covered by 3 separate coats of joint compound	Covered by 3 separate coats of joint compound	Smooth and free of tool marks and edges **

** At completion of specified taping and finish, apply one coat of high solids primer as specified hereafter.

B. Sound Transmission Characteristics: For gypsum board assemblies indicated to have STC ratings or shown to be sound walls, provide materials and construction identical to those of

assemblies whose STC ratings were determined by ASTM E 90 and classified per ASTM E 413 by a qualified independent testing agency.

1.03 SUBMITTALS

A. Product Data: Submit product data covering wallboard installations, including finish accessories, finishing materials, sealing and wallboard manufacturer's written installation instructions, with copies of code approvals, for each material and for each wall, ceiling and shaft condition. Data shall be clearly annotated to indicate products to be furnished.

1.04 JOB CONDITIONS

A. Make a detailed inspection of areas and surfaces to be enclosed or covered by gypsum wallboard and arrange for correction of defective workmanship or materials. Ascertain that other work enclosed by gypsum wallboard has been inspected and approved before starting installation; otherwise, uncover as directed at no additional contract cost.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

USG Corporation
125 South Franklin St.
P.O. Box 806278
Chicago, IL 60680
(800) 874-4968

BPB Celotex
5301 Cypress Street
Suite 300
Tampa, FL 33607
(800) 235-6839

National Gypsum Company
2001 Rexford Road
Charlotte, NC 28211
(800) 628-4662
FAX (800) 329-6421

2.02 MATERIALS

A. Use products of one of the manufacturers named above. All materials, as applicable, shall be products of one manufacturer. Products of USG are specified hereafter to establish standard of quality.

B. Gypsum Wallboard: ASTM C36, except as otherwise noted, types as listed below, 5/8" thick, except where specifically shown otherwise.

1. For ceilings and walls: Sheetrock Brand, Fire-code Type "X" or Fire-code Type "C" Gypsum Panels, unless otherwise specified.

2. For corridor walls: USG Abuse Resistant Fiber-rock

C. Exterior Gypsum Sheathing: ASTM C1177, Type "X" with Water Resistant Core, 5/8" thick. Dens-Glass Gold Fireguard as Manufactured by Georgia-Pacific, or equal products. Refer to Specifications Section 09255 for requirements.

BID NUMBER
MECHATRONICS FACILITY
OXNARD HIGH SCHOOL

OXNARD UNION HIGH SCHOOL DISTRICT
GYPSUM WALLBOARD
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D. Fasteners:

1. Screws for gypsum wallboard on metal framing: ASTM C954, corrosion-resistant self-tapping bugle-head spiral-threaded type, minimum 1-1/4" long except 1-3/4" for double layer walls, lengths to penetrate all supporting metal at least 3/8". Furnish specially hardened type screws for supports heavier than 25 gauge.

2. Screws for metal framing heavier than 20 gauge: 1-1/4" bugle head with S-12 point, with self embedding head specially designed for use with board. Fasteners shall be stainless steel or shall have non-corrosive finish.

D. Paper Faced Metal Trim and Accessories: manufactured by USG, types as follows:

1. Corner bead: B1 series.

2. Bullnose corner: SLOC series. 3/4 inch radius.

3. Inside corner: B2 series.

4. Junctions with dissimilar materials, no reveal: B4 series and B9 series.

E. Control Joints: USG Control Joint No. 093, zinc alloy, V-shaped, 1/4" wide, 7/16" deep, with removable plastic tape protection.

F. Finishing Materials: ASTM C475, joint tape, bedding compound, finishing compound, adhesive, and laminating compounds supplied by wallboard manufacturer.

G. Sealing Compound: USG W/R Compound.

H. High Solids Primer: USG Sheetrock "First Coat".

I. Skim Coat: USG "Sheetrock All Purpose Joint Compound".

J. Acoustical Sealant: Nonhardening polysulphide or elastic water-base sealant, one of the following:

1. Inmont Company "Prestite 579.64".

2. Tremco Acoustical Sealant.

3. United States Gypsum Acoustical Sealant.

4. W.W. Henry Type 313 Acoustical Sealant.

K. Acoustical Foam Tape: Compressible, closed cell polyvinyl chloride foam with pressure sensitive adhesive, in rolls with protective release liner on non-adhesive face, 6 pcf density, 1 " wide by not less than 1/4" thick, Norseal V730, manufactured by Norton Performance Plastics Corporation (800) 724-0883, or equal.

L. Acoustic Insulation: Friction fit non-combustible fiber-glass batts, of types required for acoustic and fire ratings, nominal 4" thickness unless otherwise indicated, nominal 0.65 to 2.50 pcf density. Refer to Section 07210.

M. Access doors and panels: Refer to Section 08305.

N. Cavity Shaft Wall System: U.S. Gypsum system for two (2) hour shaft wall construction erected from floor side only.

1. U.S.G. studs, 4 x 20 ga. shaft wall studs.
2. U.S.G. steel J runners, 4" wide.
3. U.S.G. shaft wall liner panels, 1" thick.
4. 5/8" thick gypsum base panels, type "x", square edge.
5. 5/8" thick gypsum face panels, type "x", tapered edge.
6. Joint type and compound.
7. Acoustical sealant (joints to floor and to structure above).
8. Fasteners: As required or recommended.

PART 3 - EXECUTION

3.01 INSTALLATION OF GYPSUM WALLBOARD TO METAL FRAMING

A. Perform all wallboard installation and finishing according to ASTM C840 and the wallboard manufacturer's instructions. Do not install wallboard until building is weathertight. Conform to fire-rating requirements, building code approvals, and requirements herein.

B. Temperature: Maintain temperature between 55 degrees F. and 70 degrees F. within building during installation. Furnish ventilation to eliminate excessive moisture.

C. Fasteners: Install screws so heads are below wallboard surface without breaking surface paper or stripping the steel framing member around the screw. Space screws according to code approvals.

D. Openings: Accurately cut and fit the wallboard at openings. At door and other openings, cut wallboard to continue across area above opening head; do not cut wallboard to both jambs and fill in area over openings with separate pieces. Make the dimension from the joint over head of an opening to jamb of openings 6" minimum. Stagger joints on opposite side of partition.

E. Walls: Place wallboard horizontally with the long dimension across the studs or in one piece vertical heights, vertical joints centered on supports and staggered on walls so as not to occur on opposite sides of the same stud. Secure to each stud and track with screws keeping screws 3/8" from edges. Where required to accommodate deflection, or where required by building code, omit screws on top track.

F. Suspended Ceilings: Apply wallboard with long dimension at right angles to furring channels, end joints staggered and centered over furring channels. Use wallboards of maximum practical length to minimize end joints and properly support around cutouts and openings. Secure with screws.

3.02 ACOUSTIC INSULATED PARTITIONS

A. Install acoustic insulation continuously between studs from finish floor to top of wall in which it occurs. Where cutouts are made for J-boxes, conduit, piping, and like items, back wall insulation with insulation so that one additional layer of insulation at least 24" wide and high is placed in back of cutout. Snugly fit in place free of gaps or holes.

B. Where ducts penetrate acoustically insulated partitions, partitions shall be framed leaving 1 " clear all around. Space between duct and partition framing shall be filled with acoustic insulation, held back behind face of wallboard. Install backer rod, and fill gap between duct and wallboard with acoustic sealant as specified below. Provide firestopping as required for rated construction.

3.03 JOINT TREATMENT AND FINISHING

A. Conform to GA 214-M and the following:

1. All Levels: Apply tape bedding compound, tape, and finishing cement on joints in wallboard as required for specified levels of finish.

2. Levels 4 and 5:

a) Apply joint cement and finishing cement over screw heads. Treat all inside corners with joint cement, tape, and finishing cement. Treat outside corners with corner beads and finishing cement.

b) Provide metal casing beads at all edges of gypsum wallboard which abut ceiling, wall, or column finish, and elsewhere as required, such as openings, offsets, etc. Make all exposed joints, trims, and attachments non-apparent following application of paint or other finishes; if the joints and fasteners are apparent, correct defects as directed with no additional contract cost.

c) Seal the raw edges of plumbing openings and of boards that have been cut to fit with sealing compound brushed on.

d) When entire installation is completed and prior to installation of finish materials by other trades, correct and repair broken, dented, scratched, or damaged wallboard.

3. Level 4: Apply one coat of high solids primer over entire surface.

4. Level 5: Apply one coat of skim coat over entire surface, followed by one coat of high solids primer over entire surface.

3.04 CAVITY SHAFT WALL SYSTEM

A. Install generally as recommended by system manufacturer.

B. Install in locations indicated.

3.05 REQUIRED LEVELS OF FINISH

A. Unless otherwise indicated or specified, levels of finish required shall be as follows:

1. Level 1: Plenum areas above ceilings, insides of shafts, and other concealed areas.

2. Level 4: Exposed, painted wallboard.

3.06 AIR SEALING

A. Seal connections between ducts, plenums, and building structure airtight with specified caulking compound or tape and cement.

3.07 CAULKING

A. Caulk between wallboard edges and floors, walls, and at structure above other than acoustical ceilings with acoustical sealant, forming a complete perimeter seal. Caulk around outlet boxes and other penetrations in same manner. Caulk space between ducts and wallboard.

3.08 ADJUST AND CLEAN

A. Inspect the completed installation. Fill all cracks or depressions with compound and finish smooth and flush with adjacent surfaces. Check all trim for accurate alignment, neat joints between trim and other materials, and repair all defects.

END OF SECTION

SECTION 09 78 00

CONCRETE FLOOR SEALER

PART 1 -GENERAL

1.01 DESCRIPTION

A. General Conditions and Division 1 applies to this Section. Provide concrete floor sealer, complete, as shown and specified.

B. Work In This Section: Principal items include:

1. Inspection of surfaces.
2. Protective sealer on exposed concrete surfaces as indicated.

1.02 QUALITY ASSURANCE

A. Qualification of Applicator: The applicator shall be qualified and certified by the sealer manufacturer.

1.03 SUBMITTALS

A. Samples and Data: Submit 12" x 12" samples of sealer showing finish and sheen specified accompanied by manufacturer's technical data, application instructions and recommended coverage rates for types of surfaces to be treated

B. Certificate and Summary Statement: Prior to completion of Work, submit a certificate stating that sealers applied conform to approved submittals and all requirements specified; in the certificate include a summary statement giving following information:

1. Number of square feet of each surface treated with sealer, classified as to the kind of material treated, and open pore or closed pore type.
2. The quantity of sealer, per coat, actually applied to the surface.

1.04 COMPLIANCE WITH REGULATIONS

A. All materials shall comply with the current rules and regulations of the local air quality management district, with the rules regarding volatile organic compounds, and with FDA rules and regulations for dangerous materials in sealers.

1.05 PRODUCT DELIVERY

A. Deliver all sealer materials to the site in containers bearing name and batch number of manufacturer, with seals intact.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. ProSoCo: 3741 Greenway Circle Kansas City, KS 66046 (800) 225-4255
FAX (785) 830-9797

B. Thoro: 889 Valley Park Drive Shakopee MN 55379 (800) 433-9517 FAX (800) 496-6067

2.02 COATING TYPES

A. General: Sealer shall be clear, water based, non-slip, SCAQMD approved, clear modified alkyl alkoxysilane coating, ProSoCo "SLX Water and Oil Repellent" or equivalent by Thoro, designed for use on interior and exterior traffic surfaces. Sealer shall be designed to penetrate the pore surface of the concrete and inhibit moisture migration.

2.03 SHEEN: Completed sealer shall have semi-gloss sheen, as defined in Section 09900.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate work of Section 03 39 00 to provide water curing only for slabs to receive floor sealer.

B. Prepare surfaces in accordance with the coating manufacturer's printed instructions. Remove contaminants including loose mortar, rust and other products of corrosion, disintegrated concrete, and other substances that could interfere with adhesion of the coating system to the substrate.

3.04 APPLICATION:

A. Application shall be by experienced mechanics using methods and spray or roller equipment recommended by coating manufacturer, after surfaces to be treated are dry.

B. Apply floor sealer in accordance with manufacturer's recommendations. Apply evenly over the surface in 2 coats at approximately 400 square feet per gallon per coat. Apply the second coat immediately after the first coat has penetrated.

C. Keep traffic from treated surfaces until the material is thoroughly dry.

END OF SECTION

SECTION 09 90 00

PAINTING

1.00 GENERAL

1.01 DESCRIPTION

- A. Painting as indicated on the drawings and specified herein, including, but not limited to these major items:
1. All surfaces scheduled, specified or indicated.
 2. Exterior surfaces not to be painted.
 - a. Concrete paving and base, including metal inserts.
 - b. Stainless steel.
 - c. Gratings, checker plate or cast iron covers and frames.
 - d. Aluminum with anodic (color) finish, or clear anodize.
 - e. Materials and equipment with complete factory finish, except as otherwise indicated. Acrylic wall covering has factory finish. Galvanize is not a factory finish.
 - f. Finish hardware except paint grade.
- B. Interior Surfaces Not to be Painted.
1. Concrete flatwork.
 2. Stainless steel or other finished metals. Galvanize is not a factory finish in this section.
 3. Materials and equipment with complete factory finish, unless specified otherwise.
 4. Ducts, piping, conduit and metal items concealed from view in furred spaces.
 5. Brass valves, chromium or nickel-plated piping and fittings.
 6. Fabric connection to fans.
 7. Flexible conduit connections to equipment, miscellaneous nameplates, stamping and instruction labels and manufacturer's data.
 8. Mechanical and electrical utility lines, piping, and heating and ventilating duct work in underfloor excavated areas or crawl spaces, attic spaces and utility spaces.
 9. Grating, checker plate or cast iron covers and frames on floors and stairs.
 10. Raised floor.
 11. Stainless steel.

1.02 SUBMITTALS

- A. In accordance with Section 01 33 00, using materials approved for the project, submit samples of each color and paint finish selected by the Architect. Prepare duplicate samples, 8 1/2" x 11" showing successive coatings. For transparent and stained finishes, prepare samples on species and quality of wood used in the work.
- B. Selection of Colors: Architect will select all colors. In multi-coat work using color pigmented paints, each coat shall have sufficient variations of color to distinguish it easily from preceding coat.
- C. Material Submitted: Prior to start of work, submit three copies of complete list of paint materials for approval of Architect. Designate manufacturer of materials, trade name and stock number. List surfaces to receive paint products, primer, undercoats and finish coats.

1.03 PRODUCT HANDLING

- A. Deliver materials to the project site in unopened containers bearing manufacturer's name and product descriptions corresponding to designation on material list.
- B. Storage: Store in dry, clean, well-ventilated areas, in a manner to prevent damage or fire, and in closed containers. Remove empty containers and paint-soiled or oily rags from the site at the end of each day's work.

1.04 MAINTENANCE MATERIALS

- A. Provide one full quart in sealed container of each color and type of paint used in the project for finish paint coats. Each container shall be identified with color and type of paint it contains.
- B. Deliver to job site at completion of project.

1.05 PROTECTION

- A. Protect floors and all adjacent surfaces from paint smears, spatters, and droppings. Use drop-cloths to protect floors. Cover fixtures and remove hardware not to be painted. Mask off areas where necessary.
- B. Hardware: Insure that hardware is removed before painting is started, and replaced only when paint finishes are thoroughly dry. Fitting, removal, and reinstallation of finish hardware is specified in the finished Carpentry and Millwork Section.

2.00 PRODUCTS

2.01 GENERAL

- A. Materials shall conform to governing requirements of South Coast Air Quality Control District.

2.02 MANUFACTURERS

- A. Materials necessary to complete the painting herein specified and listed by material number and names are standards for kinds, quality and function, and are taken from the stock list of architectural finishes of the Dunn Edwards Corporation, Los Angeles.

1. Equivalent materials from the architectural product line of Sinclair Paint Company, Sherwin- Williams, Frazee Industries Inc. or Vista Paint Corp. will be acceptable, subject to Architect's approval.
2. Except for specialty items, or otherwise specified, all materials shall be by one manufacturer. Primer shall be from same manufacturer as finish paint.
3. Miscellaneous basic materials such as linseed oils, shellac, white lead, putty and solvents shall be pure and of highest quality.

2.03 MATERIALS

A. Surfaces shall be finished in accordance with the following procedures for the surface and finish desired thereon.

B. Exterior Finishes (Semi-Gloss):

1. Finish P-1 100% Acrylic

Surface - Galvanized Metal
 Pretreatment - GE123 Galva-Etch
 1st coat - W 711 Vanprime
 2nd coat - 42-1 Compo
 3rd coat - W701 Evershield

Surface - Aluminum
 1st coat - W711 Vanprime
 2nd coat - 42-1 Compo
 3rd coat - W701 Evershield

Surface - Wood
 1st coat - W708 E-Z Prime
 2nd & 3rd coats - W710 Evershield

Surface - Concrete (Coordinate with Section 09860)
 1st coat - W709 Eff-Stop
 2nd & 3rd coats - W710 Evershield

Surface - Concrete block
 1st coat - W305 Blocfil
 2nd & 3rd coats - W710 Evershield

Surface – Concrete block
 1st Cast – W305 Blocfil
 2nd * 3rd Casts – 516 semi gloss epoxy (Rustoleum)
 (at trash enclosure).

2. Finish P-2 Acrylic Polyurethane Semi-gloss Enamel

Surface - metal - ferrous, galvanized
 1st coat - Tnemec Series 66-1211 Epoxoline Primer
 2nd coat - Tnemec Series 73 Endura-Shield II

Surface - plastered surfaces.
 1st coat - Tnemec Series 66-1211 Epoxoline Primer

2nd coat - Tnemec Series 73 Endura-Shield II

3. Finish P-3 Acrylic latex stain - Semi transparent

Surface - wood - redwood, cedar
1st & 2nd coats - Olympic Water Repellent Primer

4. Finish P-4 Acrylic-Epoxy Semi-Gloss Coating

Surface - Metal - ferrous
1st coat - Tnemec Series 15 Color Uni-bond
2nd coat - Tnemec Series 111 Color Tufcoat
3rd coat - W901 Permasheen

Surface - Wood Doors - phenolic resin
1st coat - Compo 42-1
2nd & 3rd coats - W901 Permasheen

C. Interior Finishes:

1. Finish P-5 Semi-gloss Enamel (acrylic latex)

Surface - Concrete and plaster
1st coat - W101 Vinylastic
2nd & 3rd coats - W450 Decaglo

Surface - Concrete block
1st coat - W305 Blocfil
2nd & 3rd coats W450 Decaglo

Surface - Gypsum Drywall* (See Item 2)
1st coat - W450
Decaglo to cover

Surface - Galvanized Metal
Pretreatment - GE123 Galva-Etch
1st coat - W711 Vanprime
2nd coat - E22-1 Super U-365
3rd coat - W450 Decoglo

Surface - Metal - ferrous
1st coat - W711 Vanprime
2nd coat - E2201 Super U-365
3rd coat - W450 Decaglo

2. Finish P-6 Semi-gloss Enamel (alkyd)

Surface - Wood
1st & 2nd coats - E22-1 Super U-365
3rd coat - E5 California Satin Sheen
*If gypsum drywall surface is recycled paper, 1st coat - U.S. Gypsum "First Coat".

3. Finish P-7 Semi-gloss Polyurethane

Surface - Wood
1st coat - Stainseal EV-108
2nd & 3rd coats - IP 628 Decothane Semi-gloss

4. Finish P-8 Gloss Epoxy

Surface - Gypsum Drywall* (See Item 2).
1st coat - W101 Vinylastic
2nd & 3rd coats - 1P 755 Ceralaze

3.00 EXECUTION

3.01 PREPARATION OF SURFACES

- A. General: Surfaces to receive paint finish shall be prepared as indicated by primer paint printed instructions.
- B. Metal shall be free of rust. Damaged shop primer shall be re-touched. Rough edges shall be sanded.
- C. Woodwork: Unless already properly hand-sanded, sandpaper smooth and dust clean. Before priming surfaces, thoroughly clean knots, pitch pockets and sap streaks and touch up with shellac. After priming, neatly fill nail holes, cracks and depressions with recommended filler pigmented as required to match finish. Sand smooth using No. 00 sandpaper and dust clean. Wood indicated to be resawn or sandblasted shall be cleaned of all loose material only.
- D. Millwork: Before installation, prime surfaces which are to receive opaque paint finish, giving special attention to sealing of crossgrained surfaces. Prime woodwork other than millwork on exposed surfaces only, after installation. Prime work as soon as possible after delivery to site. Back prime all wood indicated to be applied to concrete or concrete block.
- E. Gypsum Drywall and Plaster: Sand and fill imperfections.
- F. General Repainting: Applicator, in the company of the Architect, shall carefully examine existing surfaces required to receive work of this Section. Scrape the surfaces to determine the adhesion of the existing coating to the substrate. If the area of chalking, sponginess or flakiness exceeds 30%, the entire coating shall be removed. Surfaces to receive paint finish shall be prepared as indicated by the printed instructions.
 - 1. Limits for the repainting of existing or patched surfaces shall be from the point of alteration to the surface inside corner, including entire walls or ceiling surfaces, except as otherwise indicated.

3.02 PREPARATION OF PAINT

- A. Open containers when required for use and mix paint in designated rooms or spaces. Thoroughly stir and agitate paint to uniformly smooth consistency suitable for proper application. Comply with manufacturer's directions on container label for reduction, change or use, unless otherwise specified or approved. Prepare and handle paint in manner to prevent deterioration or inclusion of foreign matter.

3.03 APPLICATION

- A. General: Skilled mechanics shall perform painting and finishing. Apply each coat at proper consistency, evenly, free of sags, laps, runs and cut sharply to required lines. Apply paint only under conditions that will insure finishes free from blemishes and defects, within temperature range of 50° to 90° F. Allow sufficient drying time between coats.

Insure primer and intermediate coats are unscarred and completely integral before applying succeeding coats. The number of coats specified is the minimum that shall be applied. Apply paint finish of even, uniform color, free from cloudy or mottled appearance and evident thinness of coating on arises.

Notify Architect when each coat is ready for inspection. Do not apply succeeding coats without Architect's approval of preceding coat.

B. Methods of Application: Subject to local union requirements, paint may be applied by brush, roller, spray, or other application method, at option of the contractor, but not when a particular method would produce unsatisfactory results in the opinion of Architect. In no case will application conflict with the manufacturer's written instructions.

C. Miscellaneous Finishes:

Finishes not scheduled on drawings:

1. Where Walls are Painted:

a. Pipes, Conduits or Ducts: Apply same finish as specified for wall or ceiling adjacent to surfaces to be painted. Prime surfaces as follows before wall or ceiling finish is applied.

b. Insulation on Pipes or Ducts: Two coats pigmented 42-22.

c. Asphalt Coated Pipes: Two coats 42-44 of White Prime.

d. Galvanized Pipes or Ducts: One coat of QD43-7 White Prime.

2. Ducts, Dampers and Louvers: Finish as far back as visible from the room in which they open with two coats flat black.

3.04 CLEANING AND PATCHING

A. Upon completion, remove spillage, spatter spots and other misplaced paint material, in manner which will not damage surfaces. Patch, repair or make restitution for work of others damaged by painting operations, to satisfaction of Architect.

END OF SECTION

SECTION 10 40 00

SIGNAGE

PART 1 – GENERAL

1.01 DESCRIPTION

- A. General Conditions and Division 1 applies to this section. Provide signage, complete.
- B. Work Specified in this Section:
 - 1. Door signs;
 - 2. Room signs;
 - 3. Toilet room identification signs;
 - 4. Accessible access facilities signs;
 - 5. Occupancy signs and occupant load signs;
 - 6. Other signs shown on the Drawings.
- C. Related Work Specified Elsewhere:
 - 1. Identification for mechanical and electrical equipment
 - 2. Construction signs.

1.02 SUBMITTALS

- A. Manufacturer's Literature. Provide brochures showing signs, including general specifications, materials and construction.
- B. Shop and Layout Drawings: Provide complete drawings showing details of fabrication and erection; color type and style of letters, background and frame; setting details; and full size templates of lettering layouts.
- C. Samples: Provide one full size sample of each room and door sign, indicating construction, color, size, layout of letters, and method of attachment.
- D. Maintenance Instructions: Provide manufacturer's recommended procedures for care of finished surfaces.
- E. Certificates. Manufacturer's certification that materials meet specification requirements.

1.03 QUALITY CONTROL

- A. Signage shall comply with 2013 CBC Sections 11B-216, 11B-216.1, 11B-216.2, 11B-216.3, 11B-216.4, 11B-216.6, 11B-216.8 and 11B-703.
- B. All signs, unless otherwise specified, shall be products of one manufacturer.

1.04 EXTENT OF SIGNAGE

- A. In general, signs shall be required and shall be provided at the following locations:
 - 1. As shown on the Drawings or where required by the Specifications;
 - 2. As required by Code and the State Fire Marshal;
 - 3. At all toilet rooms, dressing rooms and staff lounge rooms;

4. At each special occupancy use room (such as conference rooms, dining rooms and other type spaces where maximum occupant load limits are required to be posted per code);
5. Occupancy load limits required by code;
6. Site signs:
 - a. Site Directional signs to each building entrance and along accessibility routes of travel;
 - b. Gate signage (one per gate)
7. Room signs: Allow for and provide one sign for each door indicated in the Door Schedule, which shall include a 3-digit room number and approximately 15 letters per sign. Letter count not used on a given sign shall be available for use on other signs.

B. Where a specific sign and/or sign wording is not indicated or shown on the plans, obtain from the Campus and Architect the exact wording for each sign required and provide such signage at no additional cost.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Sign manufacturer shall have local fabrication or distribution system, so that additional signs may be ordered as the need arises.

B. Acceptable manufacturers include the following:

1. ASI-Modulex, Curlver City, CA (310) 645-9877.
2. Equal products from the following Mfr.'s:
 - a. Mohawk Sign Systems, Inc., Schenectady, NY (518) 370-3433
 - b. Innerface Architectural Signage, Liburn GA (800) 445-4796
 - c. Vomar Products, Van Nuys, CA (818) 894-7174

2.02 BASIC MATERIALS

A. Aluminum: Aluminum alloy products shall conform to ASTM B 209, Alloy 5005-H5, for sheet or plate, and ASTM B 221, Alloy 6063-T5, for extrusions. Aluminum extrusions shall be provided at least 1/8 inch thick and aluminum plate or sheet at least 16 gauge, 0.0508 inch thick.

B. Structural steel products shall conform to ASTM A 36. Sheet and strip steel products shall conform to ASTM A 570.

C. Acrylic sheet shall be Plexiglas or Lexan, with surface hardener, thicknesses as indicated or as required for size of sign. Acrylic sheet shall meet the flammability requirements of ASTM E 84 and shall conform to ANSI Z97.1.

D. Polycarbonate sheet shall conform to SAE AMS 3611.

E. Fiber-reinforced polyester (FRP) shall be in accordance with ASTM D 3841, Type II, Grade 1, Class 124, as indicated.

F. Anchors and Fasteners

1. Exposed anchor and fastener materials shall be compatible with metal to which applied and shall match in color and finish.

2. Double sided tape: 3M Scotch Brand, foam type. Foam tape shall be minimum 1/16 inch thick closed cell vinyl foam with adhesive backing. Adhesive shall be transparent, long aging, high tech formulation on two sides of the vinyl foam. Adhesive surfaces shall be protected with a 5 mil

green flatstock treated with silicone. Foam pads shall be sized for the signage as per signage manufacturers recommendations.

3. Adhesive: Dow-Corning No. 999-A silicon type. Adhesive shall be transparent, long aging, high tech formulation.

2.03 SIGNAGE GRAPHICS

A. Provide signage graphics and characters as follows:

1. Characters on signs shall be raised 1/32 inch minimum and shall be sans serif uppercase characters accompanied by Grade 2 Braille.

2. Raised characters shall be a minimum of 5/8 inch and a maximum of 2 inches high.

3. Contrast between character, symbols and their background shall be 70% minimum and have a non-glare finish per 2013 CBC 11B-703.5.1.

4. Characters on signs shall have a width-to-height ratio *“where the width of the uppercase letter “O” is 60 percent minimum and 110 percent maximum of the height of the uppercase letter “T””,* per 2013 CBC 11B-703.2.4, and a stroke thickness where *“stroke thickness of the uppercase letter “T” shall be 15 percent maximum of the height of the character,”* per 2013 CBC 11B-703.2.6

2.04 BRAILLE

A. Contracted California Grade 2 Braille shall be provided wherever Braille symbols are required. Dots shall be 1 /10 inch (2.5 mm) on center within each cell with 2/10 inch (5.08 mm) space between cells. Dots shall be raised a minimum of 0.025” (0.6 mm) to a maximum of 0.037” (0.9 mm) above background. Rounded or domed type profile is recommended. Refer to 2013 CBC Sections 11B-703.3 and 11B-703.4.

2.05 COLORS

A. As selected from manufacturer's standard colors, or as indicated on drawings.

2.06 FINISHES

A. Metal Surfaces shall be cleaned, primed, and given a factory or shop applied semi-gloss baked enamel or two-component acrylic polyurethane finish in accordance with NAAMM AMP 505 with total dry film thickness not less than 1.2 mils.

B. Surface texture of signs shall be matte in accordance with ADA standards.

2.07 SHOP FABRICATION AND MANUFACTURE

A. Workmanship: Work shall be assembled in the shop, insofar as practicable, ready for installation at the site. Work that cannot be shop assembled shall be given a trial fit in the shop to ensure proper field assembly. Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Welding to or on structural steel shall be in accordance with AWS D1.1. Welding shall be continuous along the entire area of contact. Exposed welds shall be ground smooth. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practicable. Items specified to be galvanized shall be by hot-dip process after fabrication if practicable. Galvanizing shall be in accordance with ASTM A 123 and ASTM A 525, as applicable. Joints exposed to the weather shall be formed to exclude water. Drainage and weep holes shall be included as required to prevent condensation buildup.

B. Dissimilar Materials: Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of asphalt varnish or a coat of zinc-molybdate primer to prevent galvanic or corrosive action.

C. Shop Painting: Surfaces of miscellaneous metal work, except nonferrous metal, and stainless steel shall be given one coat of zinc-molybdate primer or an approved rust-resisting treatment and metallic primer in accordance with manufacturer's standard practice. Surfaces of items to be embedded in concrete shall not be painted. Upon completion of work, damaged surfaces shall be recoated.

2.08 POST AND PANEL SIGNS

A. Posts: One-piece galvanized steel posts shall be provided with minimum 0.125 inch wall thickness. Posts shall be designed to accept panel framing system described herein. The post shall be designed to permit attachment of panel framing system without exposed fasteners. Caps shall be provided for each post.

B. Panels shall be double pan background formed from 0.090 aluminum with a return edge on two sides and top. Panels shall wrap around support post with an 1/8 inch reveal between adjoining edges.

C. Finishes: Post finish shall be semi-gloss baked enamel or two-component acrylic polyurethane. Metal panel framing system finish shall be baked enamel or two-component acrylic polyurethane.

D. Graphics: Message shall be applied to panel using the silkscreen process. Silkscreened images shall be executed with photo screens prepared from original art. No handcut screens will be accepted. Original art shall be defined as artwork that is a first generation stencil of the original specified art. Edges and corners shall be clean. Rounded corners, cut or ragged edges, edge buildup, bleeding or surfaces pinholes will not be accepted.

E. Mounting shall be provided by embedding posts in concrete foundation as shown. Provide 1/4" rounded bottoms at path of travel signs.

2.09 PLAQUE SIGNS

A. Plaque signs for interior signage shall be a modular type signage system in profile types and dimensions shown on the Drawings. Signs shall be fabricated of acrylic plastic conforming to ANSI Z97.1.

B. Plaque signs shall consist of matte finish acrylic plastic, thickness and size as shown. Signs shall be frameless. Corners of signs shall 3/8 inch radius.

2.10 TOILET ROOM IDENTIFICATION SIGNS:

A. Type: Plaque signs as specified above.

B. Size: As indicated.

C. Facing: Single sided.

D. Fabrication: 1/4" thick acrylic plastic panel with graphic symbols precision silk screened on panel. Graphic symbols shall be developed in accordance with CBC Standards.

- E. Lettering: White precision silk screened lettering.
- F. Finish: Panels shall be integral color, with subsurface or enamelled letters and markings.
- G. Signage Types: Provide the following:
 - 1. Accessibility sign with wheelchair symbol.
 - 2. Men's toilet room sign with upper case Helvetica lettering spelling the word "men" and silhouette symbol.
 - 3. Women's toilet room sign with lower case Helvetica lettering spelling the word "women" and silhouette symbol.
 - 4. Dressing room sign with upper case Helvetica lettering spelling the word "Dressing Room" and silhouette symbols as indicated.
- H. Provide Braille indicator at side of door, of design matching door signs, as required by CBC.

2.11 ROOM IDENTIFICATION SIGNS: Signage design is based upon products from ASI-Modulex, Interior Pacific Series.

- A. Use for all door and room signage and other utility space signage as indicate on the drawings or directed.
- B. Sizes: As indicated or required.
- C. Facing: Single sided.
- D. Lettering: As indicated or required by the Campus.
- E. Finish: Color as indicated on the drawings or selected by the Architect.

2.12 SPECIAL OCCUPANCY AND UTILITY SIGNAGE: Signage design is based upon products from ASI-Modulex, Interior Pacific Series.

- A. Use for occupancy signage and other utility signage as indicate or directed.
- B. Sizes: As indicated or required.
- C. Facing: Single sided.
- D. Lettering: As indicated or required by the Campus.
- E. Finish: Color as indicated on the drawings or selected by the Architect.

2.13 FASTENERS AND OTHER MATERIALS

- A. Fastenings: Provide non-corrosive fasteners, hangers, and mounting devices which are compatible with sign material and finish. All fasteners shall be tamper proof type.
- B. Related Materials: Other materials, not specifically described but require for a complete and proper installation of signs, shall be as approved.

PART 3 – EXECUTION

3.01 INSPECTION

A. Substrate: Examine foundations, walls, doors, ceilings, and other area scheduled to receive signs for conditions that would affect quality and execution of work.

B. Defects: Do not proceed with installation until defects are corrected.

3.02 INSTALLATION

A. General: Signs shall be installed in accordance with approved manufacturer's instructions at locations shown on the drawings. Signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs on doors or other surfaces shall not be installed until finishes on such surfaces have been installed. Comply with ADA requirements for mounting heights of signs.

B. Anchorage shall be in accordance with approved manufacturer's instructions. Anchorage not otherwise specified or indicated shall be theft resistant one-way, theft resistant screws for wood.

C. Interior Signs: Locations shown on drawings are approximate. Verify exact mounting heights and locations of all signs. Attach door signs, toilet room signs and other interior signs with one-way, theft-resistant, mechanical fasteners.

3.03 PROTECTION AND CLEANING

A. The work shall be protected against damage during construction. Sign surfaces shall be cleaned in accordance with the manufacturer's approved instructions.

END OF SECTION

SECTION 10 52 20

FIRE EXTINGUISHERS AND CABINETS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Division 1 applies to this section. Provide fire extinguishers and cabinets, complete.

1.02 SUBMITTALS

- A. Shop Drawings: Submit showing installation details and required backing locations.
- B. Samples: Submit such samples as may be requested, which will be returned to Contractor. Approved samples may be installed in the work.
- C. Manufacturer's Data: Submit complete manufacturer's data for each product, clearly annotated to show exact products and options proposed for use.

1.03 QUALITY ASSURANCE

- A. Mounting locations: For surface mounted extinguishers, ensure that fasteners for mounting extinguisher are embedded 1" minimum into existing solid framing, and if such framing is not available, provide it per Sections 06 10 00 and 06 11 40. For recessed extinguisher cabinets, coordinate construction of openings, and placement of fire resistive construction behind recess prior to installation of extinguisher cabinets.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

JL Industries Inc.
4450 West 78th Street Circle
Bloomington MN 55435
(800) 554-6077

Potter-Roemer Tri Star
3100 S. Susan Street
Santa Ana CA 92704
(714) 430-5300 (800) 366-3473

Larsen's Manufacturing Co.
7421 Commerce Lane NE
Minneapolis MN 55432
(800) 527-7367

2.02 MATERIALS

- A. Extinguishers: UL rating 4A:60B:C, 5" diameter, 16" high, Type ABC multi-purpose dry chemical type with red glossy polyester coated steel cylinder with pressure gauge, wall

mounting bracket and hose. Extinguishers used in the kitchen shall be Ansul Model K-Guard, Class K portable, wall-mount per manufacturer's standard specifications.

B. Cabinets: Recessed mounted, fabricated of steel with polyester corrosion-resistant coating, size as required to accommodate extinguisher. Cabinets shall be Ambassador, or equal.

C. Doors shall be full break glass, using clear tempered safety glass, with vertical lettering "Fire Extinguisher" in contrasting color, as approved. Provide handle on door for emergency use in breaking glass.

2.03 QUANTITY

A. In addition to quantity shown, review requirements with Fire Marshal and provide all required. Coordinate locations of extinguishers and cabinets.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install cabinets square, plumb, and level. Securely anchor by mechanical means only using stainless steel fasteners. Conform to installation instructions. Exact locations shall be as indicated or directed.

END OF SECTION

SECTION 21 1313

FIRE SUPPRESSION SPRINKLER SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fire sprinkler system for protection of buildings.

B. Related Requirements: The requirements of this Section, NFPA 13 and shall take precedence over requirements found in the following:

1. Division 01 - General Requirements.
2. Section 07 8413: Penetration Fireproofing.

1.02 SUBMITTALS

A. Manufacturer's Data:

1. Submit complete and detailed equipment and material list of items to be furnished and installed under this section.
2. Submit manufacturer's specifications and other data required to demonstrate compliance the plans and specified requirements.

B. Drawings:

1. Submit shop drawings of wet pipe fire protection sprinkler system in compliance to NFPA 13, Standard for the Installation of Sprinkler Systems, Sprinkler systems shall comply with the provisions of NFPA 13.
2. Shop drawings shall fully comply with the most stringent provisions of this specification and plans, and with the applicable codes and standards.
3. Shop drawings shall be same size as the Contract Drawings and shall be produced using AutoCAD.

C. Regulatory Requirements:

1. Installation of fire sprinkler system shall not vary from the plans unless alterations have been approved by the State Fire Marshal at DSA.
2. Complete DSA standard testing forms and get sign-off by the Project Inspector.

D. Closeout Submittals: Submit in accordance to Section 01 7700, Contract Closeout, and as specified herein:

1. Record Drawings:
 - a. Record drawings of installed Work shall be maintained current on the Project site, available for Fire Marshal and the Project Inspector to review.
 - b. At completion of installation submit Record Drawings signed by installing Contractor in AutoCad format, including:
 - 1). Record Specifications.
 - 2). Record Product Data: Include specific model, type and size for equipment and material installed.
 - 3). Record Test Results.
 - 4). Maintenance Manuals.

1.03 QUALITY ASSURANCE

- A. Comply with applicable national or local codes and standards.
- B. Except where exceeded by the requirements of these specifications, the following are made part of this section: prints and details, and provisions of the NFPA 13 Standard for Installation of Sprinkler Systems.
- C. Qualifications of Manufacturer: Products used in work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a 5 year history of successful production that is acceptable to the Architect.
- D. Qualifications of Installer: Installer shall have a current C-16 license in the State of California in the installation of fire sprinkler systems.

1.04 FIRE SERVICE WATER CONNECTION

- A. The Owner shall pay fees and provide for the fire main POC (point of connection), consisting of the installation of a single detector check valve (if one is required) and meter shut off valve inside a meter vault.
- B. Fire Service Mains shall be provided with approved Meter Service Backflow protection. An approved Reduced Pressure Principle Backflow Prevention Assembly (RP) to meet minimum backflow protection requirements for meter service protection (MSP) shall be provided on the fire main, according to the California Plumbing Code (CPC) and according to the current City of Oxnard Department of Water and Power WATER SERVICE RULE 16-D where applicable (see section 2.02.D for backflow assemblies). Double Check Assemblies shall only be used with the written approval of the Water Purveyor.

1.05 PRODUCT HANDLING

- A. Comply with the provisions specified in Sections 22 0500 and 22 0513.

1.06 COORDINATION

- A. Coordinate activities in accordance with provisions of Section 22 0500.

1.07 JOB CONDITIONS

- A. Unscheduled utility flow interruptions are not permitted. Schedule service interruptions in advance, with the OAR.

1.08 EXTRA MATERIALS FOR MAINTENANCE

- A. Provide spare sprinkler heads in quantity equal to 2 percent of total number of each type of sprinkler head installed. There shall be no less than two heads of each type and temperature rating provided, and in no case less than six spare sprinkler heads per building. There shall be no fewer than 6 spare sprinkler heads for up to 300 sprinkler heads installed; no less than 12 spare sprinkler heads for up to 1,000 sprinkler heads installed; and no less than 24 spare sprinkler heads for the sites with more than 1,000 sprinkler heads installed. Spare sprinkler heads shall be kept inside of spare sprinkler head box(s). A spare sprinkler wrench for each type of sprinkler head shall also be provided inside of each spare sprinkler head box, at each building. Locations of spare sprinkler boxes shall be located at:
 - 1. Fire Sprinkler Riser, when enclosed and secure.
 - 2. Plant Manager's Office, when Fire Sprinkler Riser is exposed.

PART 2 - PRODUCTS

2.01 FIRE PROTECTION SYSTEM DESCRIPTION

- A. General: Provide systems complete including, but not limited to:
 - 1. Provide underground and above ground sprinkler including trenching and backfilling. Materials and equipment shall be UL/FM listed and approved as required by NFPA for their application. Required signage shall be provided and installed as required by NFPA 13.
 - 2. Provide overhead sprinkler system with sprinklers installed as required according to type, location and temperature rating.
- B. Sprinkler Heads:
 - 1. Provide chrome pendant spray type sprinkler heads with matching escutcheons in areas with finished ceilings. Exterior escutcheons shall be poly-coated or concealed type to prevent rusting and oxidation.
 - 2. Provide upright sprinklers in areas with exposed piping.
 - 3. Provide poly-coated glass bulb corrosion resistance type sprinklers heads in areas exposed to a corrosive environment such as parking garages and coastal air.
 - 4. Sprinklers shall be glass bulb type, with hex-shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation,
 - 5. Sprinklers in concealed spaces, exterior locations, and other areas that will experience over 100 degrees F ambient temperature shall be furnished with 200 to 225 degree rated sprinklers. Sprinkler heads in boiler rooms, furnace rooms, or heater rooms shall be furnished with sprinklers rated at 250 to 290 degrees F. If a

sprinkler is directly affected by a spotlight, steam, or other heat source, a 350 degree F or higher sprinkler head shall be furnished. Sprinkler heads in other locations, unless otherwise noted, shall be 155 to 165 degrees F rated.

6. Automatic fire sprinkler head type shall be as follows:
 - a. In areas with ceiling heights of nine-feet or lower, sprinkler heads installed shall be recessed or fully concealed.
 - b. Ceilings eight-feet or lower shall be provided with fully concealed sprinkler heads.
 - c. Areas with ceiling height of nine-feet or lower, that are not constantly supervised such as corridors, arcades, students restrooms, and other restrooms shall be provided with fully concealed sprinkler heads.
7. Sprinkler heads in light hazard occupancies are required to be Quick Response sprinklers as required in NFPA 13. Sprinkler heads shall be of the same manufacturer throughout the building/site as indicated. Sprinklers shall typically be ½ inches NPT, standard orifice, minimum 5.6 nominal K factor, UL listed for 175 psi, and listed for light and ordinary hazard occupancies.
8. Other specialized sprinkler heads such as walk-in refrigerator or freezer heads, side wall, ¾ inches sprinklers above 5.6 K factor, and those sprinklers with a K factor below 5.6, shall only be used where required by project condition. Large drop sprinkler heads and extended coverage sprinkler heads shall not be installed.
9. Sprinkler head location shall be designed and installed in an aesthetically pleasing manner and should generally be located in center of 24-inch by 24-inch ceiling tiles and in center of 24-inch by 48-inch ceiling tiles in the 24-inch direction and no closer than 12-inch from the edge in the 48-inch direction.
10. UL/FM listed Sprinkler head guards shall be provided on Sprinkler heads installed at seven feet six inches above floor or lower in exposed locations, or that are deemed subject to damage. Sprinkler head guards shall securely fasten with bolt-on feature to the base of the sprinkler or be a factory installed guard. Guards shall also be provided on upright and sidewall heads where sprinklers are installed at seven feet six-inch heights or lower.

C. Fire Sprinkler Systems:

1. Underground piping: Comply with the requirements of Section 33 1100, Site Water Distribution Utilities.
2. Provide an underground UL/FM listed PVC or Ductile iron supply line connected to detector check meter or water main as indicated. Install site water mains no closer than 10'- 0" parallel to the building foundations. Underground fire water lines shall be installed 36 inches below grade. Tracer wire shall be installed in accordance with Section 33 1100: Site Water Distribution Utilities.
3. Fire Department Connection (FDC) with check valve (wafer type) shall be provided after the backflow preventor, and before the building fire sprinkler riser(s), located where the FDC will be accessible to the fire department from the street or sidewalk

without obstructions. No shut off valve shall be allowed on the FDC line as per NFPA 13. FDCs shall have a height between two and four-foot above the ground.

4. PIVs shall be electrically supervised regardless the number of fire sprinkler served (CBC 903.4), and set at a height of three feet to the top and have the handle locked in place with a break-a-way lock.
5. Provide a UL listed, FM approved FDC, approved RP type backflow assembly, check valves, shut-off valves, drain valves, ITV, and flow indicator at the locations required. (Test-and-drain combination valves are prohibited.)
6. Flow indicator shall activate the fire alarm system between 45 and 90 seconds, and activate a local alarm on the outside of the building continuously with water flow. Connection of this switch is a part of the Work of Division 26. Shut-off including valves on the fire main backflow preventor shall be electrically supervised according to CBC 903.4., NFPA 13 and Section 28 3100 – “Fire Detection and Alarm”.
7. Pipe through ceilings at head locations shall be furnished with a two piece, or fully concealed escutcheon. Unless otherwise designated, escutcheons shall be identical and match the other escutcheons of the same type throughout the building or site. Piping through walls and ceilings shall have a split ring chrome escutcheon.
 - a. Flexible stainless steel sprinkler head drop system may be used. Flexible drops shall be UL listed, FM approved, and shall be compatible with ceiling systems. Flexible drop length shall be included in the Hydraulic Calculations. The drop system shall include the required support bracing.
8. Furnish and install required signs, spare heads, special wrenches, and spare sprinkler head boxes as required to satisfy NFPA 13 and this specification.
9. Sprinkler system piping shall be provided with complete drainage as required by NFPA. Test valve discharge shall be piped away from planters to asphalt areas. Furnish protection of piping against accidental or malicious damage.
10. Upon completion of the Work of this section, and before Substantial Completion, subject system, including underground supply connection, to tests required. A minimum hydrostatic test shall be two hundred pounds (200 psi) or fifty pounds (50 psi) in excess of the maximum system working pressure, whichever is greater, for two hours with no leaks or loss of pressure per NFPA 13. The Project Inspector shall be furnished with a NFPA 13 test certification.
11. Local fire sprinkler alarm requirements shall be accomplished with a vane or paddle type water flow detector switch and an electrically powered fire sprinkler horn located on the street side of the building and connected to the fire alarm control panel with secondary power provided from the fire alarm batteries. The drilled out disk shall be attached to the mounting U-bolt. Time delay shall be set at 45 to 60 seconds. Mechanically activated water bells with alarm valve and pressure switch are prohibited.
12. Seismic separation assemblies shall be located between the buildings if space allows accessibility. Otherwise they shall be located inside the building providing the most space. Swing joints may be fabricated on site using flexible groove couplings and six grooved (Victaulic) 90 degree elbows in a teepee formation (see NFPA 13,

figure A.9.3.3). Seismic separation assemblies can also be made utilizing a manufactured, UL/FM listed swing joint assembly rated at a minimum 175 psi.

13. Hanging, bracing and support shall be per DSA approved plan and shall utilize only UL/FM listed approved products, and comply with NFPA 13, Chapter 9 requirements for rod and bolt sizes except for the following: 4 and 6 inch pipe shall be supported by a minimum 1/2 inch hanger rod, 8 inch pipe shall be supported by a minimum 5/8 inch hanger rod, 10 and 12 inch pipe shall be supported by a minimum 3/4 inch hanger rod. Hanger rods in exterior locations and in parking structures shall have Electrodeposited Zinc Coating per ASTM B633 to prevent rusting.
14. Building Fire Sprinkler riser assemblies shall be provided as follows. Every building shall be provided with an accessible and electrically supervised riser shut off valve at a height not to exceed five-feet above the floor. Every building riser assembly shall be equipped with a check valve followed by a main drain valve and then the flow indicating switch and pressure gauge immediately after the shut-off valve. In cases where a riser assembly is provided for each floor in the building, a check valve, main drain and flow switch shall be provided for each floor; the main building shut-off shall not be required. An electrically supervised Post Indicator Valve located outside the building may serve as the building riser shut-off valve.

2.02 MATERIAL

A. Globe or Angle Valves: UL/FM listed.

AV-1	Bronze angle valve: 2 inches and smaller, screwed-in bonnet, threaded ends, rising stem:				
	Nibco	Kennedy	Fairbanks	United	Or equal
	T-301	98 SD	0210	126T	

B. Automatic Fire Sprinkler Head, UL/FM listed:

AFSH-1	Brass pendant type for areas with suspended ceilings:				
	Victaulic	Tyco	Viking	Reliable	Or equal
	V27	TY 3231	VK302	F1FR56	

AFSH-2	Brass upright type for areas with no ceilings:				
	Victaulic	Tyco	Viking	Reliable	Or equal
	V27	TY3131	VK300	F1FR300	

AFSH-3	Chrome or poly coated semi recessed type with semi-recessed escutcheon:				
	Victaulic	Tyco	Viking	Reliable	Or equal
	V27	TY3231	VK302	F1FR56	

AFSH-4	Fully concealed type sprinklers; chrome cover:				
	Victaulic	Tyco	Viking	Reliable	Or equal
	V38	TY3531	VK462 VK404	F4FR G4A	

C. Backflow Prevention Assemblies:

BPV-1 Reduced Pressure Principle Backflow Prevention Assembly (RP) type for meter service protection (MSP) requirements:

Ames	Febco	Watts	Wilkins	Or equal
4000SS	860 OS&Y	909 RP	975 RP	
C400	880 OS&Y	957 RP	375 RP	
M400		994 RP		

BPV-2 Reduced Pressure Principle Detector Assembly (RPDA) for MSP requirements:

Ames	Febco	Watts	Wilkins	Or equal
5000SS	860 DA	909 RPDA	950 DA	
C500	880 DA	957 RPDA	350 DA	
M500		994 RPDA		

D. Gear Operated Butterfly Valves:

GOBFV-1 Grooved end Gear Operated Butterfly Valve, 300 psi, for fire protection sprinkler risers. UL listed, FM approved, with weatherproof gearbox and double pole/double throw monitor switch, double seal design for bubble tight shut off at 175 psi. Corrosion-resistant, fusion-bonded nylon II body coating, easy to read position indicator:

Kennedy	Nibco	Victaulic	Tyco	Or equal
Figure 82M	GD-4765-8N, 300 psi	705W 300 psi	580 300 psi	

GOBFV-2 Wafer Type Gear Operated. Butterfly Valve, same requirements as GOBFV-1:

Kennedy	Nibco	Or Equal
Figure 82W	WD-3510 300 psi	

E. Check Valves:

CV-1 Bronze check valves: 2 inches and smaller, 200 psi WOG, bronze disc, swing type, conforming to MSS-SP-80-97, threaded ends:

Crane	Nibco	Stockham	United	Or Equal
37	T-433-Y	B-319	62T	

CV-2 Iron check valves: 2-1/2 inches and larger, class 175, composition disc, swing type, bolted cap, UL listed, FM approved flanged ends:

Stockham	Kennedy	Tyco	Clow	Or Equal
G-940	126	Model G	F5380	

CV-3 Wafer Type Check Valve:

United Wafer Check #90	Nibco KW-900-W	Mueller A-2102
Or equal.		

CV-4 Grooved Check valve 2 ½ inch and larger:

United	Gruvlock	Reliable	Victaulic	Tyco
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67	7800	Mode "G"	Series 717	590F
Or equal.				

F. Escutcheons

ES-1 Chrome plated, or white poly-coated, 2-piece canopy (escutcheon), 2.25 to 3.5 inches in extended position:

FPPI	Tyco	Reliable	Or equal
01 - 401	No. 401	HBC (chrome)	
Chrome or	Chrome or	HBW (white)	
White	White		

ES-2 Chrome plated or white poly coated, 2-piece recessed:

FPPI	Tyco	Reliable (semi recessed)	Or equal
01 - 400	410	GF2-C (chrome)	
01 - 402	420	GF2-W (white)	

G. Fire Department Connections:

FDC-1 UL listed, FM approved, type, 4 inch by 2-1/2 inches by 2-1/2 inches bronze body fire department hose connection (FDC):

Crocker	Potter-Roemer	Tyco	Powhaten	Or equal
6405 or	5710 or	86	21-201 or	
6420	5730		31-133	

H. Flow Indicators:

FIA-1 Listed by State Fire Marshal, with double pole, double-throw switch, one normally open and one normally closed, UL listed and FM approved:

Potter-Roemer	Notifier	Or equal
VSRF Series	WFR Series	

I. Outside Stem and Yoke Gate Valves:

OS&Y-1 Bronze Gate Valves: 2 inches and smaller, class 175, solid bronze wedge disc, OS&Y, copper silicon alloy stem, UL/FM listed, threaded ends:

Stockham	Crane	Nibco	United	Or equal
B-133	459	T-14	18	

OS&Y-2 Iron gate valves: 2 1/2-inch and larger, class 175, IBBM, OS&Y, solid wedge disc, Teflon-impregnated packing, UL/FM listed, flanged ends:

Stockham	Crane	Kennedy	Mueller	Victaulic
G-634	467	68	A-2073	771

Or equal.

OS&Y-3 2 1/2-inch and larger, epoxy coated, resilient wedge, 175 pounds gate valve for riser valves, P.I.V., and shut off:

Clow F-6136	Nibco 617-0	Kennedy KV-4068	Mueller A-2360	Or equal
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J. Gate Valves:

GV-1 Bronze gate valves: 2-inch and smaller, class 175, solid bronze wedge disc, rising stem copper silicon alloy stem, UL/FM listed, threaded ends:

Stockham B-133	Crane 459 Fig. 66	Grinnell 14	United	Or equal
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GV-2 Iron gate valves: 2 1/2-inch and larger, class 175, IBBM, solid wedge disc, Teflon impregnated packing, UL/FM listed, flanged ends:

Stockham G-634	Crane 467	Kennedy 68	Mueller Victaulic A-2052 772
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Or equal.

K. Gear Operated Ball Valves:

GOBV-1 Threaded ball valve for sizes two inches and smaller:

Nibco KT-505W-4 Victaulic 728	Or equal.
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L. Seismic Swing Joints:

SJ-1 UL/FM Approved flexible seismic connector with grooved, or threaded ends for seismic separation requirements.

SJ-2 Fabricated swing joints as per NFPA 13 using six groove 90 degree elbows and flexible groove couplers such as Victaulic style 75.

M. Post Indicator Valves:

PIV-1 Vertical Indicator Posts: Furnished for underground valves, post must provide a means of knowing if the valve is open or shut, UL/FM listed. (Where a backflow assembly is provided, the shutoff valves on the backflow preventer satisfy the requirement for a post indicator valve to control the fire main and FD Connection):

Stockham G-951	Kennedy 2945	Grinnell F-750	Or equal
Clow F-576	Mueller 2945	Victaulic 774	

PIV-2 Posts Indicator valve: Furnished for underground valves. Ductile iron fusion bonded epoxy coated resilient wedge gate valves: 4 inches and larger, class 175 lb, non-rising stem, mounting plate for indicator post, UL/FM listed, flanged or mechanical ends (in accordance with NSF 61).

Stockham G-635	Kennedy 71X	Clow F-6100	Mueller Victaulic 2360 772
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O equal

N. Sprinkler Guards:

SPG-1 Sprinklers installed at seven feet six inches above floor or lower in exposed locations, or that are deemed subject to damage shall be equipped with a UL/FM listed, head guard. Guards shall be listed, supplied and approved for use with the sprinkler by the sprinkler manufacturer. Sprinkler head guards shall securely fasten with bolt-on feature to the base of the sprinkler or be a factory installed guard. Guards shall also be provided on upright and sidewall heads where sprinklers are installed at seven feet six-inch heights or lower.

Reliable Viking Tyco FPPI Victaulic
Or equal.

O. Sprinkler Horn:

SPH-1 UL/FM approved, surface-mounted, weatherproof and red finished:

Horn:	Bell:	Wheelock equal
HRK System Sensor	SSM-24-10 System Sensor	
24 V-DC	24 V-DC	
Weatherproof with	Weatherproof with	
BBS-2 back-box for	WBB box for	
Surface mount	Surface mount installation	

Or equal

P. Hangers, Supports, Bracing: (Shall be per DSA approved drawings).

HSB-1 Tolco products or UL listed and FM or equal.

Q. Threaded fittings:

TF-1 Ductile iron, 300 psi rated, UL listed, FM or NFPA approved.

TF-2 Cast iron fittings, 175 psi rated, UL listed, FM or NFPA approved:

Anvil Ward Taylor Or equal

TF-3 Malleable Iron, 300 psi rated, UL, Listed, FM or NFPA approved

TF-4 Galvanized, 175 psi rated, UL Listed, FM or NFPA approved

R. Fire Sprinkler Pipes:

FSP-1 Fire sprinkler pipe: 1 inch through 8-inch, Schedule 40, black or galvanized steel meeting ASTM Standards A53, A135, or A795. Pipe Corrosion Resistance Ratio (CRR) shall be 1.00 or greater. Pipe may be threaded or grooved.

- a. Piping 2 inches and smaller shall have threaded joints and fittings in concealed, non-accessible locations. Groove coupler connections (Victaulic, Viking VGS, or equal) on pipe sizes 1 inch through 2 inches are acceptable in accessible areas with required seismic bracing provided. Plain end connections such as "Plainlock" and "FIT" are prohibited.
- b. For pipe sizes 2 ½-inch and larger, grooved type (Victaulic, Viking VGS, or equal), welded, threaded and flanged connections may be used. Any connection that does not utilize a threaded, welded or grooved connection is prohibited, except for mechanical tee bolt-on branch outlet fittings sizes 2-inch and smaller (Victaulic 920 and the 920N).
- c. Submit Verification from manufacturer stating that piping material furnished meets above criteria; (i.e.: threadable pipe has a UL assigned CRR of 1.00 minimum, that it meets ASTM A53, A135 or A795, and it is UL listed, FM or NFPA approved.)

- FSP-2 Ductile iron pipe, AWWA C151 (for pipes below grade). Gasketed self retaining joints per ASME/ANSI B16.4.
- FSP-3 Plastic, PVC, thick wall (cast iron OD sized), DR 14 (200 PSI). UL listed for fire main service (underground). Gasketed self retaining joints - Johns Manville Blue Brute AWWA C900, JM Eagle C900 water pipe or equal.
- FSP-4 Fire Sprinkler Pipe: 1 inch through 3-inch, Copper meeting NFPA 13 Standards. Pipe may be grooved.
- FSP-5 Flexible Fire Sprinkler Head Connectors: 1 inch pipe size flexible stainless steel fire sprinkler head connectors "Flex Head Industries" Models 2024, 2036, 2048, 2060 and 2072, or equal..

2.03 ACCESSORIES AND APPURTENANCES

- A. Escutcheons: Polished chrome plated split-ring type for exposed piping at every penetration inside finished rooms.
- B. Guards: Provide sprinklers with guards at ceiling at or under seven feet six-inch high and where subject to damage or vandalism.
- C. Miscellaneous: Provide accessories and appurtenances for a complete system.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which Work of this section shall be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe ends.
- B. Remove scale and foreign matter, from inside and outside of pipes, before assembly.
- C. Provide piping connections to equipment with flanged or grooved connections.

3.03 INSTALLATION

- A. Install underground supply line connected to detector check or water main indicated. Braced or clamped bends shall be in accordance with requirements of NFPA 24. Provide vertical clamp rods at flange and spigot piece of risers, long enough to pass through riser's base flange where required. Furnish concrete thrust blocks where required. Tracer wire shall be installed as per Section 22 0553: Plumbing Identification on PVC underground piping. Overhead installation shall be per DSA approved drawings.
- B. Install FDCs, check valves, shut-off valves, gauges, Inspector's test and drain assemblies and flow indicator. FDC must be installed so that it is unobstructed and accessible for the Fire Department's first response unit.
- C. Pipe through floors, wall, and ceilings, at head locations, shall be furnished with required sleeves, and escutcheons and fire caulking where indicated and/or required by code. Escutcheons shall be polished chrome plated unless other finish is selected by the Architect.
- D. Sprinkler system shall be provided with complete drainage facilities in accordance with CBC standards. Drain discharge may discharge into a sewer, storm drain, sump pit or street gutter. Fire sprinkler drains shall not discharge onto a playground or across a sidewalk. Discharge to plumbing fixtures is prohibited due to the inability of a plumbing fixture to receive a full flow of water from a fire sprinkler drain valve under working pressure.
- E. Upon completion of the Work of this section, and before Substantial Completion, subject the entire system, including underground supply connections, to tests as required by NFPA 13, and CBC standards and furnish the Owner with a certificate of compliance as required.
- F. Close nipples are prohibited. Threaded unions are prohibited. Where a threaded union or coupling is needed, a groove type fitting (Victaulic or equal) shall be used instead. If a groove style coupling is used in a concealed area, an access panel allowing full access to that connection shall be provided.
- G. Fire sprinkler systems piping hangers, seismic bracing, anchors and supports shall be per DSA approved drawings and shall conform to NFPA 13, CBC and other applicable codes and the requirements of this specification.
- H. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer.

- I. Tee branch outlets on fire sprinkler mains shall be by the use of a threaded ductile iron tee fitting, a groove type tee fitting, (Victaulic or equal), or by the use of a thread-a-let welded on by a certified welder as required by NFPA. Mechanical tee bolted branch outlet fittings are prohibited except for branch outlet sizes 2-inch and smaller.
- J. Sprinkler lines within the building shall be concealed within the structure. Risers shall be installed in utility, supply rooms or similar service areas whenever possible, and shall not obstruct access, or maintenance of other equipment within the space. Mains and risers shall be located within the area protected by the sprinkler system unless otherwise approved by fire authorities having jurisdiction.
- K. Sprinklers that have been dropped, damaged, have cracked bulbs, or show a visible loss of fluid shall not be installed.
- L. Sprinkler bulb protectors shall be removed by hand after sprinkler installation. Tools or other devices to remove the protector that could damage the bulb in any way shall not be used.
- M. Routing of piping in non-concealed exposed areas shall be subject to the Architect's review in the final shop drawings.
- N. Underground piping shall have a minimum of 36 inches of cover to grade. Underground pipe shall be installed on a flat not less than 6-inch thick undisturbed sand bed. After required pressure-leak test, pipe shall be covered with sand not less than 6 inches thick, before backfilling. Comply with NFPA Standards. Piping is not allowed to be underground below the building floor slab.
- O. Provide approved backflow prevention assemblies. Installations of backflow prevention assemblies shall be tested and certified by a certified by City of Oxnard backflow prevention device tester prior to Substantial Completion. Tests shall be performed in the presence of the Project Inspector. Test reports shall be turned over to the Project Inspector for mailing to proper agency.
- P. Test valve (ITV) shall be located at the opposite end of the sprinkler system from the supply. Test-and-drain type combination valves are prohibited. ITV discharge and main drain lines shall be piped to a sump pit or to the outside of the building to within a foot from the ground where it will drain away from the building to an exterior storm drain.
- Q. Each building with a sprinkler riser shall be furnished with an accessible shut off riser valve installed no higher than five feet from the finish floor. Each floor shall have a separate shut off valve with flow switch, and shall be securely enclosed or secured with a chain and break-a-way lock. Also see section 2.01- C-12 of this specification.

3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.05 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose at off-project site.

END OF SECTION

STRAIGHT TEE



Ductile Iron



MATERIAL SPECIFICATIONS

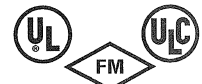
Ductile iron threaded fittings are UL & ULC Listed & Factory Mutual Approved for 500 psi service.

Ductile iron per ASTM A536 Class 65-45-12.

Dimensions conform to ASME B16.3 Class 150.

Threads are NPT per ANSI/ASME B1.20.1.

NOTICE: Ductile iron fittings have higher tensile strength than that of steel pipe. Therefore, over tightening can cause damage to pipe threads which may cause leakage. Ductile iron fittings should be tightened three turns beyond hand tight, but no more than four turns.

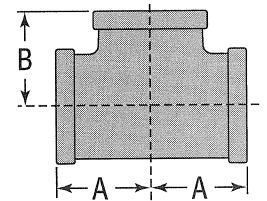


APPROVED

For Listing/Approval Details and Limitations visit our Web Site www.anvilintl.com or contact an Anvil®/AnvilStar™ Sales Representative.

STRAIGHT TEE

Nominal Size	Anvil Item Number	Universal Number	Max. Working Pressure *	Dimensions		Approx. Wt. Each
				A	B	
<i>In. (mm)</i>			<i>PSI (kPa)</i>	<i>In. (mm)</i>	<i>In. (mm)</i>	<i>Lbs. (kg)</i>
1 25	840003164	DT333	500 3450	1.50 38.10	1.50 38.10	0.85 0.39
1 1/4 32	840003172	DT444	500 3450	1.75 44.45	1.75 44.45	1.22 0.55
1 1/2 40	840003180	DT555	500 3450	1.94 49.27	1.94 49.27	1.55 0.70
2 50	840003198	DT666	500 3450	2.25 57.15	2.25 57.15	2.45 1.11



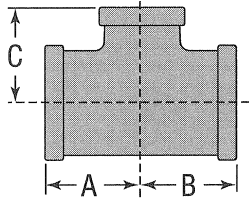
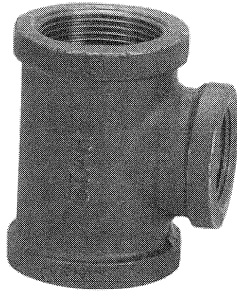
* UL, ULC & FM Pressure Ratings

For additional listings and approvals, see the technical data section.

REDUCING TEE



Ductile Iron



* UL, ULC & FM Pressure Ratings

For additional listings and approvals, see the technical data section.

MATERIAL SPECIFICATIONS

Ductile iron threaded fittings are UL & ULC Listed & Factory Mutual Approved for 500 psi service.

Ductile iron per ASTM A536 Class 65-45-12.

Dimensions conform to ASME B16.3 Class 150.

Threads are NPT per ANSI/ASME B1.20.1.

NOTICE: Ductile iron fittings have higher tensile strength than that of steel pipe. Therefore, over tightening can cause damage to pipe threads which may cause leakage. Ductile iron fittings should be tightened three turns beyond hand tight, but no more than four turns.



For Listing/Approval Details
and Limitations visit our Web Site
www.anvilintl.com or contact an
Anvil®/AnvilStar™ Sales Representative.

REDUCING TEE

Nominal Size In. (mm)	Anvil Item Number	Universal Number	Max. Working Pressure* PSI (kPa)	Dimensions			Approx. Wt. Each Lbs. (kg)
				A In. (mm)	B In. (mm)	C In. (mm)	
1 x 1/2 x 1 25 x 15 x 25	840004196	DT313	500 3450	1.50 38.10	1.36 34.54	1.50 38.10	0.64 0.29
1 x 3/4 x 1 25 x 20 x 25	840004204	DT323	500 3450	1.50 38.10	1.45 36.83	1.50 38.10	0.73 0.33
1 x 1 x 1/2 25 x 25 x 15	840004212	DT331	500 3450	1.26 32.00	1.26 32.00	1.36 34.54	0.71 0.32
1 x 1 x 3/4 25 x 25 x 20	840004220	DT332	500 3450	1.37 34.80	1.37 34.80	1.45 36.83	0.76 0.34
1 x 1 x 1/4 25 x 25 x 32	840004238	DT334	500 3450	1.67 42.41	1.67 42.41	1.58 40.13	0.98 0.44
1 x 1 x 1/2 25 x 25 x 40	840004246	DT335	500 3450	1.80 45.72	1.80 45.72	1.65 41.91	1.16 0.53
1/4 x 1 x 1/2 32 x 25 x 15	840004253	DT431	500 3450	1.34 34.04	1.26 32.00	1.53 38.86	0.82 0.37
1/4 x 1 x 3/4 32 x 25 x 20	840004261	DT432	500 3450	1.45 36.83	1.37 34.80	1.62 41.15	0.90 0.41
1/4 x 1 x 1 32 x 25 x 25	840004279	DT433	500 3450	1.58 40.13	1.50 38.10	1.67 42.42	1.00 0.45
1/4 x 1 x 1/4 32 x 25 x 32	840004287	DT434	500 3450	1.75 44.45	1.67 42.42	1.75 44.45	1.08 0.49
1/4 x 1 x 1/2 32 x 25 x 40	840004295	DT435	500 3450	1.88 47.75	1.80 45.72	1.82 46.22	1.42 0.64
1/4 x 1/4 x 1/4 32 x 32 x 15	840004303	DT441	500 3450	1.34 34.04	1.34 34.04	1.53 38.86	0.86 0.39
1/4 x 1/4 x 3/4 32 x 32 x 20	840004311	DT442	500 3450	1.45 36.83	1.45 36.83	1.62 41.15	0.92 0.42
1/4 x 1/4 x 1 32 x 32 x 25	840004329	DT443	500 3450	1.58 40.13	1.58 40.13	1.67 42.42	0.95 0.43
1/4 x 1/4 x 1/2 32 x 32 x 40	840004337	DT445	500 3450	1.88 47.75	1.88 47.75	1.82 46.22	1.45 0.66
1/4 x 1/4 x 2 32 x 32 x 50	840004345	DT446	500 3450	2.10 53.34	2.10 53.34	1.90 48.26	1.75 0.79
1/2 x 1 x 1/2 40 x 25 x 15	840004352	DT531	500 3450	1.41 35.81	1.34 34.04	1.66 42.16	0.95 0.43
1/2 x 1 x 3/4 40 x 25 x 20	840004360	DT532	500 3450	1.52 38.61	1.37 34.80	1.75 44.45	1.14 0.52
1/2 x 1 x 1 40 x 25 x 25	840004378	DT533	500 3450	1.65 41.91	1.50 38.10	1.80 45.72	1.17 0.53
1/2 x 1 x 1/4 40 x 25 x 32	840004386	DT534	500 3450	1.82 46.23	1.67 42.42	1.88 47.75	1.34 0.61
1/2 x 1 x 1/2 40 x 25 x 40	840004394	DT535	500 3450	1.94 49.28	1.80 45.72	1.94 49.28	1.45 0.66
1/2 x 1/4 x 1/2 40 x 32 x 15	840004402	DT541	500 3450	1.41 35.81	1.34 34.04	1.66 42.16	1.05 0.48
1/2 x 1/4 x 3/4 40 x 32 x 20	840004410	DT542	500 3450	1.52 38.61	1.45 36.83	1.75 44.45	1.15 0.52

REDUCING TEE

Nominal Size In. (mm)	Anvil Item Number	Universal Number	Max. Working Pressure* PSI (kPa)	Dimensions			Approx. Wt. Each Lbs. (kg)
				A In. (mm)	B In. (mm)	C In. (mm)	
1/2 x 1/4 x 1 40 x 32 x 25	840004428	DT543	500 3450	1.65 41.91	1.58 40.13	1.80 45.72	1.25 0.57
1/2 x 1/4 x 2 40 x 32 x 50	840004436	DT546	500 3450	2.16 54.86	2.10 53.34	2.02 51.30	1.90 0.86
1/2 x 1/2 x 1/2 40 x 40 x 15	840004444	DT551	500 3450	1.41 35.81	1.41 35.81	1.16 29.46	1.15 0.52
1/2 x 1/2 x 3/4 40 x 40 x 20	840004451	DT552	500 3450	1.52 38.61	1.52 38.61	1.75 44.45	1.24 0.56
1/2 x 1/2 x 1 40 x 40 x 25	840004469	DT553	500 3450	1.65 41.91	1.65 41.91	1.80 45.72	1.30 0.59
1/2 x 1/2 x 1/4 40 x 40 x 32	840004477	DT554	500 3450	1.82 46.23	1.82 46.23	1.88 47.75	1.48 0.67
1/2 x 1/2 x 2 40 x 40 x 50	840004485	DT556	500 3450	2.16 54.86	2.16 54.86	2.02 51.30	1.98 0.90
2 x 1 x 2 50 x 25 x 50	840004493	DT636	500 3450	2.25 57.15	2.02 51.31	2.25 57.15	2.15 0.98
2 x 1/4 x 2 50 x 32 x 50	840004501	DT646	500 3450	2.25 57.15	2.10 53.34	2.25 57.15	2.30 1.04
2 x 1/2 x 1/2 50 x 40 x 15	840004519	DT651	500 3450	1.49 37.85	1.41 35.81	1.88 47.75	1.50 0.68
2 x 1/2 x 3/4 50 x 40 x 20	840004527	DT652	500 3450	1.60 40.64	1.52 38.61	1.97 50.04	1.62 0.73
2 x 1/2 x 1 50 x 40 x 25	840004535	DT653	500 3450	1.73 43.94	1.65 41.91	2.02 51.31	1.64 0.74
2 x 1/2 x 1/4 50 x 40 x 32	840004543	DT654	500 3450	1.90 48.26	1.82 46.23	2.10 53.34	1.80 0.82
2 x 1/2 x 1/2 50 x 40 x 50	840004550	DT655	500 3450	2.02 51.31	1.94 49.28	2.16 54.86	2.00 0.91
2 x 1/2 x 2 50 x 40 x 50	840004568	DT656	500 3450	2.25 57.15	2.16 54.86	2.25 57.15	2.35 1.07
2 x 2 x 1/2 50 x 50 x 15	840004576	DT661	500 3450	1.49 37.85	1.49 37.85	1.88 47.75	1.60 0.73
2 x 2 x 3/4 50 x 50 x 20	840004584	DT662	500 3450	1.60 40.64	1.60 40.64	1.97 50.04	1.68 0.76
2 x 2 x 1 50 x 50 x 25	840004592	DT663	500 3450	1.73 43.94	1.73 43.94	2.02 51.31	1.85 0.84
2 x 2 x 1/4 50 x 50 x 32	840004600	DT664	500 3450	1.90 48.26	1.90 48.26	2.10 53.34	2.04 0.93
2 x 2 x 1/2 50 x 50 x 40	840004618	DT665	500 3450	2.02 48.26	2.02 48.26	2.16 48.26	2.18 0.99
2 x 2 x 2/2 50 x 50 x 65	-	DT667	500 3450	2.60 44.45	2.60 44.45	2.39 44.45	3.61 1.64
2 1/2 x 2 x 3/4 65 x 50 x 20	-	DT762	500 3450	1.74 44.45	1.62 42.42	2.32 44.45	2.28 1.08



REDUCING COUPLING



Ductile Iron

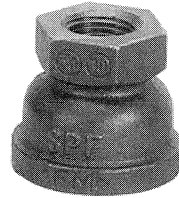
MATERIAL SPECIFICATIONS

Ductile iron threaded fittings are UL & ULC Listed & Factory Mutual Approved for 500 psi service.

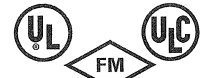
Ductile iron per ASTM A536 Class 65-45-12.

Dimensions conform to ASME B16.3 Class 150.

Threads are NPT per ANSI/ASME B1.20.1.



NOTICE: Ductile iron fittings have higher tensile strength than that of steel pipe. Therefore, over tightening can cause damage to pipe threads which may cause leakage. Ductile iron fittings should be tightened three turns beyond hand tight, but no more than four turns.



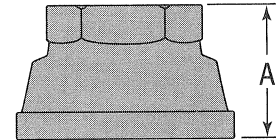
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For Listing/Approval Details and Limitations visit our Web Site www.anvilintl.com or contact an Anvil®/AnvilStar™ Sales Representative.

REDUCING COUPLING					
Nominal Size	Anvil Item Number	Universal Number	Max. Working Pressure *	Dimensions A	Approx. Wt. Each
In. (mm)			PSI (kPa)	In. (mm)	Lbs. (kg)
1 x 1/2 25 x 15	840010755	DRC031	500 3450	1.69 42.92	0.39 0.18
1 x 3/4 25 x 20	840010763	DRC032	500 3450	1.69 42.92	0.53 0.24

* UL, ULC & FM Pressure Ratings

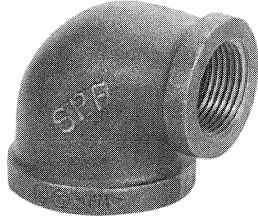
For additional listings and approvals, see the technical data section.



REDUCING 90° ELBOW



Ductile Iron



MATERIAL SPECIFICATIONS

Ductile iron threaded fittings are UL & ULC Listed & Factory Mutual Approved for 500 psi service.

Ductile iron per ASTM A536 Class 65-45-12.

Dimensions conform to ASME B16.3 Class 150.

Threads are NPT per ANSI/ASME B1.20.1.

NOTICE: Ductile iron fittings have higher tensile strength than that of steel pipe. Therefore, over tightening can cause damage to pipe threads which may cause leakage. Ductile iron fittings should be tightened three turns beyond hand tight, but no more than four turns.



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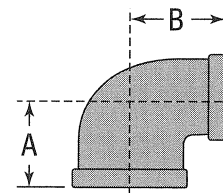
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REDUCING 90° ELBOW

Nominal Size	Anvil Item Number	Universal Number	Max. Working Pressure*	Dimensions		Approx. Wt. Each
				A	B	
In. (mm)			PSI (kPa)	In. (mm)	In. (mm)	Lbs. (kg)
1 x 1/2 25 x 15	840001036	DB90031	500 3450	1.26 32.00	1.36 34.54	0.44 0.20
1 x 3/4 25 x 20	840001044	DB90032	500 3450	1.37 34.79	1.45 36.83	0.52 0.24
1 1/4 x 1/2 32 x 15	840001051	DB90041	500 34550	1.34 34.03	1.53 38.86	0.64 0.29
1 1/4 x 3/4 32 x 20	840001069	DB90042	500 3450	1.45 36.83	1.62 41.14	0.72 0.33
1 1/4 x 1 32 x 25	840001077	DB90043	500 3450	1.58 40.13	1.67 42.41	0.75 0.34
1 1/2 x 1 40 x 25	840001085	DB90053	500 3450	1.65 41.91	1.80 45.72	0.92 0.42
1 1/2 x 1 1/4 40 x 32	840001093	DB90054	500 3450	1.82 46.22	1.88 47.75	1.08 0.49
2 x 1/2 50 x 15	840001101	DB90061	500 3450	1.49 37.84	1.88 47.75	1.08 0.49
2 x 3/4 50 x 20	840001119	DB90062	500 3450	1.60 40.64	1.97 50.03	1.24 0.56
2 x 1 50 x 25	840001127	DB90063	500 3450	1.73 43.94	2.02 51.30	1.40 0.64
2 x 1 1/4 50 x 32	840001135	DB90064	500 3450	1.90 48.26	2.10 53.34	1.52 0.70
2 x 1 1/2 50 x 40	840001143	DB90065	500 3450	2.02 51.30	2.16 54.86	1.65 0.75

* UL, ULC & FM Pressure Ratings

For additional listings and approvals, see the technical data section.





Ductile Iron

MATERIAL SPECIFICATIONS



Ductile iron threaded fittings are UL & ULC Listed & Factory Mutual Approved for 500 psi service.

Ductile iron per ASTM A536 Class 65-45-12.

Dimensions conform to ASME B16.3 Class 150.

Threads are NPT per ANSI/ASME B1.20.1.

NOTICE: Ductile iron fittings have higher tensile strength than that of steel pipe. Therefore, over tightening can cause damage to pipe threads which may cause leakage. Ductile iron fittings should be tightened three turns beyond hand tight, but no more than four turns.



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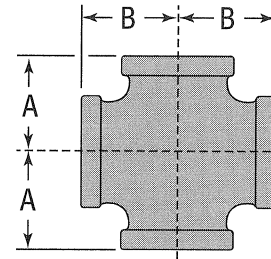
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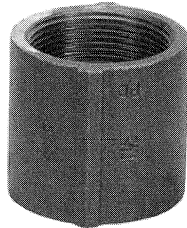
CROSS

Nominal Size	Anvil Item Number	Universal Number	Max. Working Pressure*	Dimensions		Approx. Wt. Each
				A	B	
In. (mm)	In. (mm)	PSI (kPa)	PSI (kPa)	In. (mm)	In. (mm)	Lbs. (kg)
1 25	840006647	DX033	500 3450	1.50 38.10	1.50 38.10	0.98 0.44
1 1/4 32	840006654	DX044	500 3450	1.75 44.45	1.75 44.45	1.50 0.68
1 1/2 40	840006662	DX055	500 3450	1.94 49.27	1.94 49.27	1.90 0.86
2 50	840006670	DX066	500 3450	2.25 57.15	2.25 57.15	2.95 1.34
1 1/4 x 1 32 x 25	840007678	DX043	500 3450	1.58 40.13	1.67 42.41	1.27 0.58
1 1/2 x 1 40 x 25	840007686	DX053	500 3450	1.65 41.91	1.80 45.72	1.48 0.67
2 x 1 50 x 25	840007694	DX063	500 3450	1.73 43.94	2.02 51.30	2.10 0.95

* UL, ULC & FM Pressure Ratings

For additional listings and approvals, see the technical data section.





MATERIAL SPECIFICATIONS

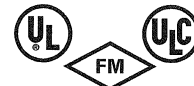
Ductile iron threaded fittings are UL & ULC Listed & Factory Mutual Approved for 500 psi service.

Ductile iron per ASTM A536 Class 65-45-12.

Dimensions conform to ASME B16.3 Class 150.

Threads are NPT per ANSI/ASME B1.20.1.

NOTICE: Ductile iron fittings have higher tensile strength than that of steel pipe. Therefore, over tightening can cause damage to pipe threads which may cause leakage. Ductile iron fittings should be tightened three turns beyond hand tight, but no more than four turns.



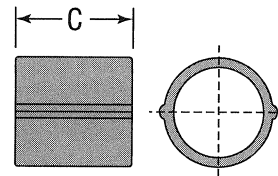
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COUPLING

Nominal Size	Anvil Item Number	Universal Number	Dimensions A	Approx. Wt. Each
<i>In. (mm)</i>			<i>In. (mm)</i>	<i>Lbs. (kg)</i>
1 25	840008692	DCL033	1.67 42.42	0.40 0.18
1 1/4 32	840008700	DCL044	1.93 49.02	0.57 0.26
1 1/2 40	840008718	DCL055	2.15 54.61	0.75 0.34
2 50	840008726	DCL066	2.53 64.26	1.15 0.52

For additional listings and approvals, see the technical data section.





Ductile Iron

MATERIAL SPECIFICATIONS

Ductile iron threaded fittings are UL & ULC Listed & Factory Mutual Approved for 500 psi service.

Ductile iron per ASTM A536 Class 65-45-12.

Dimensions conform to ASME B16.3 Class 150.

Threads are NPT per ANSI/ASME B1.20.1.

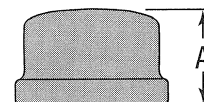


NOTICE: Ductile iron fittings have higher tensile strength than that of steel pipe. Therefore, over tightening can cause damage to pipe threads which may cause leakage. Ductile iron fittings should be tightened three turns beyond hand tight, but no more than four turns.



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CAPS					
Nominal Size	Anvil Item Number	Universal Number	Max. Working Pressure *	Dimensions A	Approx. Wt. Each
<i>In. (mm)</i>			<i>PSI (kPa)</i>	<i>In. (mm)</i>	<i>Lbs. (kg)</i>
1 25	840005615	DCP003	500 3450	1.16 29.46	0.32 0.15
1 1/4 32	840005623	DCP004	500 3450	1.28 32.51	0.43 0.20
1 1/2 40	840005631	DCP005	500 3450	1.33 33.78	0.60 0.27
2 50	840005649	DCP006	500 3450	1.45 36.83	0.91 0.41



* UL, ULC & FM Pressure Ratings

For additional listings and approvals, see the technical data section.

BULL HEAD TEE



Ductile Iron



MATERIAL SPECIFICATIONS

Ductile iron threaded fittings are UL & ULC Listed & Factory Mutual Approved for 500 psi service.

Ductile iron per ASTM A536 Class 65-45-12.

Dimensions conform to ASME B16.3 Class 150.

Threads are NPT per ANSI/ASME B1.20.1.

NOTICE: Ductile iron fittings have higher tensile strength than that of steel pipe. Therefore, over tightening can cause damage to pipe threads which may cause leakage. Ductile iron fittings should be tightened three turns beyond hand tight, but no more than four turns.



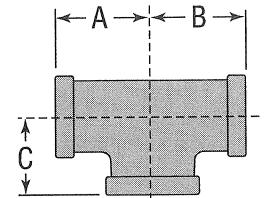
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For Listing/Approval Details and Limitations visit our Web Site www.anvilintl.com or contact an Anvil®/AnvilStar™ Sales Representative.

BULL HEAD TEE							
Nominal Size	Anvil Item Number	Universal Number	Max. Working Pressure*	Dimensions			Approx. Wt. Each
				A	B	C	
In. (mm)			PSI (kPa)	In. (mm)	In. (mm)	In. (mm)	Lbs. (kg)
1 x 1 x 1 1/4 25 x 25 x 32	840004238	DT334	500 3450	1.67 42.41	1.67 42.41	1.58 40.13	0.98 0.44
1 x 1 x 1 1/2 25 x 25 x 40	840004246	DT335	500 3450	1.80 45.72	1.80 45.72	1.65 41.91	1.16 0.53
1 1/4 x 1 x 1 1/2 32 x 25 x 40	840004295	DT435	500 3450	1.88 47.75	1.80 45.72	1.82 46.22	1.42 0.64
1 1/4 x 1 1/4 x 1 1/2 32 x 32 x 40	840004337	DT445	500 3450	1.88 47.75	1.88 47.75	1.82 46.22	1.45 0.66
1 1/4 x 1 1/4 x 2 32 x 32 x 50	840004345	DT446	500 3450	2.10 53.34	2.10 53.34	1.90 48.26	1.75 0.79
1 1/2 x 1 1/4 x 2 40 x 32 x 50	840004436	DT546	500 3450	2.16 54.86	2.10 53.34	2.02 51.30	1.90 0.86
1 1/2 x 1 1/2 x 2 40 x 40 x 50	840004485	DT556	500 3450	2.16 54.86	2.16 54.86	2.02 51.30	1.98 0.90

* UL, ULC & FM Pressure Ratings

For additional listings and approvals, see the technical data section.



90° ELBOW



Ductile Iron

MATERIAL SPECIFICATIONS



Ductile iron threaded fittings are UL & ULC Listed & Factory Mutual Approved for 500 psi service.

Ductile iron per ASTM A536 Class 65-45-12.

Dimensions conform to ASME B16.3 Class 150.

Threads are NPT per ANSI/ASME B1.20.1.

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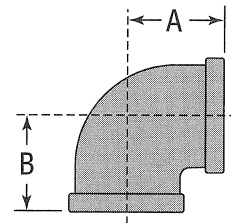
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90° ELBOW						
Nominal Size	Anvil Item Number	Universal Number	Max. Working Pressure *	Dimensions- In.(mm)		Approx. Wt. Each
				A	B	
In. (mm)			PSI (kPa)	In. (mm)	In. (mm)	Lbs. (kg)
1 20	840000004	DB90033	500 3450	1.50 38.10	1.50 38.10	0.62 0.28
1¼ 32	840000012	DB90044	500 3450	1.75 44.45	1.75 44.45	0.90 0.41
1½ 40	840000020	DB90055	500 3450	1.94 49.276	1.94 49.276	1.20 0.54
2 50	840000038	DB90066	500 3450	2.25 57.15	2.25 57.15	1.85 0.84

* UL, ULC & FM Pressure Ratings

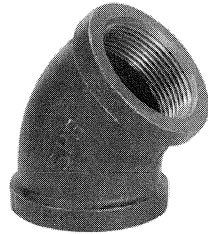
For additional listings and approvals, see the technical data section.



45° ELBOW



Ductile Iron



MATERIAL SPECIFICATIONS

Ductile iron threaded fittings are UL & ULC Listed & Factory Mutual Approved for 500 psi service.

Ductile iron per ASTM A536 Class 65-45-12.

Dimensions conform to ASME B16.3 Class 150.

Threads are NPT per ANSI/ASME B1.20.1.

NOTICE: Ductile iron fittings have higher tensile strength than that of steel pipe. Therefore, over tightening can cause damage to pipe threads which may cause leakage. Ductile iron fittings should be tightened three turns beyond hand tight, but no more than four turns.



APPROVED

For Listing/Approval Details and Limitations visit our Web Site www.anvilintl.com or contact an Anvil®/AnvilStar™ Sales Representative.

45° ELBOW

Nominal Size	Anvil Item Number	Universal Number	Max. Working Pressure *	Dimensions-		Approx. Wt. Each
				A	B	
<i>In. (mm)</i>			<i>PSI (kPa)</i>	<i>In. (mm)</i>	<i>In. (mm)</i>	<i>Lbs. (kg)</i>
1	840002133	DB45033	500	1.12	1.12	0.46
25			3450	28.44	28.44	0.21
1¼	840002141	DB45044	500	1.29	1.29	0.73
32			3450	32.76	32.76	0.33
1½	840002158	DB45055	500	1.43	1.43	0.92
40			3450	36.32	36.32	0.42
2	840002166	DB45066	500	1.68	1.68	1.50
50			3450	42.67	42.67	0.68

* UL, ULC & FM Pressure Ratings

For additional listings and approvals, see the technical data section.

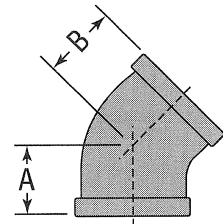




Fig. 78 - All Steel Ceiling Plate

Size Range — 3/8" rod

Material — Carbon Steel

Features — Attachment to wood beams, ceilings, metal decks or walls. Can also be welded to steel beams.

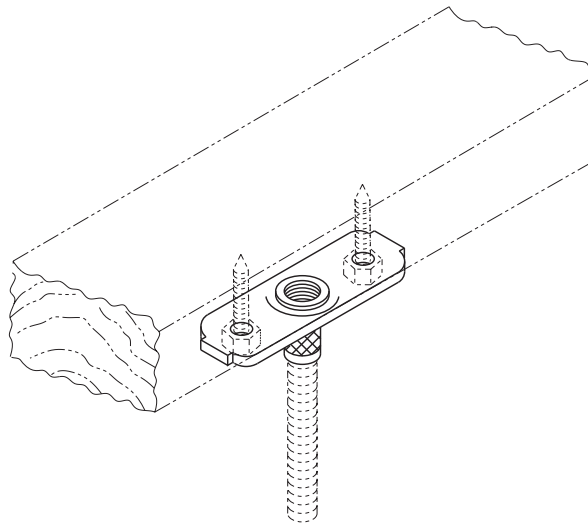
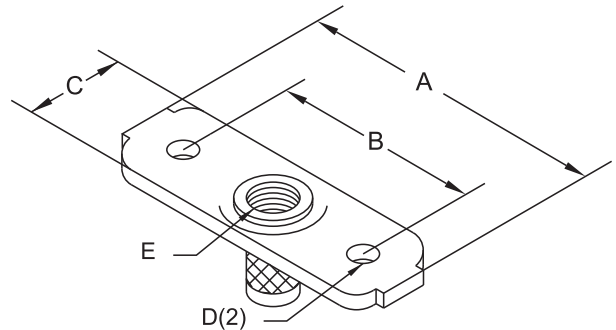
Approvals — Underwriters' Laboratories Listed in the USA (**UL**) and Canada (**cUL**). Additionally, (**UL**) has listed the Fig. 78 with fasteners as shown in the table below.

Finish — Plain

Note — Available in Electro-Galvanized and HDG finish.

Order By — Figure number, rod size and finish

Patent #5,702,077



UL Listed Fastener Table

Pipe Size	Qty	Fastener Type	Material
1/2 - 2	2	#14 x 1 1/4 A-point hex-washer-head sheet metal screw	Wood
2 1/2 - 4	2	1/4 x 1 1/2 wood screws*	Wood
1/2 - 2	2	1/4 x 1 tek screws	Metal (18 gauge)
1/2 - 2	2	#14 x 1 1/4 A-point hex-washer-head sheet metal screw	Wood
1/2 - 2	2	#14 x 2 A-point-hex-washer-head sheet metal screw	Wood thru 5/8" gyp board

* No pre-drilling

Dimensions • Weights

Pipe Size	A	B	C	D	E	Max. Rec. Load Lbs.*	Approx. Wt./100
1/2 - 2	3	2 1/8	1 1/8	5/16	3/8	150	15
5 - 6	Consult factory for data						

* Minimum safety factor of 5



Fig. 200 "Trimline" Adjustable Band Hanger

Size Range – 1/2 thru 8 inch pipe.

Material – Carbon Steel, Mil. Galvanized to G-90 specifications.

Function – For fire sprinkler and other general piping purposes. Knurled swivel nut design permits hanger adjustment after installation.

Features

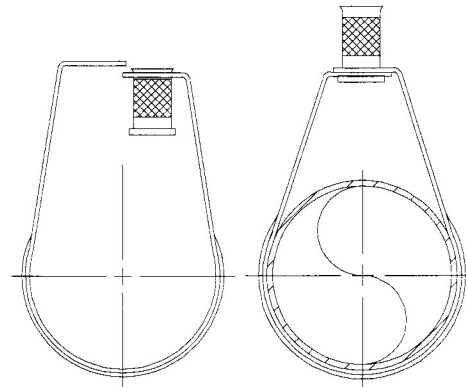
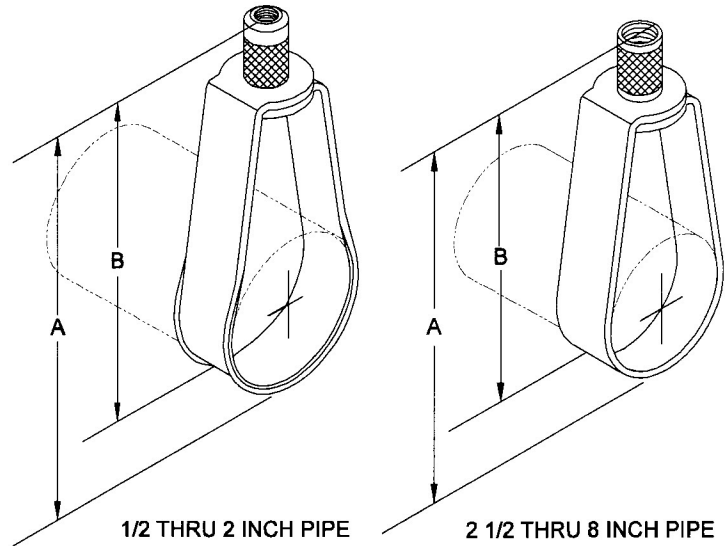
- (1/2 thru 2 inch) Flared edges ease installation for all pipe types and protect CPVC plastic pipe from abrasion. Captured design keeps adjusting nut from separating with hanger. Hanger is easily installed around pipe.
- (2-1/2 thru 8 inch) Spring tension on nut holds it securely in hanger before installation. Adjusting nut is easily removed.

Approvals – Underwriters' Laboratories Listed (1/2" thru 8") in the USA (**UL**) and Canada (**cUL**) for steel and CPVC plastic pipe and Factory Mutual Engineering Approved (3/4" thru 8"). Conforms to Federal Specifications WW-H-171E, Type 10, and Manufacturers Standardization Society SP-69, type 10.

Maximum Temperature - 650°F.

Finish – Mil. Galvanized, for Stainless Steel materials order TOLCO™ Fig. 200WON.

Order By – Figure number and pipe size.



Pipe Size	Inch	Rod Size Metric*	A	B	Max. Rec. Load Lbs.	Approx. Wt./100
1/2	3/8	8mm or 10mm	3-1/8	2-5/8	400	11
3/4	3/8	8mm or 10mm	3-1/8	2-1/2	400	11
1	3/8	8mm or 10mm	3-3/8	2-5/8	400	12
1-1/4	3/8	8mm or 10mm	3-3/4	2-7/8	400	13
1-1/2	3/8	8mm or 10mm	3-7/8	2-7/8	400	14
2	3/8	8mm or 10mm	4-1/2	3	400	15
2-1/2	3/8	10mm	5-5/8	4-1/8	600	27
3	3/8	10mm	5-7/8	4	600	29
3-1/2	3/8	10mm	7-3/8	5-1/4	600	34
4	3/8	10mm	7-3/8	5	1000	35
5	1/2	12mm	9-1/8	6-1/4	1250	66
6	1/2	12mm	10-1/8	6-3/4	1250	73
8	1/2	12mm	13-1/8	8-3/4	1250	136

*Order Fig. 200M

Fig. 909 - No-Thread Swivel Sway Brace Attachment



Component of State of California OSHPD Approved Seismic Restraints System

Size Range — 1" bracing pipe. For brace pipe sizes larger than 1", use TOLCO Fig. 980.

Material — Carbon Steel, hardened cone point engaging screw

Function — The structural component of a sway and seismic bracing system.

Features — This product's design incorporates a **concentric** attachment opening which is critical to the performance of structural seismic connections. NFPA 13 (2010) 9.3.5.8.4 indicates clearly that fastener table load values are based only on concentric loading. No threading of the bracing pipe is required. Open design allows for easy inspection of pipe engagement.

Application Note — The Fig. 909 is used in conjunction with the TOLCO Fig. 1000, Fig. 1001, Fig. 4 (A) or Fig. 4L pipe clamp, and joined together with bracing pipe. Sway brace assemblies are intended to be installed in accordance with NFPA 13 (or TOLCO State of California OSHPD Approved Seismic Restraint Manual) and the manufacturer's installation instructions. The required type, number and size of fasteners used for the structure attachment fitting shall be in accordance with NFPA 13 and/or OSHPD.

Approvals — Underwriters Laboratories Listed in the USA (**UL**) and Canada (**cUL**). Included in our Seismic Restraints Catalog approved by the State of California Office of Statewide Health Planning and Development (**OSHPD**). For additional load, spacing and placement information relating to OSHPD projects, please refer to the TOLCO Seismic Restraint Systems Guidelines.

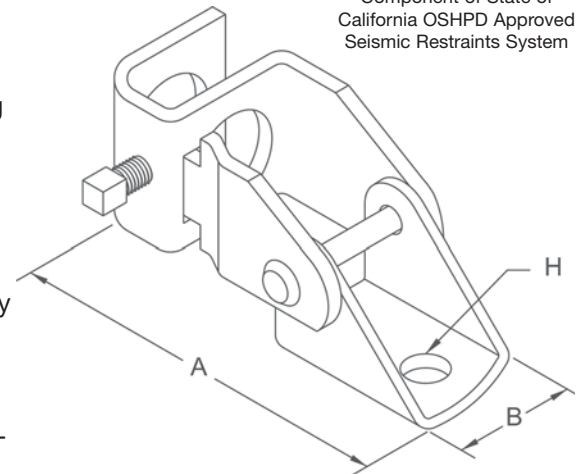
Installation Instructions — The Fig. 909 is the structural or transitional attachment component of a longitudinal or lateral sway brace assembly. It is intended to be combined with the "bracing pipe" and TOLCO "braced pipe" attachment, Fig. 1000, 1001, 4A, 4B or 4L to form a complete bracing assembly. NFPA 13 and/or OSHPD guidelines should be followed.

To Install — Place the Fig. 909 onto the bracing pipe. Tighten the set bolt until head bottoms out on surface. Attachment can pivot for adjustment to proper brace angle.

Finish — Plain

Note — Available in Electro-Galvanized and HDG finish.

Order By — Figure number, pipe size and finish.



Dimensions • Weights

Pipe Size	A	B	Hole Size H*	Max. Design Load Lbs.	Max. Design Load Lbs. w/Washer	Approx. Wt./100
1	6	1 $\frac{5}{8}$	17/32	2015	2765	91

* Available with hole sizes to accommodate up to 3/4" fastener. Consult Factory.

TOLCO® brand bracing components are designed to be compatible **ONLY** with other TOLCO® brand bracing components, resulting in a Listed seismic bracing assembly. **DISCLAIMER** — NIBCO does **NOT** warrant against the failure of TOLCO® brand bracing components, in the instance that such TOLCO® brand bracing components are used in combination with products, parts or systems which are not manufactured or sold under the TOLCO® brand. NIBCO shall **NOT** be liable under any circumstance for any direct or indirect, incidental or consequential damages of any kind, including but not limited to loss of business or profit, where non-TOLCO brand bracing components have been, or are used.

Fig. 70 - Steel Rod Coupling
Fig. 70R - Steel Reducing Rod Coupling
Fig. 70S - Short Pattern Steel Rod Coupling
Fig. 71 - Steel Window Rod Coupling

Size Range—1/4 thru 1-1/2 inch rod.

Material—Carbon Steel.

Function—Used for coupling two threaded rods together of equal or reduced rod sizes, with or without inspection hole.

Finish—Electro-Galvanized.

Note—Available in HDG finish or Stainless Steel materials.

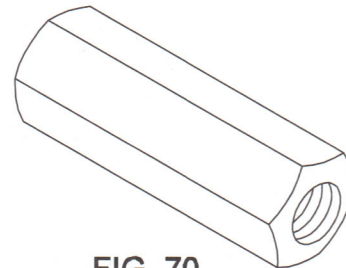


FIG. 70

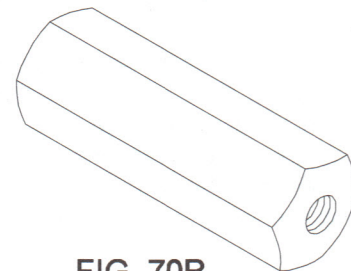


FIG. 70R

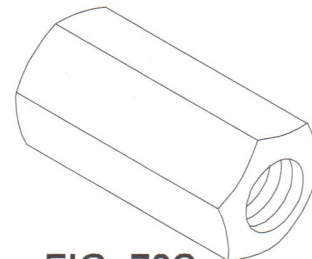


FIG. 70S

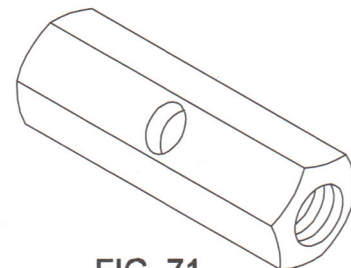


FIG. 71

Fig. 70

Rod Size	Length	Max. Rec. Load Lbs.	Approx. Wt./100
1/4	7/8	240	2
5/16	1-3/4	300	13
3/8	1-3/4	610	11
1/2	1-3/4	1130	11
5/8	2-1/8	1810	16
3/4	2-1/4	2710	27
7/8	2-1/2	3770	57
1	2-3/4	4960	70

1-1/8" - 1-1/2" Consult Factory for specifications.

Fig. 70R

Rod Size	Length	Max. Rec. Load Lbs.	Approx. Wt./100
3/8x1/4	1-3/4	240	4
1/2x3/8	1-3/4	610	7
5/8x1/2	2-1/8	1130	14
3/4x5/8	2-1/4	1810	21
7/8x3/4	2-1/2	2710	40

Fig. 70S / Fig. 71

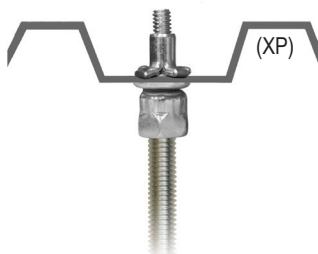
Rod Size	Length	Max. Rec. Load Lbs.	Approx. Wt./100
3/8	1-1/8	610	4
1/2	1-1/4	1130	6

SAMMY X-PRESS® Installs into Metal Deck, Purlin, or Tubular Steel

SAMMY X-PRESS® - Vertical Application



Application

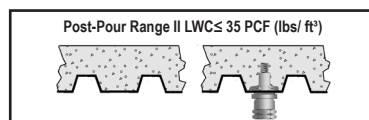
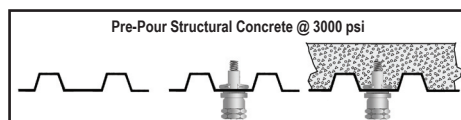
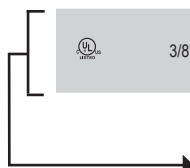


Product Features

- The **Sammy X-Press** expands to provide direct vertical attachment in:
 - light gauge steel deck or purlin (22 ga. - 1/8").
- Installs in seconds with Sammy X-Press It® Tool, saving time & installation costs.
- Use in applications where access to the back of the installed fastener is prohibited, i.e. metal roof deck, tubular steel, or vapor barrier fabric.
- Less jobsite material needed.
- No retaining nut required.
- Provides design flexibility.
- Made in the U.S.A.

Watch a video demonstration at www.itwbuildex.com

Approvals	Rod Size	Part Number	Model	Description	Ultimate Pullout (lbs)	UL Test Load (lbs)	UL Min Thick	FM Test Load (lbs)	FM Min Thick	Max Thick	Box Qty	Case Qty	Application
VERTICAL MOUNT													
UL	1/4"	8181922	XP 200	Sammy X-Press 200	1146 (22 ga)	185 (Luminaire) 250 (Luminaire)	.027" .056"			.125"	25	125	Metal Deck
UL FM	3/8"	8150922	XP 20	Sammy X-Press 20	1146 (22 ga)	850 (2 1/2" Pipe) 185 (Luminaire) 250 (Luminaire) 283 (Conduit & Cable)	.027" .027" .056" .029"	940 (2" Pipe) 1475 (4" Pipe)	.029" .104"	.125"	25	125	Metal Deck
UL FM	3/8"	8153922	XP 35	Sammy X-Press 35	1783 (16 ga)	1500 (4" Pipe) 185 (Luminaire) 250 (Luminaire) 416 (Conduit & Cable)	.060" .029" .056" .059"	940 (2" Pipe) 1475 (4" Pipe)	.029" .104"	.125"	25	125	Purlin
UL	3/8"	8150922	XP 20	Sammy X-Press 20	1146 (22 ga)	850 (2 1/2" Pipe)		Pre-Pour Structural Concrete @ 3000 psi			25	125	Metal Deck (Pre-Pour) Metal Deck (Post-Pour)
								Post-Pour Range II LWC ≤ 35 PCF (lbs/ft³)					



SIDEWINDER X-PRESS™ - Horizontal Application



Application



Product Features

- The **Sidewinder X-Press** expands to provide horizontal attachment in:
 - 16 ga - 3/16" steel - purlin, tubular steel.
- Installs in seconds with Sammy X-Press It® Tool, saving time & installation costs.
- Use in applications where access to the back of the installed fastener is prohibited; i.e. metal roof deck, tubular steel, or vapor barrier fabric.
- Less jobsite material needed.
- No retaining nut required.
- Provides design flexibility.
- Made in the U.S.A.

Watch a video demonstration at www.itwbuildex.com

Approvals	Rod Size	Part Number	Model	Description	Ultimate Pullout (lbs)	UL Test Load (lbs)	UL Min Thick	FM Test Load (lbs)	Max Thick	Box Qty	Case Qty	Application
HORIZONTAL MOUNT												
UL	3/8"	8293957	SWXP 35	Sidewinder X-Press 35	1798 (16 ga)	1250 (3 1/2" Pipe) 80 (Luminaire) 416 (Conduit & Cable)	.059"		.125"	25	125	Purlin





MATERIAL SPECIFICATIONS



Ductile iron threaded fittings are UL & ULC Listed & Factory Mutual Approved for 500 psi service.

Ductile iron per ASTM A536 Class 65-45-12.

Dimensions conform to ASME B16.3 Class 150.

Threads are NPT per ANSI/ASME B1.20.1.

NOTICE: Ductile iron fittings have higher tensile strength than that of steel pipe. Therefore, over tightening can cause damage to pipe threads which may cause leakage. Ductile iron fittings should be tightened three turns beyond hand tight, but no more than four turns.



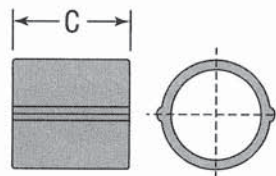
APPROVED

For Listing/Approval Details and Limitations visit our Web Site www.anvilintl.com or contact an Anvil®/AnvilStar™ Sales Representative.

COUPLING

Nominal Size	Anvil Item Number	Universal Number	Dimensions A	Approx. Wt. Each
<i>In. (mm)</i>			<i>In. (mm)</i>	<i>Lbs. (kg)</i>
1	840008692	DCL033	1.67	0.40
25			42.42	0.18
1 1/4	840008700	DCL044	1.93	0.57
32			49.02	0.26
1 1/2	840008718	DCL055	2.15	0.75
40			54.61	0.34
2	840008726	DCL066	2.53	1.15
50			64.26	0.52

For additional listings and approvals, see the technical data section.



Seismic Bracing

Fig. 75 - Swivel Attachment

Size Range: — 3/8"-16 Rod Attachment

Material: Steel

Function: Recommended applications for this product:

- May be used as a Branch Line Restraint for structural attachment to anchor bolt, beam clamp, etc.
- May be used in a pitched or sloped roof application, to meet requirements of NFPA 13 (2010) 9.1.2.6.

Approvals: Underwriters Laboratories Listed in the USA (UL) and Canada (cUL) to support up to 4" (100mm) pipe.

Finish: Electro-Galvanized

Weight: Approx. Wt./100 - 13.3 Lbs. (6.0kg)

Order By: Figure number

Patent: #7,887,248

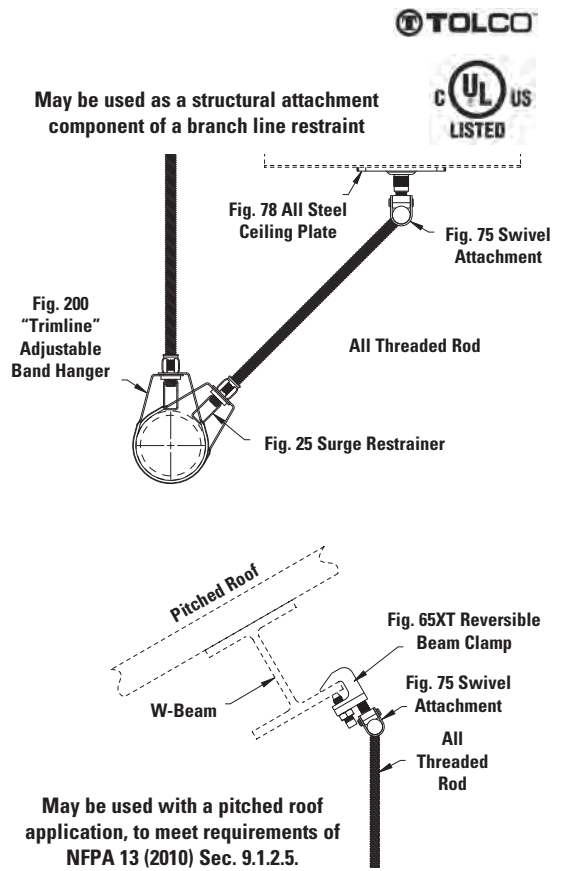
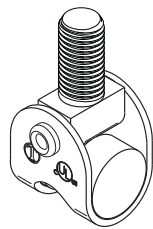


Fig. 98 - Rod Stiffener

Fig. 98B - Rod Stiffener with Break-Off Bolt Head

Size Range: Secures 3/8"-16 thru 7/8"-9 hanger rod

Material: Steel

Function: Secures channel to hanger rod for vertical seismic bracing. Slight distortion of the channel (strut) may occur upon installation of rod stiffeners.

Approvals: Included in our Seismic Restraints Catalog approved by the State of California Office of Statewide Health Planning and Development (OSHPD). For additional load, spacing and placement information relating to OSHPD projects, please refer to the TOLCO Seismic Restraint Systems Guidelines

Finish: Electro Galvanized. Contact B-Line for alternative finishes and materials.

Weight: Approx. Wt./100: Fig. 98 - 11.8 Lbs. (5.3kg)
Fig. 98B - 12.7 Lbs. (5.7kg)

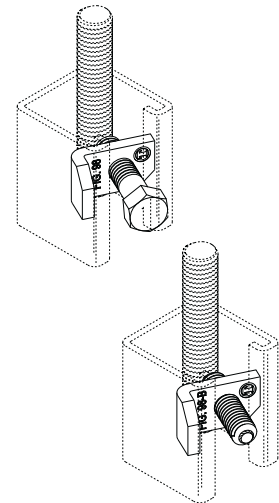
Order By: Figure number



Fig. 98



Fig. 98B



Rod Size	Maximum Rod Length Without Rod Stiffener	Maximum Spacing Between Rod Stiffeners
3/8"	19" (482mm)	13" (330mm)
1/2"	25" (635mm)	18" (457mm)
5/8"	31" (787mm)	23" (584mm)
3/4"	37" (940mm)	28" (711mm)
7/8"	43" (1092mm)	33" (838mm)
1"	50" (1270mm)	38" (965mm)
1 1/4"	60" (1524mm)	43" (1092mm)

Notes:

- 1.) Rod stiffeners are required only on hanger and trapeze assemblies that have seismic bracing attached at or within 4" (101.6mm) of the rod. A minimum of two rod stiffeners (Figure 98, 98B, or SC228) must be installed.
- 2.) Recommended torque on Figure 98 and SC228 is 8 ft-lbs. (10.8Nm) or finger tight and one full turn with a wrench. Figure 98B has the break off bolt head.

Fig. 25 - Surge Restrainer



Size Range — One size fits 3/4" thru 2" pipe.

Material — Pre-Galvanized Steel

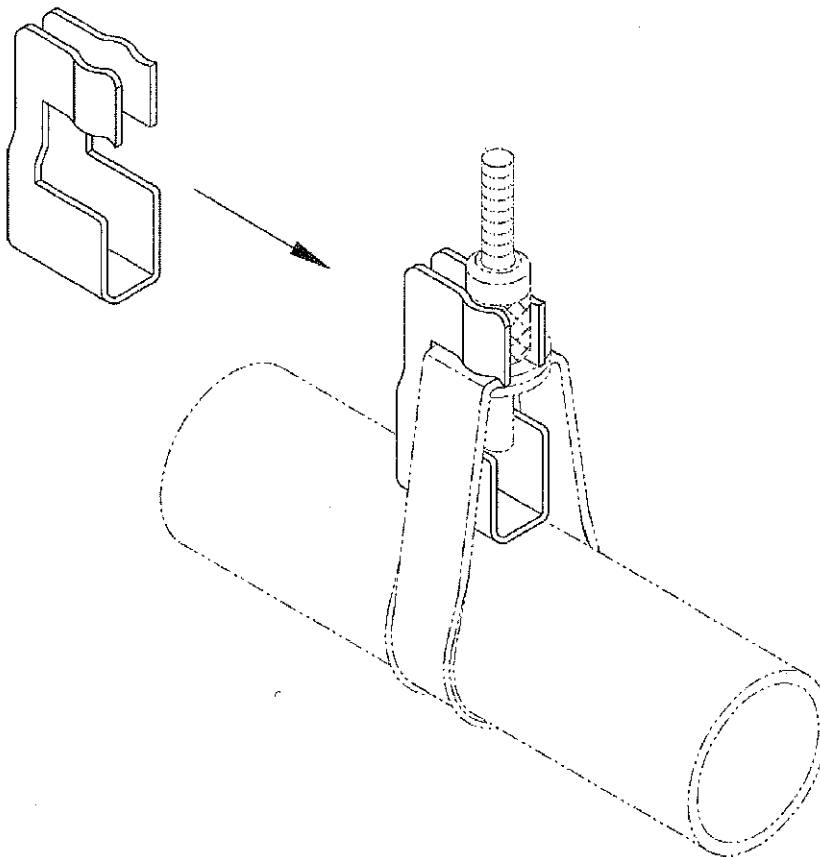
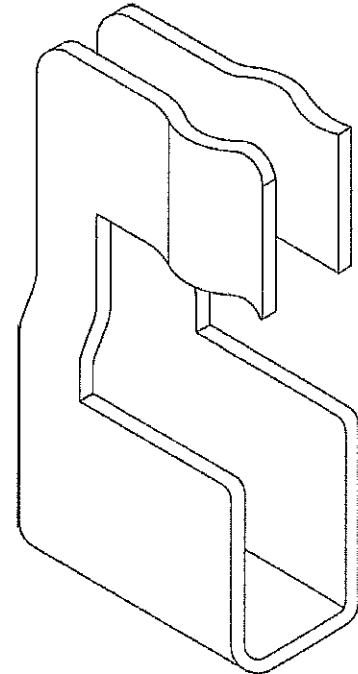
Function — Designed to be used in conjunction with TOLCO® Band Hangers to restrict the upward movement of piping as it occurs during sprinkler head activation or earthquake type activity. The surge restrainer is easily and efficiently installed by snapping into a locking position on the band hanger. This product is intended to satisfy the requirements as indicated in the National Fire Protection Association NFPA 13, 2010 edition, 9.2.3.4.4.1 and 9.2.3.4.4.4 Can be used to restrain either steel pipe or CPVC plastic Pipe.

Approvals — Underwriters' Laboratories Listed **only** when used with TOLCO band hangers Fig. 2, 2NFPA and 200, in the USA (**UL**) and Canada (**cUL**).

Finish — Pre-Galvanized

Order By — Figure number and TOLCO band hanger, size from 3/4" thru 2".

Patent #5,344,108





TECHNICAL DATA

MICROFAST® QUICK RESPONSE PENDENT SPRINKLER VK302 (K5.6)

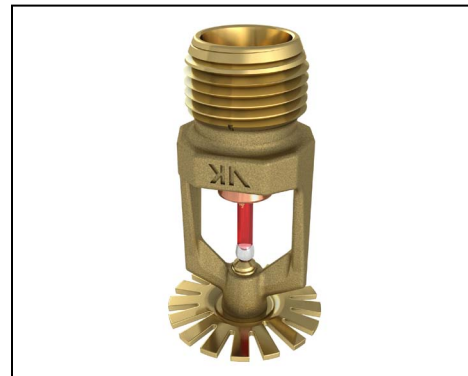
The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Visit the Viking website for the latest edition of this technical data page: www.vikinggroupinc.com

1. DESCRIPTION

The Viking Microfast® Quick Response Pendent Sprinkler VK302 is a small thermo-sensitive glass bulb spray sprinkler available with various finishes and temperature ratings to meet design requirements. The special Polyester and Electroless Nickel PTFE (ENT) coatings can be used in decorative applications where colors are desired. In addition, these coatings have been investigated for installation in corrosive atmospheres and are listed/approved as corrosion resistant as indicated in the Approval Charts. (Note: **FM Global approves ENT finish as corrosion resistant.** FM Global has no approval classification for Polyester coatings as corrosion resistant.)



2. LISTINGS AND APPROVALS



cULus Listed: Category VNIV



FM Approved: Class Series 2000



VdS Approved: Certificates G414009 and G414010



LPCB Approved



CE Certified: Standard EN 12259-1:1999, A3:2006 Certificate of Constancy of Performance 0832-CPR-S0021



CCC Approved: Approved by the China Certification Center for Fire Products (CCC)

Refer to Approval Charts and Design Criteria for listing and approval requirements that must be followed.

3. TECHNICAL DATA

Specifications:

Minimum Operating Pressure: 7 psi (0.5 bar)
 Rated to 175 psi (12 bar) water working pressure
 Factory tested hydrostatically to 500 psi (34.5 bar)
 Thread size: 1/2" NPT, 15 mm BSP
 Nominal K-Factor: 5.6 U.S. (80.6 metric**)
 Glass-bulb fluid temperature rated to -65 °F (-55 °C)
 Overall Length: 2-1/4" (58 mm)

*cULus Listing, FM Approval, and NFPA 13 installs require a minimum of 7 psi (0.5 bar). The minimum operating pressure for LPCB and CE Approvals ONLY is 5 psi (0.35 bar).

Material Standards:

Frame Casting: Brass UNS-C84400 or QM Brass
 Deflector: Phosphor Bronze UNS-C51000 or Copper UNS-C19500
 Bulb: Glass, nominal 3 mm diameter
 Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with PTFE Tape
 Screw: Brass UNS-C36000
 Pip Cap and Insert Assembly: Copper UNS-C11000 and Stainless Steel UNS-S30400
For Polyester Coated Sprinklers: Belleville Spring-Exposed
For ENT Coated Sprinklers: Belleville Spring-Exposed, Screw and Pipcap - ENT plated.

Ordering Information: (Also refer to the current Viking price list.)

Order Quick Response Pendent Sprinklers by first adding the appropriate suffix for the sprinkler finish and then the appropriate suffix for the temperature rating to the sprinkler base part number.

Finish Suffix: Brass = A, Chrome = F, White Polyester = M-/W, Black Polyester = M-/B, and ENT = JN

Temperature Suffix: 135 °F (57 °C) = A, 155 °F (68 °C) = B, 175 °F (79 °C) = D, 200 °F (93 °C) = E, 286 °F (141 °C) = G

For example, sprinkler VK302 with a Brass finish and a 155 °F (68 °C) temperature rating = Part No. 12979AB

Available Finishes And Temperature Ratings: Refer to Table 1.

Accessories: (Also refer to the current Viking price list.)



TECHNICAL DATA

MICROFAST® QUICK RESPONSE PENDENT SPRINKLER VK302 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Visit the Viking website for the latest edition of this technical data page: www.vikinggroupinc.com

Sprinkler Wrenches:

- A. Standard Wrench: Part No. 21475M/B (available since 2017).
- B. Wrench for Recessed Pendent Sprinklers: Part No. 13655W/B** (available since 2006)
- C. Optional Protective Sprinkler Cap Remover/Escutcheon Installer Tool*** Part No. 15915 (available since 2010)

**A ½" ratchet is required (not available from Viking).

***Allows use from the floor by attaching a length of 1" diameter CPVC tubing to the tool. Ideal for sprinkler cabinets. Refer to Bulletin F_051808.

Sprinkler Cabinets:

- A. Six-head capacity: Part No. 01724A (available since 1971)
- B. Twelve-head capacity: Part No. 01725A (available since 1971)

4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

5. OPERATION

During fire conditions, the heat-sensitive liquid in the glass bulb expands, causing the glass to shatter, releasing the pip cap and sealing spring assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

6. INSPECTIONS, TESTS AND MAINTENANCE

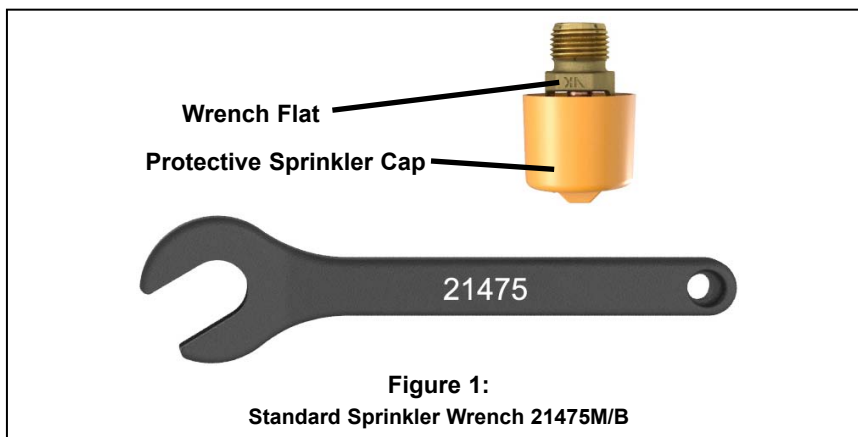
Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

7. AVAILABILITY

The Viking Microfast® Quick Response Pendent Sprinkler VK302 is available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.





TECHNICAL DATA

**MICROFAST® QUICK
RESPONSE PENDENT
SPRINKLER VK302 (K5.6)**

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
 Visit the Viking website for the latest edition of this technical data page: www.vikinggroupinc.com

TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES

Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating ¹	Maximum Ambient Ceiling Temperature ²	Bulb Color
Ordinary	135 °F (57 °C)	100 °F (38 °C)	Orange
Ordinary	155 °F (68 °C)	100 °F (38 °C)	Red
Intermediate	175 °F (79 °C)	150 °F (65 °C)	Yellow
Intermediate	200 °F (93 °C)	150 °F (65 °C)	Green
High	286 °F (141 °C)	225 °F (107 °C)	Blue

Sprinkler Finishes: Brass, Chrome, White Polyester, Black Polyester, and ENT

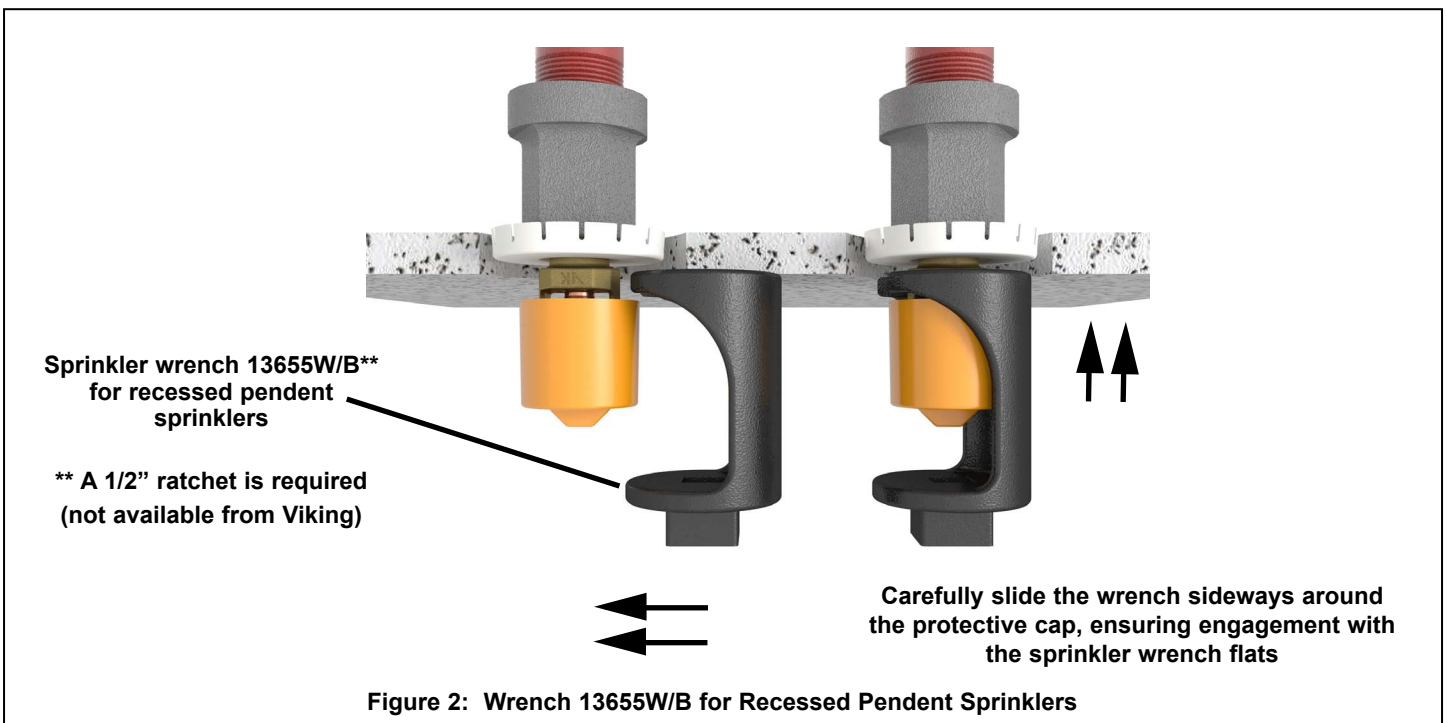
Corrosion-Resistant Coatings³: White Polyester, and Black Polyester. ENT in all temperature ratings except 135 °F (57 °C)

Footnotes

¹ The sprinkler temperature rating is stamped on the deflector.

² Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

³ The corrosion-resistant coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Charts. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the coatings indicated are applied to the exposed exterior surfaces only. Note that the spring is exposed on sprinklers with Polyester and ENT coatings. For ENT coated automatic sprinklers, the waterway is coated.



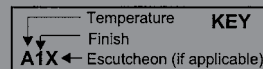


TECHNICAL DATA

MICROFAST® QUICK RESPONSE PENDENT SPRINKLER VK302 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
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Approval Chart 1 (UL)
 The Viking Microfast® Quick Response Pendent Sprinkler VK302
 Maximum 175 PSI (12 Bar) WWP



Base Part Number ¹	SIN	Sprinkler Style	Thread Size		Nominal K-Factor		Overall Length		Listings and Approvals ³ (Refer also to Design Criteria.)					
			NPT	BSP	U.S.	metric ²	Inches	mm	cULus ⁴	VdS	LPCB	CE ⁷	⚙️	CCC
12979	VK302	Pendent	1/2"	15 mm	5.6	80.6	2-1/4	58	A1Z, B1Y, D2, C2X	A1	A1Z, B1Y	D1Z, C1Y	--	--
19780	VK302	Pendent	1/2"	--	5.6	80.6	2-1/4	58	--	--	--	--	--	D3
21354	VK302	Pendent	--	15 mm	5.6	80.6	2-1/4	58	--	--	--	--	--	D3

NOTICE - Product Below - Limited Availability (Contact Local Viking Office)

06662B	VK302	Pendent	1/2"	15 mm	5.6	80.6	2-1/4	58	A1Z, B1Y, D2, C2X	--	--	--	--	--
18021	VK302	Pendent	1/2"	15 mm	5.6	80.6	2-1/4	58	A1X, B1Y	A1	A1X, B1Y	D1X, C1Y ⁸	D1X, C1Y ⁹	--

Approved Temperature Ratings	Approved Finishes	Approved Escutcheons
A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 286 °F (141 °C) B - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C) C - 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C) D - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 286 °F (141 °C)	1 - Brass, Chrome, White Polyester ^{5,6} , Black Polyester ^{5,6} 2 - ENT ⁵ 3 - Chrome	X - Standard surface-mounted escutcheon or the Viking Micromatic® Model E-1 Recessed Escutcheon Y - Standard surface-mounted escutcheon or the Viking Microfast® Model F-1 Adjustable Escutcheon, or recessed with the Viking Micromatic® Model E-1, E-2, or E-3 Recessed Escutcheon Z - Standard surface-mounted escutcheon or the Viking Microfast® Model F-1 Adjustable Escutcheon

Footnotes

- ¹ Base part number shown. For complete part number, refer to Viking's current price schedule.
- ² Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.
- ³ This table shows the listings and approvals available at the time of printing. Other approvals may be in process.
- ⁴ Listed by Underwriters Laboratories Inc. for use in the U.S. and Canada.
- ⁵ cULus Listed as corrosion-resistant.
- ⁶ Other colors are available on request with the same Listings and Approvals as the standard colors.
- ⁷ CE Certified, Standard EN 12259-1, EC-certificate of conformity 0832-CPD-2001.
- ⁸ CE Certified, Standard EN 12259-1, EC-certificates of conformity 0832-CPD-2001 and 0832-CPD-2003.
- ⁹ MED Certified, Standard EN 12259-1, EC-certificates of conformity 0832-MED-1003 and 0832-MED-1008.

DESIGN CRITERIA - UL
 (Also refer to Approval Chart 1 above.)

cULus Listing Requirements:

The Viking Microfast® Quick Response Pendent Sprinkler VK302 is cULus Listed as indicated in the Approval Chart for installation in accordance with the latest edition of NFPA 13 for standard spray sprinklers.

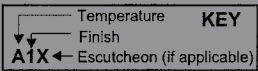
- Designed for use in Light and Ordinary occupancies.
- The sprinkler installation rules contained in NFPA 13 for standard spray pendent sprinklers must be followed.

IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to Form No. F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.

	<h2 style="margin: 0;">TECHNICAL DATA</h2>	<h3 style="margin: 0;">MICROFAST® QUICK RESPONSE PENDENT SPRINKLER VK302 (K5.6)</h3>
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The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
Visit the Viking website for the latest edition of this technical data page: www.vikinggroupinc.com

Approval Chart 2 (FM) The Viking Microfast® Quick Response Pendent Sprinkler VK302 Maximum 175 PSI (12 Bar) WWP									
Base Part Number ¹	SIN	Sprinkler Style	Thread Size		Nominal K-Factor		Overall Length		FM Approvals ³ (Refer also to Design Criteria.)
			NPT	BSP	U.S.	metric ²	Inches	mm	
12979	VK302	Pendent	1/2"	15 mm	5.6	80.6	2-1/4	58	A1Z, B1Y, D2X, C2
NOTICE - Product Below - Limited Availability (Contact Local Viking Office)									
06662B	VK302	Pendent	1/2"	15 mm	5.6	80.6	2-1/4	58	A1Z, B1Y, D2X, C2
18021	VK302	Pendent	1/2"	15 mm	5.6	80.6	2-1/4	58	A1Z, B1Y
Approved Temperature Ratings A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 286 °F (141 °C) B - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C) C - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 286 °F (141 °C) D - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C)			Approved Finishes 1 - Brass, Chrome, White Polyester ⁴ , and Black Polyester ⁴ 2 - ENT ⁵			Approved Escutcheons X - Standard surface-mounted escutcheon or the Viking Micromatic® Model E-1 Recessed Escutcheon Y - Standard surface-mounted escutcheon or the Viking Microfast® Model F-1 Adjustable Escutcheon, or recessed with the Viking Micromatic® Model E-1 or E-2 Recessed Escutcheon Z - Standard surface-mounted escutcheon or the Viking Microfast® Model F-1 Adjustable Escutcheon			
Footnotes									
¹ Base part number shown. For complete part number, refer to Viking's current price schedule. ² Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0. ³ This table shows the FM Approvals available at the time of printing. Other approvals may be in process. ⁴ Other colors are available on request with the same Approvals as the standard colors. ⁵ FM approved as corrosion resistant.									



DESIGN CRITERIA - FM (Also refer to Approval Chart 2 above.)
<p>FM Approval Requirements:</p> <p>The Viking Microfast® Quick Response Pendent Sprinkler VK302 is FM Approved as quick response Non-storage pendent sprinklers as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2-0). FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.</p> <p>NOTE: The FM installation guidelines may differ from cULus and/or NFPA criteria.</p> <p>IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to page F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.</p>



TECHNICAL DATA

MICROFAST® QUICK RESPONSE PENDENT SPRINKLER VK302 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
 Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
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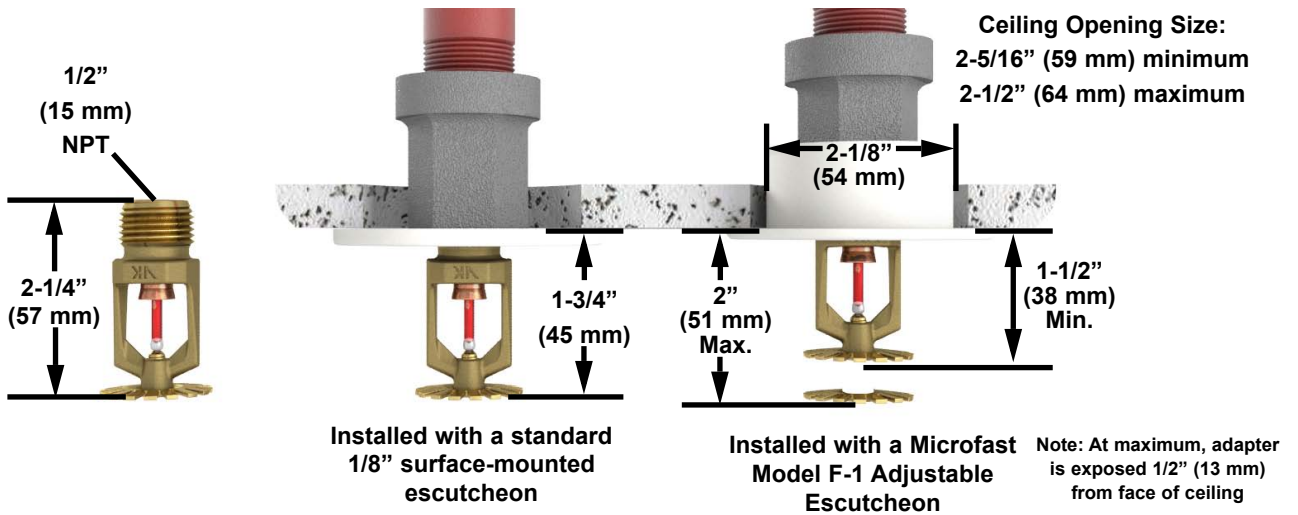


Figure 3: Sprinkler Dimensions with a Standard Escutcheon and the Model F-1 Adjustable Escutcheon

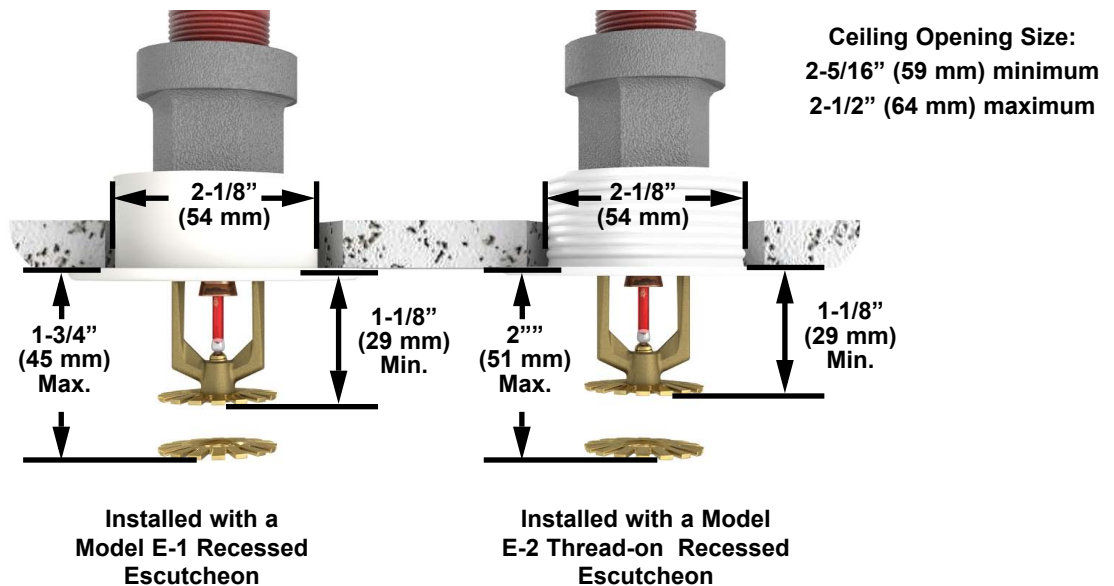


Figure 4: Sprinkler Dimensions with the Model E-1 and E-2 Recessed Escutcheons

Fire Sprinkler Pipe

Schedule 10 and Schedule 40

Submittal Data Sheet



FM Approved and Fully Listed Sprinkler Pipe
Wheatland's Schedule 10 and Schedule 40 steel fire sprinkler pipe is FM Approved and UL, C-UL and FM Listed.

Approvals and Specifications

Both products meet or exceed the following standards:

- ASTM A135, Type E, Grade A (Schedule 10)
- ASTM A795, Type E, Grade A (Schedule 40)
- NFPA 13

Manufacturing Protocols

Schedule 10 and Schedule 40 are subjected to the toughest possible testing protocols to ensure the highest quality and long-lasting performance.

Finishes and Coatings

All Wheatland black steel fire sprinkler pipe up to 6" receives a proprietary mill coating to ensure a clean, corrosion-resistant surface that outperforms and outlasts standard lacquer coatings. This coating allows the pipe to be easily painted, without special preparation. Schedule 10 and Schedule 40 can be ordered in black, or with hot-dip galvanizing, to meet FM/UL requirements for dry systems that meet the zinc coating specifications of ASTM A795 or A53. All Wheatland galvanized material is also UL Listed.

Product Marking

Each length of Wheatland fire sprinkler pipe is continuously stenciled to show the manufacturer, type of pipe, grade, size and length. Barcoding is acceptable as a supplementary identification method.

~~SCHEDULE 10 SPECIFICATIONS~~

NPS	NOM OD		NOM ID		NOMINAL WALL		NOMINAL WEIGHT		UL CRR*	PIECES Lift
	in.	mm	in.	mm	in.	mm	lbs./ft.	kg/m		
1¼	1.660	42.2	1.442	36.6	.109	2.77	1.81	2.69	7.3	61
1½	1.900	48.3	1.682	42.7	.109	2.77	2.09	3.11	5.8	61
2	2.375	60.3	2.157	54.8	.109	2.77	2.64	3.93	4.7	37
2½	2.875	73.0	2.635	66.9	.120	3.05	3.53	5.26	3.5	30
3	3.500	88.9	3.260	82.8	.120	3.05	4.34	6.46	2.6	19
4	4.500	114.3	4.260	108.2	.120	3.05	5.62	8.37	1.6	19
5	5.563	141.3	5.295	134.5	.134	3.40	7.78	11.58	1.5	13
6	6.625	168.3	6.357	161.5	.134	3.40	9.30	13.85	1.0	10
8	8.625	219.1	8.249	209.5	.188	4.78	16.96	25.26	2.1	7

* Calculated using Standard UL CRR formula, UL Fire Protection Directory, Category VIZY.

* The CRR is a ratio value used to measure the ability of a pipe to withstand corrosion. Threaded Schedule 40 steel pipe is used as the benchmark (value of 1.0).

SCHEDULE 40 SPECIFICATIONS

NPS	NOM OD		NOM ID		NOMINAL WALL		NOMINAL WEIGHT		UL CRR*	PIECES Lift
	in.	mm	in.	mm	in.	mm	lbs./ft.	kg/m		
1	1.315	33.4	1.049	26.6	.133	3.38	1.68	2.50	1.00	70
1¼	1.660	42.2	1.380	35.1	.140	3.56	2.27	3.39	1.00	51
1½	1.900	48.3	1.610	40.9	.145	3.68	2.72	4.05	1.00	44
2	2.375	60.3	2.067	52.5	.154	3.91	3.66	5.45	1.00	30

* Calculated using Standard UL CRR formula, UL Fire Protection Directory, Category VIZY.

* The CRR is a ratio value used to measure the ability of a pipe to withstand corrosion. Threaded Schedule 40 steel pipe is used as the benchmark (value of 1.0).



SUBMITTAL INFORMATION

PROJECT:

CONTRACTOR:

DATE:

ENGINEER:

SPECIFICATION REFERENCE:

SYSTEM TYPE:

LOCATIONS:

COMMENTS:

BLACK

HOT-DIP GALVANIZED

Fire Sprinkler Pipe

A53 Schedule 40

Submittal Data Sheet



FM Approved and Fully Listed Sprinkler Pipe

Wheatland's A53 Schedule 40 steel fire sprinkler pipe is UL Listed and FM Approved, sizes 1 through 6 NPS, for use in fire sprinkler pipe applications, and is suitable for welding, threading and grooving.

Approvals and Specifications

The product meets or exceeds the following standards:

- ASTM A53, Type F, Grade A/53M 1"-4"
- ASTM A53, Grade A, 2"-6"
- ASTM A53, Grade B, 2"-6"
- ASME B36.10M
- Federal Specification WW-P-404

Manufacturing Protocols

The weld seam of Wheatland's A53 Schedule 40 is heat-treated after welding to 1400°F and is subjected to the toughest possible testing protocols to ensure the highest quality and long-lasting performance.

Finishes and Coatings

The average weight of zinc coating shall not be less than 1.8 ounces per square foot of surface (inside and outside). When galvanized pipe is bent or otherwise fabricated to a degree that causes zinc coating to stretch or compress beyond the limit of elasticity, some flaking of the coating may occur.

Product Marking

Each length of Wheatland fire sprinkler pipe is continuously stenciled to show the manufacturer, type of pipe, grade, size and length. Barcoding is acceptable as a supplementary identification method.

WEIGHTS AND DIMENSIONS CHART

NPS	NOM OD INCHES	NOMINAL WALL	WT./FT. H ₂ O FILLED	WT./LBS. FT.
2	2.375	.154	5.109	3.66
2 1/2	2.875	.203	7.871	5.80
3	3.500	.216	10.783	7.58
4	4.500	.237	16.311	10.88
5	5.563	.258	23.262	14.63
6	6.625	.280	31.498	18.99
8	8.625	.322	—	28.58



SUBMITTAL INFORMATION

PROJECT:

CONTRACTOR:

DATE:

ENGINEER:

SPECIFICATION REFERENCE:

SYSTEM TYPE:

LOCATIONS:

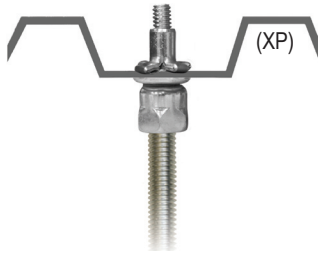
COMMENTS:

SAMMY X-PRESS® Installs into Metal Deck, Purlin, or Tubular Steel

SAMMY X-PRESS® - Vertical Application



Application

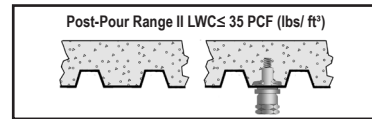
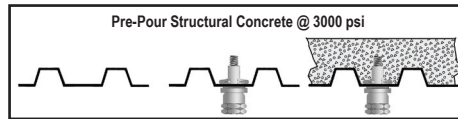
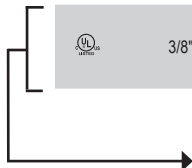


Product Features

- The **Sammy X-Press** expands to provide direct vertical attachment in:
 - light gauge steel deck or purlin (22 ga. - 1/8").
- Installs in seconds with Sammy X-Press It® Tool, saving time & installation costs.
- Use in applications where access to the back of the installed fastener is prohibited, i.e. metal roof deck, tubular steel, or vapor barrier fabric.
- Less jobsite material needed.
- No retaining nut required.
- Provides design flexibility.
- Made in the U.S.A.



Approvals	Rod Size	Part Number	Model	Description	Ultimate Pullout (lbs)	UL Test Load (lbs)	UL Min Thick	FM Test Load (lbs)	FM Min Thick	Max Thick	Box Qty	Case Qty	Application
VERTICAL MOUNT													
UL	1/4"	8181922	XP 200	Sammy X-Press 200	1146 (22 ga)	185 (Luminaire) 250 (Luminaire)	.027" .056"			.125"	25	125	Metal Deck
UL FM	3/8"	8150922	XP 20	Sammy X-Press 20	1146 (22 ga)	850 (2 1/2" Pipe) 185 (Luminaire) 250 (Luminaire) 283 (Conduit & Cable)	.027" .027" .056" .029"	940 (2" Pipe) 1475 (4" Pipe)	.029" .104"	.125"	25	125	Metal Deck
UL FM	3/8"	8153922	XP 35	Sammy X-Press 35	1783 (16 ga)	1500 (4" Pipe) 185 (Luminaire) 250 (Luminaire) 416 (Conduit & Cable)	.060" .029" .056" .059"	940 (2" Pipe) 1475 (4" Pipe)	.029" .104"	.125"	25	125	Purlin
UL	3/8"	8150922	XP 20	Sammy X-Press 20	1146 (22 ga)	850 (2 1/2" Pipe)		Pre-Pour Structural Concrete @ 3000 psi			25	125	Metal Deck (Pre-Pour) Metal Deck (Post-Pour)
								Post-Pour Range II LWC ≤ 35 PCF (lbs/ft³)					



SIDEWINDER X-PRESS™ - Horizontal Application



Application



Product Features

- The **Sidewinder X-Press** expands to provide horizontal attachment in:
 - 16 ga - 3/16" steel - purlin, tubular steel.
- Installs in seconds with Sammy X-Press It® Tool, saving time & installation costs.
- Use in applications where access to the back of the installed fastener is prohibited; i.e. metal roof deck, tubular steel, or vapor barrier fabric.
- Less jobsite material needed.
- No retaining nut required.
- Provides design flexibility.
- Made in the U.S.A.



Approvals	Rod Size	Part Number	Model	Description	Ultimate Pullout (lbs)	UL Test Load (lbs)	UL Min Thick	FM Test Load (lbs)	Max Thick	Box Qty	Case Qty	Application
HORIZONTAL MOUNT												
UL	3/8"	8293957	SWXP 35	Sidewinder X-Press 35	1798 (16 ga)	1250 (3 1/2" Pipe) 80 (Luminaire) 416 (Conduit & Cable)	.059"		.125"	25	125	Purlin





TECHNICAL DATA

MICROFAST® QUICK RESPONSE UPRIGHT SPRINKLER VK300 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Visit the Viking website for the latest edition of this technical data page: www.vikinggroupinc.com

1. DESCRIPTION

The Viking Microfast® Quick Response Upright Sprinkler VK300 is a small, thermostatic, glass-bulb spray sprinkler available in several different finishes and temperature ratings to meet design requirements. The special Polyester and Electroless Nickel PTFE (ENT) coatings can be used in decorative applications where colors are desired. In addition, these coatings have been investigated for installation in corrosive atmospheres and are listed/approved as corrosion resistant as indicated in the Approval Charts. (Note: **FM global approves the ENT coating as corrosion resistant.** FM Global has no approval classification Polyester coatings as corrosion resistant.)



2. LISTINGS AND APPROVALS



cULus Listed: Category VNIV

FM Approved: Classes 2002 and 2020

Refer to Approval Charts and Design Criteria for listing and approval requirements that must be followed.

3. TECHNICAL DATA

Specifications:

Minimum Operating Pressure: 7 psi (0.5 bar)*

Maximum Working Pressure: 175 psi (12 bar) wwp.

Factory tested hydrostatically to 500 psi (34.5 bar)

Testing: U.S.A. Patent No. 4,831,870

Thread size: 1/2" NPT, 15 mm BSP

Nominal K-Factor: 5.6 U.S. (80.6 metric**)

Glass-bulb fluid temperature rated to -65 °F (-55 °C)

Overall Length: 2-3/16" (56 mm)

*cULus Listing, FM Approval, and NFPA 13 installs require a minimum of 7 psi (0.5 bar). The minimum operating pressure for LPCB and CE Approvals ONLY is 5 psi (0.35 bar).

Material Standards:

Frame Casting: Brass UNS-C84400 or QM Brass

Deflector: Brass UNS-C23000 or Copper UNS-C19500

Bulb: Glass, nominal 3 mm diameter

Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with PTFE Tape

Screw: Brass UNS-C36000

Pip Cap and Insert Assembly: Copper UNS-C11000 and Stainless Steel UNS-S30400

For Polyester Coated Sprinklers: Belleville Spring-Exposed

For ENT Coated Sprinklers: Belleville Spring-Exposed, Screw and Pipcap - ENT plated

Ordering Information: (Also refer to the current Viking price list.)

Order Viking Microfast® Quick Response Upright Sprinkler VK300 by first adding the appropriate suffix for the sprinkler finish and then the appropriate suffix for the temperature rating to the sprinkler base part number.

Finish Suffix: Brass = A, Chrome = F, White Polyester = M-/W, Black Polyester = M-/B, and ENT = JN

Temperature Suffix (°F/°C): 135°/57° = A, 155°/68° = B, 175°/79° = D, 200°/93° = E, and 286°/141° = G

For example, sprinkler VK300 with a 1/2" NPT thread, Brass finish and a 155 °F/68 °C temperature rating = Part No. 12978AB

Available Finishes And Temperature Ratings: Refer to Table 1.

Accessories: (Also refer to the Viking website.)

Sprinkler Wrench: Standard Wrench: Part No. 21475M/B (available since 2017)

Sprinkler Cabinets:

A. Six-head capacity: Part No. 01724A (available since 1971)

B. Twelve-head capacity: Part No. 01725A (available since 1971)

4. INSTALLATION

Refer to appropriate NFPA Installation Standards.



TECHNICAL DATA

MICROFAST® QUICK RESPONSE UPRIGHT SPRINKLER VK300 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058

Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

Visit the Viking website for the latest edition of this technical data page: www.vikinggroupinc.com

5. OPERATION

During fire conditions, the heat-sensitive liquid in the glass bulb expands, causing the glass to shatter, releasing the pip cap and sealing spring assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

7. AVAILABILITY

The Viking Microfast® Quick Response Upright Sprinkler VK300 is available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES

Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating ¹	Maximum Ambient Ceiling Temperature ²	Bulb Color
Ordinary	135 °F (57 °C)	100 °F (38 °C)	Orange
Ordinary	155 °F (68 °C)	100 °F (38 °C)	Red
Intermediate	175 °F (79 °C)	150 °F (65 °C)	Yellow
Intermediate	200 °F (93 °C)	150 °F (65 °C)	Green
High	286 °F (141 °C)	225 °F (107 °C)	Blue

Sprinkler Finishes: Brass, Chrome, White Polyester, Black Polyester, and ENT

Corrosion-Resistant Coatings³: White Polyester, Black Polyester, and Black PTFE. ENT in all temperature ratings except 135 °F (57 °C)

Footnotes

¹ The sprinkler temperature rating is stamped on the deflector.

² Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

³ The corrosion-resistant coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Charts. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the coatings indicated are applied to the exposed exterior surfaces only. Note that the spring is exposed on sprinklers with Polyester, ENT, and PTFE coatings. For ENT coated automatic sprinklers, the waterway is coated.

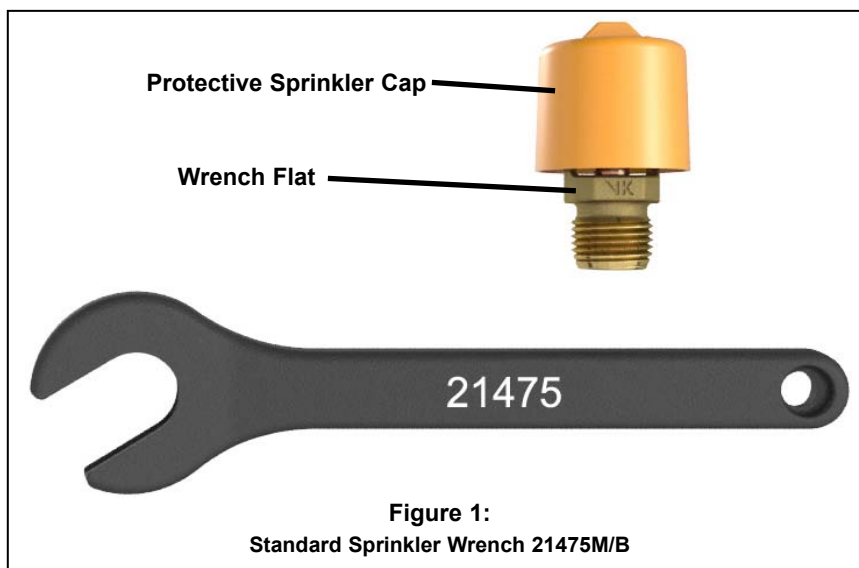


Figure 1:

Standard Sprinkler Wrench 21475M/B



TECHNICAL DATA

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Approval Chart 1 (UL)

Microfast® Quick Response
 Upright Sprinkler VK300
 Maximum 175 PSI (12 bar) WWP

KEY	
Temperature	Temperature
Finish	Finish
A1X	Escutcheon (if applicable)

Base Part Number ¹	SIN	Thread Size		Nominal K-Factor		Overall Length		Listings and Approvals ³				
		NPT	BSP	U.S.	metric ²	Inches	mm	cULus	VdS	LPCB	NYC ⁸	CE
12978	VK300	1/2"	15 mm	5.6	80.6	2-3/16	56	A1, B2	--	--	See footnote 7.	--

NOTICE - Product Below - Limited Availability (Contact Local Viking Office)

06661B	VK300	1/2"	15 mm	5.6	80.6	2-3/16	56	A1, B2	--	--	See footnote 7.	--
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Approved Temperature Ratings

A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141 °C)

B - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141 °C)

Approved Finishes

1 - Brass, Chrome, White Polyester^{5,6}, and Black Polyester^{5,6}
 2 - ENT⁶

Footnotes

¹ Base part number is shown. For complete part number, refer to Viking's current price schedule.

² Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

³ This table shows the listings and approvals available at the time of printing. Check with the manufacturer for any additional approvals.

⁴ Listed by Underwriters Laboratories Inc. for us in the U.S. and Canada

⁵ Other colors are available on request with the same Listings and Approvals as the standard colors.

⁶ cULus Listed as corrosion resistant.

⁷ Meets New York City requirements, effective July 1, 2008

⁸ Accepted for use, City of New York Board of Standards and Appeals, Calendar Number 219-76-SA and City of New York Department of Buildings, MEA 89-92-E, Vol. 16.

DESIGN CRITERIA - UL

(Also refer to Approval Chart 1 above.)

cULus Listing Requirements:

The Viking Microfast® Quick Response Upright Sprinkler VK300 is cULus Listed as indicated in Approval Chart 1 for installation in accordance with the latest edition of NFPA 13 for standard spray sprinklers.

- Designed for use in Light and Ordinary Hazard occupancies.
- The sprinkler installation rules contained in NFPA 13 for standard spray upright sprinklers must be followed.

IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to Form No. F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.



TECHNICAL DATA

MICROFAST® QUICK RESPONSE UPRIGHT SPRINKLER VK300 (K5.6)

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Approval Chart 2 (FM)

Microfast® Quick Response
 Upright Sprinkler VK300
 Maximum 175 PSI (12 bar) WWP

KEY	
Temperature	↓
Finish	←
A1X ← Escutcheon (if applicable)	

Base Part Number ¹	SIN	Thread Size		Nominal K-Factor		Overall Length		FM Approvals ³ (Refer also to Design Criteria below.)
		NPT	BSP	U.S.	metric ²	Inches	mm	
12978	VK300	1/2"	15 mm	5.6	80.6	2-3/16	56	A1, B2
NOTICE - Product Below - Limited Availability (Contact Local Viking Office)								
06661B	VK300	1/2"	15 mm	5.6	80.6	2-3/16	56	A1, B2
Approved Temperature Ratings A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141°C) B - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 286 °F (141°C)							Approved Finishes 1 - Brass, Chrome, White Polyester ⁵ , and Black Polyester ⁵ 2 - ENT ⁶	
Footnotes								
¹ Base part number is shown. For complete part number, refer to Viking's current price schedule. ² Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0. ³ This table shows the FM Approvals available at the time of printing. Check with the manufacturer for any additional approvals. ⁵ Other colors are available on request with the same Approvals as the standard colors. ⁶ FM approved as corrosion resistant.								

DESIGN CRITERIA - FM

(Also refer to Approval Chart 2 above.)

FM Approval Requirements:

The Microfast® Quick Response Upright Sprinkler VK300 is FM Approved as a quick response **Non-Storage** upright sprinkler as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2-0). FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.

NOTE: The FM installation guidelines may differ from cULus and/or NFPA criteria.

IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to Form No. F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. This Section provides the basic plumbing requirements that apply to the Work of Division 22.

B. Related Requirements:

1. Division 01: General Requirements.
2. Division 22: Plumbing
3. Division 23: HVAC
4. Division 26: Electrical.

1.02 REGULATORY REQUIREMENTS

- A.** Current federal Safe Drinking Water Act (SDWA) regulations require the furnishing of lead-free pipe, solder, and flux in the installation or repair of plumbing in non-residential facilities connected to public drinking water systems. Under this regulation, solders and flux are considered lead-free when they contain 0.2 percent lead or less. Under California regulations pipes and pipe fittings are considered lead-free when they contain 0.25 percent lead or less as defined in California Assembly Bill 1953 (AB 1953). No pipe, pipe fittings, or any other fitting or fixture intended to convey or dispense water for human consumption by drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of AB 1953. Weighted average lead content of the wetted surface area of pipes, fittings and fixtures may not exceed 0.25 percent.

1. Provide lead-free water pipe, solder, and flux materials that meet the standards as outlined by the federal SDWA regulations and California AB 1953 if installed in drinking water system.
2. Collect pipe, solder, and flux material samples as required by the Project Inspector. Test samples shall be delivered to an Owner designated testing laboratory for testing of lead content.
 - a. Test samples for lead content by the atomic absorption spectrophotometry method.
3. Materials found not conforming to SDWA and California AB 1953 regulations shall be deemed defective Work and shall be replaced with lead-free materials.
4. Comprehensive testing of the remaining materials for their lead content shall be performed as required by the Project INSPECTOR.

- A.** Materials, fabrication, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:

1. ANSI - American National Standards Institute.
2. ASME - American Society of Mechanical Engineers.
 - a. ASME Boiler and Pressure Vessel Code.

- b. ASME B31 - Standards for Pressure Piping.
 - 3. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers.
 - 4. ASTM - American Society for Testing and Materials.
 - a. ASTM A53 Specification for Welded and Seamless Pipe.
 - 5. AWWA - American Water Works Association.
 - 6. CSA - Canadian Standards Association.
 - 7. FM Global - Factory Mutual Global
 - 8. IAPMO - International Association of Plumbing and Mechanical Officials.
 - 9. NFPA - National Fire Protection Association.
 - 10. OSHA - Occupational Safety and Health Administration.
 - 11. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association.
 - 12. UL - Underwriters Laboratories Inc.
 - 13. Intertek (ETL Certification).
- B. Materials, fabrication, equipment, and installation shall comply with federal, state, and local codes including, but not limited to, the following:
 - 1. CBC, California Building Code, and CMC, California Plumbing Code.
 - a. Latest edition as adopted by the City of Oxnard, the County of Ventura, and the State of California including amendments effective on the Effective Date of the Contract.
 - 2. California Code of Regulations, Title 8, Industrial Relations, Division 1, Chapter 4, Division of Industrial Safety.
- 3OSHA - Occupational Safety and Health Administration.
- 4. CDPH - California Department of Public Health.
- 5. SCAQMD - South Coast Air Quality Management District.
- C. Specifications or Drawings shall not be construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.
- D. Permits and Fees: Refer to the General and Supplementary Conditions.

1.03

SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00: Submittal Procedures and with specific requirements of Division 22 sections, as applicable.
- B. The above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.
- C. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project. Drawings prepared in accordance with requirements of Section 01 31 13: Project Coordination and Section 01 33 00 may be provided by the Architect to serve as a background for the Shop Drawings. Shop Drawings shall comply with the requirements of Section 01 31 13 and Section 01 33 00 and shall indicate at a minimum:

1. Complete system layout of equipment, components, plumbing fixtures, piping, indicating service clearances, and pipe sizes, fitting types and sizes and pipe elevations, distances of pipes and equipment from building reference points and hanger support locations. The above items shall be coordinated on the shop drawings according to the requirements of Section 01 31 13.
2. Schedule and description of equipment, piping and fittings.

1.04

PROJECT RECORD DOCUMENTS

- A. Comply with provisions of Section 01 77 00: Contract Closeout.
- B. Project Record Drawings:
 1. Provide a complete set of plumbing and fire protection drawings in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-ROM. Also submit one set of full size reproducible plots on vellum and 3 sets of prints.
 2. Before Contract Completion, deliver corrected and completed prints to the OAR. Delivery of project record documents to the OAR does not relinquish responsibility of furnishing required information omitted from project record documents.
- C. Operation and Maintenance Manuals:
 1. Submit two copies of operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy shall be returned with instructions for changes; perform such changes and return three copies of manuals. Manuals shall be bound in accordance to Section 01 77 00. Deliver manuals to the OAR. Submit an electronic copy of the entire manual in PDF file format.
 2. Contents of Manual:
 - a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.
 - b. Manufacturer's operating instructions including, but not limited to, the following:
 - 1) Identification of components and controls.
 - 2) Trouble shooting checklist and guidelines.
 - 3) Recommendations for optimum performance.
 - 4) Warnings and safety precautions on improper or hazardous operational procedures or conditions
 - c. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 22 that includes the following as a minimum:
 - 1) Manufacturer's model, identification and serial numbers.
 - 2) Exploded view of assembly drawings identifying each component or part with the relevant part number.
 - 3) Directory of manufacturer's representatives, service contractors and part distributors.
 - 4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.

- d. Project Record Drawings: Complete set of plumbing, fire protection and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.
- e. Testing, Adjusting, and Balancing reports: Submit as specified in Section 23 05 93.
- f. South Coast Air Quality Management District (SCAQMD) permits to install and operate boilers, water heaters and other fuel burning equipment and third-party source test reports as required by SCAQMD to allow start-up and operation of equipment.
- g. Ventura County industrial waste permits.
- h. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.
- i. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.05 COORDINATION

- A. Contract Documents indicate extent and general arrangement of Work under Division 22. Contractor shall coordinate work in accordance with Section 01 31 13 requirements and make adjustments as required to provide maximum headroom, a neat arrangement to keep passageways and openings clear to provide accessibility and provisions for maintenance, and to meet code requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.
- B. Do not store plastic pipe or materials in direct sunlight.

1.07 PRELIMINARY OPERATION

- A. OAR may require any portion of plumbing Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.
- B. Notify the INSPECTOR at least 24 hours in advance of lighting or re-lighting pilots.

1.08 TRAINING OF OWNER PERSONNEL

- A. Training of Owner's personnel shall include:
 - 1. A minimum of 4 hours of on-site overview of the overall Plumbing System.
 - 2. Refer to Division 22 sections for specific training on each of the components of the Plumbing System.
- B. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance, trouble-shooting, and Project site repair of each component, equipment, or system provided under this Contract.
- C. Operational and maintenance training shall be conducted on the Project site, unless indicated otherwise.

- D. Upon completion of Owner training, a completion certificate indicating the nature of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by OAR.
- E. An attendance sheet with the names and signatures of all participants attending the training shall be submitted to the OAR and kept as part of the project documents.

1.09 GUARANTEES AND DAMAGE RESPONSIBILITY

- A. Sound of water flowing in piping shall not be transmitted to building structure. Operation of mechanical system shall not produce operational sounds that can be heard outside of rooms enclosing apparatus or equipment.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.
- B. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.
- C. Equipment and materials indicated or required to be installed outdoors shall be of the type that is designed, manufactured, listed or approved by authorities having jurisdiction for outdoor installation by being resistant to the adverse effects of weather. The additional protective measures against outdoor weather required by the manufacturers' installation instructions and prevalent practice shall be provided.
- D. For substitution of materials or products, refer to the General Conditions.

PART 3 – EXECUTION

3.01 SERVICE INTERRUPTIONS, OFF-SITE, GAS AND WATER

- A. Schedule Work so there shall be no service interruptions of existing systems or systems during normal hours of operation of affected systems and facilities.
- B. When service interruptions are mandatory, arrange in advance with the OAR as to time and date of such interruptions.
- C. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

3.02 CUTTING, NOTCHING, AND BACKING

- A. Conform to California Building Code, Title 24, Part 2, for notches and bored holes in wood and for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.
- B. Where pipes pass through or are located within one inch of any construction element, install a resilient pad, ½ inch thick minimum, to prevent contact.
- C. Furnish provisions for recesses, chases, and accesses and provide blocking and backing for proper reception and installation of plumbing Work.

3.03 LOCATION OF PIPING AND EQUIPMENT

- A. Location of piping, apparatus and equipment indicated on the Drawings is approximate and shall be altered to avoid obstructions, preserve headroom, and provide free and clear openings and passageways.
- B. Trenches parallel to footings shall not be closer than 18 inches to the face of footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.
- C. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.
- D. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.04 TESTS AND TESTING

- A. Tests shall be as required under the applicable sections of Division 22, including this Section.
- B. Additional tests may be required in the case of products, materials, and equipment if:
 - 1. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.
 - 2. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.
- C. Piping Tests:
 - 1. Perform tests required to demonstrate that operation of plumbing systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the Inspector, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.
 - 2. If required tests are not performed, Owner may provide in accordance with the Contract Documents.
 - 3. Pressure gauges furnished in testing shall comply with CPC. Air shall be bled from lines requiring hydrostatic or water tests.
 - 4. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.
 - 5. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.
 - 6. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the Inspector.
 - 7. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.
- D. Pipe Testing Schedule:

System Tested	Test Pressure (psig)	Test With:
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Durham system, glass or plastic acid waste, vent and roof drain (except pipes running under a slab or underground)	Fill with water to top of highest vent; allow to stand two hours, or longer, as required by Inspector. Minimum head required for any joint shall be 10 feet in building.	Water
Cast-iron soil, waste and interior downspout, condensate drain from air conditioning equipment	10 feet of water, vertically	
Storm water disposal lines	Running water test	Water
Vacuum pump or condensate pump discharge and condensate return piping	150	Water
Domestic water piping	200	Water
Standpipes, wet or dry	300	Water
Fire sprinkler piping	200	Water
Gas piping (steel threaded or plastic)	60 (both tests)	Air
Gas piping (steel welded)	100 (both tests)	Air
Gas welding station	1-1/2 Working pressure 100 min.	Dry nitrogen
Compressed air piping	175	Air

E. Equipment Performance Assurance Tests:

1. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed and recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and materials shall be replaced or repaired as required.
2. Upon completion of the above, adjust the system settings to within normal operating conditions to prevent the system from being damaged upon start-up.
3. Run-test the equipment after start-up for five consecutive days. Tests shall include operation of all equipment and systems for a period of not less than two 8 hour periods at 90 percent of the full specified capacities.
4. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of start-up report for review by the Architect.
 - a. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.
5. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.
6. Provide electric energy and fuel required for tests.
7. Final adjustment to equipment or systems shall meet specified performance requirements.
8. Equipment, systems, or Work deemed defective during testing shall be replaced or corrected as required. Test until satisfactory results are provided.

- F. Specific Coordinated Plan for Test and Balance:
1. Provide a narrative of the operational intent that clearly describes the function and sequence of operation of each component, equipment, or system installed. Instruct designated Owner personnel in the operation of the installed systems.
 2. Prior to final test and balance, plumbing equipment and systems shall be operated and tested as indicated in Article 3.04.F above to demonstrate satisfactory overall operation of the installed systems.
 3. Welding performed as part of this Division may be subject to radiographic inspections at random in accordance with requirements specified in Section 22 05 13: Basic Plumbing Materials and Methods.

3.05 NOISE AND VIBRATION REDUCTION

- A. Correct noise or vibration caused by plumbing systems. Provide all necessary adjustments to specified and installed equipment and accessories to reduce noise to the lowest possible level
- B. Correct noise or vibration problems caused by failure to install work in accordance with Contract Documents. Include all labor and materials required as a result of such failure. Pay for re-testing of corrected noise or vibration problems by the project acoustical consultant including travel, lodging, test equipment expenses, etc.

3.06 PROTECTION, CARE AND CLEANING

- A. In addition to storage criteria of the General Conditions, and provisions under Section 01 50 00: Construction Facilities and Temporary Controls, the following shall be provided:
1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.
 2. Protect installed Work.
 3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.
 4. Protect covering for bearings, open connections to tanks, pumps, compressors, and similar equipment.
 5. Interior of piping shall be maintained free of dirt, grit, dust, and other foreign materials.
 6. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.
 7. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas.

END OF SECTION

SECTION 22 05 13

BASIC PLUMBING MATERIALS AND METHODS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. This Section prescribes basic materials and methods generally common to the Work of Division 22.

B. Related Requirements:

1. Division 01: General Requirements.
2. Division 22: Plumbing.
3. Division 23: HVAC.
4. Division 26: Electrical.

1.02 SUBMITTALS

- ###### A.
- Provide in accordance with Division 01, Section 22 05 00 and specific requirements of each section of Division 22.

- ###### B.
- Types of welding rods to be used.

1.03 QUALITY ASSURANCE

- ###### A.
- Standards: Comply with applicable national, state, and local codes and standards: ASTM, ASME, and ANSI. Federal Specifications, AWWA, SISPI, NFPA, FM, UL, CPC (California Plumbing Code), CMC (California Plumbing Code), CSA.

- ###### B.
- Conform to provisions of Section 22 05 00: Common Work Results for Plumbing.

- ###### C.
- Manufacturer of plumbing products must be third-party certified to ANSI/NSF Standard 61, Section 9 certification, and ANSI/NSF 372 to demonstrate compliance with the federal requirements for lead contribution to drinking water, the Safe Drinking Water Act SDWA, and the California Health and Safety Code Section 116875.

- ###### D.
- Qualifications of Manufacturer: Products used in the Work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production as reviewed by the ARCHITECT.

1.04 COORDINATION

- ###### A.
- Coordinate related Work in accordance with provisions of Section 01 31 13: Project Coordination.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Provide the following products if they are indicated in the Contract Documents or if they are required for the proper installation, function or operation of equipment, systems or components indicated in the Contract Document.
- B. Provide the following products as a complete assembly with required accessories for a complete and functioning entity in compliance with governing codes and applicable standards as specified in Section 22 05 00, manufacturer's instructions or as required.
 - 1. Omission of minor details in the Contract Documents does not waive and/or otherwise relinquish compliance with the above requirements.

2.02 MANUFACTURERS AND MATERIALS

A. Ball Valves: 2-inch and smaller:

BV-1: Class 150, 600 psi, Bronze, CWP two piece construction with reinforced TFE seats, full port, adjustable packing gland, (no threaded stem designs allowed), threaded or solder ends.

Manufacturer: NIBCO T-685-66-LF/S-685-66-LF, Hammond UP8303A/UP8513, Milwaukee UPBA400S/ UPBA450S, or equal.

BV-2: Class 150, 600 psi, Stainless Steel, CWP two piece construction with reinforced TFE seats, full port, adjustable packing gland, (no threaded stem designs allowed), threaded or solder ends.

Manufacturer: NIBCO T-585-S6-R-66-LL, Milwaukee BA260, or equal.

Ball Valves in Insulated Piping: Use extended operating handle of non-thermal conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied. NIBCO Nib-Seal Handle.

B. Butterfly Valves:

BFV-1 Centerline Series A, 200 psi CWP tight shut-off.

- 1. Body: Lug type ductile iron. Suitable for bi-directional dead-end service at rated pressure without use of downstream flange.
- 2. Disc: Bronze, or aluminum bronze.
- 3. Stem: One or two-piece, 400 series stainless steel.
- 4. Seat and O-Rings: EPDM.
- 5. Upper and Lower Stem Bearings: Copper alloy or non-metallic material.
- 6. Operators: Valves 6 inches and smaller, with lever handle. Valves 8 inches and larger, with manual gear operator and disc position indicator.
- 7. Manufacturers:
 - a) Valves 2.5 to 6-inch: Milwaukee ML 233E, Hammond 6411-03, or equal.

- b) Valves 8-inch and larger: Milwaukee ML 333E, Hammond 6411-03, NIBCO LD 2000, or equal.

C. Check Valves:

1. Bronze, 2-inch and smaller:

CHV-1: 200 psi, CWP horizontal swing, Y pattern, renewable seat and disc, threaded ends.

Manufacturer: NIBCO T-413-Y-LF, Milwaukee UP-509, Hammond UP-904, or equal.

CHV-2: 200 psi, CWP, bronze body, horizontal swing, Y pattern, renewable seat and disc, solder ends.

Manufacturer: Nibco S-413-Y-LF, Hammond Up-943, or equal.

CHV-3: Class 125, 200 psi, swing check, bronze body, Teflon disc, soldered ends.

Manufacturer: Stockham B-310TY, Crane 1340, NIBCO S-413-Y, Milwaukee 1509-T, Hammond IB-912, or equal.

2. Cast Iron 2 1/2-inch and larger:

CHV-4: Class 125, 200 psi, CWP, IBBM, renewable seat and disc, bolted cap, threaded ends:

Manufacturer: Crane 372, Stockham G-927, NIBCO T-918-B, or equal.

CHV-5: Special low-pressure check valve for installation in gas lines.

Manufacturer: Circle Seal Products Co., 119B-xPP; 0-15 psi; #1:1/8 inch IPS; #2:1/4 inch IPS #3:3/8 inch IPS.

D. Flow Control Valve – Manual:

FC-1: Flow control valves: Bell and Gossett Series CB circuit setter balancing valve, line size, with integral pointer (to register degree of valve opening), differential pressure meter connections with built-in check valves and lockable memory stops. Manufacturer: Armstrong ARMFLO circuit-balancing valves, series CBV, or equal.

E. Gate Valves:

1. Bronze, 2-inch and smaller:

GV-1: Class 125, 200 psi, CWP, bronze body and bonnet, non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends:

Manufacturer: NIBCO T-113-LF, Milwaukee UP105-P2, Hammond UP645, or equal.

GV-2: Same as GV-1, except solder ends:

Manufacturer: NIBCO S-113-LF, Milwaukee UP115, Hammond UP647, or equal.

2. Bronze, 2-1/2-inch and larger:

GV-3: Class 125 250 psi CWP iron body, flanged ends, bolted bonnet with wheel handle, resilient wedge, non-rising stem.

Manufacturer: NIBCO F-619-RW, or equal.

GV-4: Class 125, 250 psi CWP iron body, flanged ends, bolted bonnet with 2-inch operating nut, resilient wedge, non-rising stem, fusion bonded epoxy coated.

Manufacturer: NIBCO F-619-RW-SON, or equal.

GV-5: Class 250, 250 psi, CWP, O S and Y, IBBM, resilient seat gate valve, flanged ends.

Manufacturer: Watts 408-OSYRW, or equal.

GV-6: Class 125, 200 psi CWP, bronze body and bonnet non-rising stem, inside screw, screw-in bonnet, solid disc, threaded ends.

Manufacturer: Hammond IB645, Crane 1701, Milwaukee 105, American 3F, NIBCO T-113, or equal.

F. Globe Valves:

1. Bronze, 2-inch and smaller:

GLV-1: Class 125, 200 psi, CWP, screw-in bonnet, Teflon disc, threaded ends:

Manufacturer: Milwaukee UP502-P2, Hammond UP440-P2, or equal.

GLV-2: Class 125, 200 psi, CWP, screw in bonnet, Teflon disc, soldered ends.

Manufacturer: Hammond UP418, Milwaukee UP1502, or equal.

G. Heater Vent Pipe:

1. Schedule Number:

HVP-1 Shall be UL approved for service specified. Concealed heater vent pipe, including pipe in or through attic spaces, shall be City approved double wall metal vent pipe. For recessed wall heaters, furnish B.W. type. All others may be Type B, or B.W. Clearances must comply with City code and conditions of UL listing.

Manufacturer: American Metal Products Co., Inc., Simpson Dura-Vent, AmeriVent, Hart & Cooley Mfg. Co., Metalbestos, or equal.

H. Liquid Level Gage:

LLG-1 Refrigerant type, carbon steel with stainless steel trim or all forged steel construction, back-seating standard design. Upper and lower valve furnished with ball check valves; 1/2 inch diameter glass on center. Four 3/16 inch diameter gage glass guard rods or slotted steel guard.

Manufacturer: Peneberthy, Henry, Conbraco, or equal.

I. Piping and fittings:

1. Piping shall be continuously and permanently marked with manufacturer's name, type of material, size, pressure rating, and the applicable ASTM, ANSI, UL, or NSF listing. On plastic pipe, date of extrusion must also be marked.

2. Underground non-ferrous pressure pipes shall be installed with proper color tracer wires. Refer to color code provisions in 22 05 53: Plumbing Identification.

P-1: Cast iron: Hubless, service weight, ASTM A888, CISPI 301, conforming to CISPI 310 and installed in accordance to IAPMO IS 6.

Manufacturer: American Foundry, Tyler, AB & I, or equal.

PF-1a: Cast iron, soil or waste no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless steel clamps. 2 bands for size 1 ½-inch thru 4-inch, IAPMO, ASTM C 564 and CISPI 310.

Manufacturer: American Foundry, Tyler, AB & I, or equal.

PF-1b: Cast iron, soil or waste, Heavy-duty no-hub coupling with neoprene gaskets, stainless steel corrugated shields and stainless steel clamps. 4 bands for size 5-inch thru 10-inch. IAPMO, ASTM C564 and CISPI 310.

Manufacturer: American Foundry, Tyler, AB & I, or equal.

PF-1c: Same as PF-1a with Heavy Duty Husky SD 4000 Coupling and stainless steel clamps. IAPMO, ASTM C564 and CISPI 310.

P-2: Galvanized steel, Schedule 40, ASTM A53.

Manufacturer: US Steel or equal.

PF-2: Malleable iron, Class 150, threaded, galvanized, beaded, ANSI B 16.3.

Manufacturer: Stockham, Stanley Flagg, Grinnell, or equal.

P-3: Copper drainage tube, inside structure and above grade. Type DWV hard temper, ASTM B 306.

Manufacturer: Mueller, Anaconda, Cerro Brass, Cambridge-Lee, Halstead, or equal.

PF-3: Cast brass drainage fittings ASA B 16.23, ASTM B 42.

Manufacturer: Mueller Brass, Nibco, Stanley Flagg, Lee Brass, or equal.

P-4: Copper water tube, Type L hard, ASTM B88. (For above ground use only.)

Manufacturer: Mueller, Cambridge-Lee, Halstead, or equal.

PF-4a: Copper Press-Connect pressure fittings, comply with ASME B16.51 "Copper Alloy Press-Connect Pressure Fittings", with Ethylene Propylene Diene Monomer, EPDM O-Ring Seal in each end. Fittings with the sizes of 2-1/2" and larger shall have cross-section Grab Rings and separation rings.

Manufacturer: Viega, Mueller Industries, Apollo, or equal.

PF-4b: Wrought copper - solder type ANSI B 16.22.

Manufacturer: Mueller Brass, Nibco, Lee Brass, or equal.

PF-4c: Grooved end type— ASTM B75 or B152 and ANSI B16.22 wrought copper, bronze sand casting per ASTM B584-87 copper alloy CDA 836 per ANSIB16.18. Couplings shall be CTS style 606 supplied with angle pattern bolt pads for rigidity, coated with copper coated alkyd enamel. Gaskets shall be pre-lubricated Flush seal type.

Manufacturer: Victaulic, or equal.

P-5: Copper water tube, Type K hard, ASTM B88.

Manufacturer: Mueller, Cerro Brass, Cambridge-Lee, Halstead, or equal.

P-6: Type 316L Stainless steel chemical waste pipe, marked with manufacturer's identification and fittings. Manufacturer's representative shall instruct installers and certify them for joint installation. Piping system shall be provided with a five-year manufacturer's material warranty.

Manufacturer: Blucher-Josam, Viega, or equal.

PF-6a: Type 316L Stainless Steel Mechanical joints. Stainless steel joint for chemical waste piping systems including drain or bottle traps.

Manufacturer: Blucher-Josam, or equal.

PF-6b: Type 316L Stainless Steel Press Fittings. For chemical waste piping systems including drain, vent or bottle traps, provide with EPDM seals. For compressed air piping systems, provide with HNBR seals. Manufacturer's representative shall instruct installers and certify them for joint installation.

Manufacturer: Viega, or equal.

P-7: Black steel pipe, Schedule 40, ASTM A53, Type E, ERW.

Manufacturer: US Steel, or equal.

PF-7a: Malleable iron, Class 125, ANSI B 16.3, threaded or welded Schedule 40 black steel for 2-inches and below and welded for 2 ½-inch and above.

Manufacturer: Stockham, or equal.

PF-7b: Grooved end type– ASTM A395 and A536 ductile iron; ASTM A234 WPB forged steel; fabricated from ASTM A53 carbon steel. Couplings shall be supplied with angle-pattern bolt pads for rigidity, except in locations where flexibility is desired. Gaskets shall be pre-lubricated.

Manufacturer: Victaulic, Galvanized or painted, or equal.

PF-7c: MegaPressG, ASME B31, Carbon Steel, – For aboveground piping 2-inches and below. Provide fittings with Hydrogenated Nitrile Butadiene Rubber, HNBR Sealing Element.

Manufacturer: Viega, or equal.

PF-7d: Malleable Iron, class 125, ANSI B 16.3, threaded schedule 80 black steel.

Manufacturer: Stockham, or equal.

P-8: Red seamless brass 85-5-5, iron pipe size (IPS), threaded pipe, ASTM B43.

Manufacturer: Mueller, Cerro Brass, Cambridge-Lee, Halstead, or equal.

PF-8: Bronze and brass, 250 psi, threaded, ASA B16.17 and F S WW-P-460.

Manufacturer: Mueller Brass, Lee Brass, or equal.

P-9: PVC, thick wall, cast-iron OD sized, UL, and NSF listed, comply with AWWA C900, and ASTM D1784 Cell Class 12454B, with tracer wire.

Manufacturer: Blue Brute, or equal.

PF-9: Ductile Iron conforming to AWWA C110, and AWWA C153, with bell and spigot gasket joints conforming to AWWA C111/A21.11.

Manufacturer: EBAA Iron Sales Inc. Megalug 2000PV, or equal.

P-10: CPVC (Chlorinated polyvinyl Chloride) schedule 40 pipe, conforming to ASTM D1784, and UL723 (ASTM E84).

Manufacturer: Spears, Corzan, Charlotte, or equal.

PF-10: CPVC (Chlorinated Polyvinyl Chloride) schedule 40 fittings, conforming to ASTM D1784, and UL723 (ASTM E84). The joints shall be of solvent cement type conforming to ASTM F493. Installer shall be certified by the manufacturer for this type of joint installation. Drains, bottle traps and similar devices shall be the same material and gauge as the pipe with mechanical joints.

Manufacturer: Spears, Corzan, Charlotte, or equal.

P-11: PVDF (Polyvinylidene Fluoride) schedule 40 chemical waste pipe, conforming to ASTM F1673, ASTM D3222 and complying with UL723 (ASTM E84). The joints shall be no-hub mechanical Joints or Socket Fusion. Installer shall be certified by manufacturer for joint installation.

Manufacturer: Orion, or equal.

PF-11a: PVDF (Polyvinylidene Fluoride), schedule 40, No-hub coupling. Each coupling shall have 300 series stainless steel outer band and 5/16 inch bolts, nuts and washers plated to meet a 100-hour salt spray test per ASTM B117. Drains, bottle traps and similar devices shall be the same material and gauge as the pipe with mechanical joints. Installer shall be certified by the manufacturer for this type of joint installation.

Manufacturer: Orion, or equal.

PF-11b: PVDF (Polyvinylidene Fluoride), schedule 40 coupling. Joined using the socket fusion system conforming to ASTM 2657. Drains, bottle traps and similar devices shall be the same material and gauge as the pipe with mechanical joints. Installer shall be certified by the manufacturer for this kind of joint installation.

Manufacturer: Orion, or equal.

P-12: FRPP (Flame Retardant Polypropylene) schedule 40 chemical waste pipe, conforming to ASTM F1412 and ASTM D4101. The joints shall be no-hub mechanical joints or Socket Fusion type. Installer shall be certified by the manufacturer for joint installation.

Manufacturer: Orion, or equal.

PF-12a: FRPP (Flame Retardant Polypropylene), schedule 40, No-hub coupling. Each coupling shall have 300 series stainless steel outer band and 5/16 inch bolts, nuts and washers plated to meet a 100-hour salt spray test per ASTM B117. Drains, bottle traps and similar devices shall be the same material and gauge as the pipe with mechanical joints. Installer shall be certified by the manufacturer for this type of joint installation.

Manufacturer: Orion, or equal.

PF-12b: FRPP (Flame Retardant Polypropylene), schedule 40 coupling. Joined using the socket fusion system conforming to ASTM 2657. Drains, bottle traps and similar devices shall be the same material and gauge as the pipe with mechanical joints. Installer shall be certified by the manufacturer for this kind of joint installation.

Manufacturer: Orion, or equal.

P-13: Polyethylene plastic pipe, ASTM D 2513, Standard Dimension Ratio 11 rated at 80 psi working pressure and 73° Fahrenheit for 3 inches and smaller, SDR 11.5 rated at 76 psi and 73° Fahrenheit for 4 inches and above, butt or socket type fittings, joined by heat fusion, orange or yellow color. Installer shall be certified by the manufacturer for this kind of joint installation.

Manufacturer: CPCHEM (Chevron Phillips Chemical Company LP) PE 2406, or equal.

PF-13a: Polyethylene plastic fittings, ASTM D 3261 and D 2683, Standard Dimension Ratio 11 rated at 80 psi working pressure and 73° Fahrenheit for 3 inches and smaller, SDR 11.5 rated at 76 psi at 73° Fahrenheit for 4 inches and above, butt or socket type fittings, joined by heat fusion, Installer shall be certified by manufacturer for joint installation. Color orange or yellow.

Manufacturer: CPCHEM, (Chevron Phillips Chemical Company LP), or equal.

PF-13b: Polyethylene transition risers, for PF-13a above, Transition fitting must have a minimum vertical height of 36 inches from the horizontal connection which will allow for a 6-inch steel riser above ground. Polyethylene transition risers shall be anodeless.

Manufacturer: Central Plastics Company, or equal.

P-14: PVC, schedule 40, extruded from 100 percent virgin Polyvinyl Chloride (PVC) compound, meeting requirements of class 1254-13 of ASTM D1784. (Use for irrigation systems after the control valves only.)

Manufacturer: Spears, Charlotte, or equal.

PF-14 Plastic fittings, schedule 40 molded from PVC type I compound, conforming to the requirements of specification ASTM D2466.

Manufacturer: Spears, Charlotte, Harvel Plastics Inc., or equal.

P-15: Purple pipe, PVC, schedule 40 for reclaimed or recycled water (below ground only for non-potable irrigation systems), type 1, grade 1, PVC-1120, Cell Class 12454 B.

Manufacturer: Charlotte, or equal.

PF-15: Purple Plastic fittings, schedule 40 molded from PVC type I compound, conforming to the requirements of specification ASTM D2466. Refer to section 32 84 26 "Reclaimed Water Irrigation".

Manufacturer: Charlotte, or equal.

J. Pipe and Fitting Requirements Schedule: Unless otherwise specified or indicated on Drawings, pipe and fittings shall be installed in accordance with the following table:

TABLE I
PIPE AND FITTING SCHEDULE

Use	Limits	Pipe	Fittings
Compressed air	All sizes	P-6	PF-6
Condensate drains and drains From HVAC Equipment	All sizes	P-4, or P-6 *Roof penetration & above, and exterior exposed piping shall be P-6 only	PF-4b, or PF-6b *Roof penetration & above, and exterior exposed piping shall be P-6 only
Domestic Cold Water, underground	Within 5' from building, All sizes	P-5	PF-4a, or PF-4b
Domestic Cold Water, underground	Site distribution only, 4" and over	P-9; Refer to 33 1100	PF-9; Refer to 33 1100
Domestic Hot and Cold water,	Interior only	P-4	PF-4a, or PF-4b

Use	Limits	Pipe	Fittings
aboveground			
Waste - ACID - Aboveground	All sizes	P-10	PF-10
Waste - ACID - Underground	All sizes	P-6	PF-6a, or 6b
Waste - FORCED	All sizes	P-1	PF-1c
Waste and Vent - Indirect	All sizes	P-3	PF-3
Waste and Vent – Sanitary/ Grease	All sizes	P-1	PF-1a, or 1b
Waste and Vent – Sanitary/ Grease	Underground, site only	P-1; Refer to 33 3000	PF-1a, or 1b; Refer to 33 3000

K. Pipe Isolators:

PLA-1 Absorption pad shall be not less than ½ inch thick, unloaded. Pad shall completely encompass pipe.

Manufacturer: Holdrite, LSP, Stoneman, Potter-Roemer, Trisolator, PR-Isolator, or equal.

Manufacturer: Hydra-Zorb Cushion Clamps, Acousto-Clamp, or equal.

L. Pressure Gage: Aluminum or steel case, minimum 4 ¼-inch dial; pressure type or combination vacuum-pressure type, with provisions for field calibration. Dial indicator to indicate pressure in psi with accuracy to within plus or minus 0.5 percent of maximum dial reading. Furnish gages with restriction screw, size 60, to eliminate vibration impulses. Black case and ring, bourdon tube of seamless copper alloy with brass tip and socket. Three way gage cock, constructed of brass with stuffing box, 1/2 inch couplings, with fixed or movable cap nut to shut off pressure gage.

PG-1 Pressure type, black drawn steel case, 4-1/2-inch glass dial, range approximately twice line pressure.

Manufacturer: Marsh Keckley, Trerice, Weksler, Weiss, or equal.

M. Plug Valves:

PV-1 2 inches and smaller: Rockwell No.114, lubricated plug type, 200-pound., water operating gauge pressure iron body and plug, regular pattern, threaded, with indicating arc.

Manufacturer: Walworth, Homestead, WKM, or equal.

PV-2. 2 ½-inch and larger: Rockwell No.115 and No.165 lubricated plug type, 200 pound water operating gauge. Iron body and plug, regular pattern, flanged, with indicating arc.

Manufacturer: Walworth, Homestead, WKM, or equal.

N. Safety Relief Valves:

SRV-1: Combination temperature and pressure relief type. CSA approved. Set to open at 125 psi pressure.

Manufacturer: Watts: 40L, Cash-Acme: NCLX-1, or equal.

SRV-2: Same as SRV-1, except provide on storage type water heater with anode in dip tube.

Manufacturer: Watts: 100XL, Cash-Acme: NCLX-1, or equal.

SRV-3 Spring type, ASME and NB stamped and certified with manual lifting device for air or gas.

Manufacturer: Bailey, Cash-Acme, Watts, Keckley, or equal.

O. Strainers:

STR-1 Description: Wye type with monel or stainless steel strainer cylinder (manufacturer's standard mesh), and gasketed machine strainer cap. Where indicated on Drawings, provide with valved (globe valve) blowout piping, same size as blowout plug.

1. 2-inch and smaller:
C.M. Bailey No.100-A, 250 lb., cast iron body, threaded, Keckley: Style B, Spirax Sarco Y-type, or equal.

2. 2 ½-inch and larger:
C.M. Bailey No.100-A, 125 lb., cast iron body, flanged, or Victaulic style 732, 300 psi, ductile iron body, grooved, fusion bonded epoxy coated.

Manufacturer: C.M.Bailey, Armstrong, Muessco, Keckley 'A', or equal.

STR-2 Y pattern cast iron bodies, 125 psi, monel screen. Open area at least twice the cross-sectional area of IPS pipe in which strainer is installed and may be woven wire or perforated type. Screwed ends for sizes up to 2 inches, flanged ends fusion bonded epoxy coated for 2 ½-inch and larger perforations, in accordance with the following:

1. Steam service - 40 square mesh.

2. Other services - 16 square mesh.

Manufacturer: Bailey No.100, Armstrong, RP&C, Keckley or equal.

STR-3 Flanged, bucket type, semi-steel body, 125 psi, stainless steel screen with 1/8 inch diameter perforations, all sizes.

Manufacturer: Bailey No.1, Zurn 150 Series, RP&C, Keckley GFV, or equal.

STR-4 Grooved, T-pattern, ductile iron body, 300 psi, stainless steel frame and mesh basket, grooved ends.

P. Vent Caps:

VC-1 Vandal-proof hood type, for plumbing vent lines.

Manufacturer: Stoneman Engineering and Mfg., Semco 1550, or equal.

Q. Vacuum Valves:

VV-1 Vacuum valves; for vacuum serve, 125 psig working pressure, cast iron body, spring loaded lubricated plug type.

Manufacturer: General Controls, Honeywell, Valmatic, or equal.

R. Flanges: Flanges shall be furnished and installed at each flanged connection of each type of equipment, tanks, and valves. Faces of flanges being connected shall be furnished alike.

Connection of a raised face flange to a flat-faced flange is not permitted. Flanges shall conform to following schedules:

TYPE OF PIPE	FLANGE
Screwed black or galvanized grooved steel pipelines.	125-pound black cast iron screwed flange, flat faced or grooved flange adapters, Victaulic Style 741, Tyco-Grinnell Fig. 71, Gruvlok Fig. 7401, or equal.
Welded or grooved steel pipe, except high pressure steam lines.	150-pound black forged steel welding flanges, 1/16 inch raised face ASTM A 105, Grade II or grooved flange adapters, Victaulic Style 741, Tyco-Grinnell Fig. 71, Gruvlok Fig. 7401, or equal.
Copper and brass pipe or tubing.	150 pound cast bronze, flat-faced flange with solder end or grooved flange adapters, Victaulic Style 641, Tyco-Grinnell Fig. 61, Gruvlok Fig. 6084, or equal.

1. Gasket material for flanged connections shall be full faced or ring type to suit facing on flanges and shall be furnished in accordance with following schedule:

SERVICE	TYPE
Cold water	1/16-inch-thick neoprene

Grooved end flange adapters supplied with pressure responsive elastomeric Gaskets supplied with grooved flange adapters shall be pre-lubricated by the manufacturer. Grade of gasket to suit intended service.

S. Unions:

1. Unions shall be furnished and installed in accordance with the following requirements (unless flanges are furnished):
 - a. At each threaded or soldered connection to equipment and tanks, except in Freon or fuel gas, piping systems, whether indicated or not.
 - b. Immediately downstream of any threaded connection to each manually operated threaded valve or cock, and each threaded check valve, yard box or access box except those in Freon piping systems, whether indicated or not.
 - c. At each threaded connection to threaded automatic valves (except those in Freon piping systems) such as reducing valves and temperature control valves, whether indicated or not.
 - d. If grooved piping is used, couplings shall serve as unions. Additional unions are not required
2. Unions shall be located so that piping can be easily disconnected for removal of equipment, tank, or valve.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which Work of this Section shall be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Provide all materials and equipment for the Work. Furnish and install necessary apparatus, parts, materials, and accessories.
- B. Pipe Installation:
 - 1. Install piping parallel to wall and provide an orderly grouping of proper materials and execution.
 - 2. Piping shall clear obstructions, preserve headroom, provide openings and passageways clear, whether indicated or not. Verify the Work of other Divisions to avoid interference.
 - 3. If obstructions or the Work of other Divisions prevent installation of piping or equipment as indicated by the Drawings, perform minor deviations as required by the ARCHITECT.
 - 4. Install piping after excavation or cutting has been performed. Piping shall not be permanently enclosed, furred in, or covered before required inspection and testing is performed.
 - 5. Exposed polished or enameled connections from fixtures or equipment shall be installed with no resulting tool marks or threads at fittings. Residue or exposed pipe compound shall be removed from exterior of pipe.
 - 6. Piping shall be concealed in chases, partitions, walls, and between floors, unless otherwise directed or specifically noted on Drawings. When penetrating wood studs, joists, and other wood members, provide such members with reinforcement steel straps of Continental Steel & Tube Co., ULINE, Independent Metal Strap, or equal.
 - 7. Reduce fitting where any change in pipe size occurs. Bushings shall not be furnished unless specifically reviewed by the ARCHITECT, or indicated on Drawings.
 - 8. Piping subject to expansion or contraction shall be anchored in a manner, which permits strains to be evenly distributed. Swing joints or expansion loops shall be installed. Seismic restraints shall be installed so as not to interfere with expansion and contraction of piping. Seismic loops required at all building separations.
 - 9. Immediately after lines have been installed, openings shall be capped or plugged to prevent entrance of foreign materials. Caps shall be left in place until removal is necessary for completion of installation.
 - 10. Couplings shall not be installed except where required pipe runs between other fittings are longer than standard length of type of pipe being installed and except where their installation is specifically reviewed by the ARCHITECT.
 - 11. Water piping shall be installed generally level, free of traps, unnecessary offset, arranged to conform to building requirements, clear of ducts, flues, conduits, and other Work. Piping shall be arranged with valves installed to provide for complete drainage and control of system. Piping shall not be installed which causes an objectionable noise from flow of water therein under normal conditions. Refer to Section 23 05 00: Common Work Results for Plumbing.

12. Water lines may be installed in same trench with sewer lines, provided bottom of water line is 12 inches minimum above top and to the side of sewer line.
13. Changes in pipe sizes shall be furnished with eccentric reducers, flat on top. Offsets to clear obstruction shall not be installed so as to produce air pockets.

C. Pipe Sleeves and Plates:

1. Provide pipe sleeves of Schedule 40 black steel pipe or Schedule 40 PVC plastic pipe in concrete or masonry walls, footings, and concrete floors below grade. Provide adjustable submerged deck type sleeves at locations where pipes pass through concrete floors, except concrete slab floors on grade, and at locations where soil pipe for floor type water closets passes through concrete floors.
2. Sleeves shall provide ½ inch clearance around pipes, except plastic pipe shall have 1 inch clearance. Caps of deck type sleeves shall be removed just prior to installation of pipe. Area around sleeves shall be smooth and without high or low spots. Sleeves in walls shall not extend beyond exposed surface of wall. Sleeves in concrete floors and walls shall be securely fastened to forms to prevent movement while concrete is being placed.
3. Piping installed on a roof shall clear the roof surface by 10 inches minimum, with or without insulation. Bottom of individual fittings may infringe on 10 inches clear space but not groups of fittings or fittings located within 27 inches of each other.
4. Stiles shall be provided to facilitate crossing of piping when parallel piping runs are laterally greater than 12 inches out-to-out, or any pipe is higher than 18 inches, and more than 40 feet long or runs between two or more major pieces of equipment or housings greater than 20 feet apart. Stiles shall be not less than 20 inches wide with a minimum tread depth of 10 inches. Where stiles are required, they shall be located so greatest obstructed distance is 30 feet.
5. Where pipes pass through waterproofed walls, floors, or floors on grade, sealant with Link-Seal Modular Seals, or equal, between pipe and sleeve to provide a waterproof joint. Where earth is in contact with pipe on both sides of a wall or foundation, the waterproof joint is not required. Commercial rubber compression units may be furnished instead of sealed sleeves if reviewed by the ARCHITECT.
6. A swing joint, or other required device, shall be furnished and installed in hot water lines with 10 feet of sealant or compression joint to allow for expansion.
7. Provide polished, chrome-plated flanges when plumbing pipes pass through walls at plumbing fixtures, etcetera as specified in Section 22 4000 Plumbing. Provide polished steel, chromium-plated split floor and ceiling plates at locations where pipes pass through walls, floors, ceilings, and partitions in finished portion that neatly conceals pipe insert.
8. Pipe sleeves shall be provided where pipes intersect footings or foundation walls and sleeve clearances shall provide for footing settlement, but not less than one inch all around pipe.

D. Welding of Pipe and Qualifications of Welder:

1. Joints above grade or accessible conduit or tunnels in steel piping may be either welded or screwed unless specifically indicated otherwise on Drawings or specified. Joints in below grade steel piping, whether in insulation or not, shall not be welded, unless otherwise indicated.

2. Welded joints in pipe shall be continuous around pipe and shall comply with ASME B31: Code for Pressure Piping, unless otherwise specified.
3. Each pipe weld shall be stamped with welder's identification mark. Welding shall be performed by welders possessing a valid certificate of qualification for welding carbon steel welding pipe in horizontal position (2G) and horizontal fixed position (5G) in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code, by an OWNER-recognized, DSA approved testing laboratory.
4. Before any welder performs welding on the Work, furnish the INSPECTOR with a copy of welder's valid qualification papers and obtain verification. Welder qualification is not valid unless it has been issued while welder was performing work for current employer, and has performed type of work described by qualification in the preceding 3 months.
5. Welding performed under these Specifications is subject to special tests and inspections including rigid Ultra Sonic Testing (UT) and radiographic inspection at random, in accordance with Technique for Radiographic Examination of Welded Joints by an OWNER recognized, DSA approved testing laboratory.

E. Unacceptable Welds and Repairs to Welding:

1. Welds containing any of the following types of imperfections shall be deemed defective Work:
 - a. Cracks of any type.
 - b. Zones of incomplete (in excess of 1/32 inch) fusion or penetration.
 - c. Elongated slab inclusions longer than 1/4 inch.
 - d. Groups of slag inclusions in welds having an aggregate length greater than thickness of parent metal in a length 12 times the thickness of the parent metal.
 - e. Undercuts greater than 1/32 inch.
 - f. Overlaps, abrupt ridges or valleys.
3. When a defective weld is detected by examination as outlined above, two additional welds shall be radiographed at locations selected by the Project Inspector. If the two selected welds demonstrate compliant welding, then the two tested welds shall be deemed to be in compliance. Welding revealed by radiographs to be defective Work shall be removed, repaired, and tested by radiograph.
4. If either of the two selected welds demonstrates welding deemed to be defective Work, all welding in that portion of the Work shall be deemed defective Work and either: all welds shall be cutout, prepare new ends for welding and weld to comply with this Specification, or radiograph all welds, removing and repairing only such welding deemed to be defective Work.
5. Repair welding shall be performed in a manner in full compliance with ASME B31. The welded joints or repairs shall be spot examined with UT or radiographic tests in accordance with foregoing requirements.

6. OWNER shall cause to be performed additional random UT and radiographic examinations of welds. OWNER shall be responsible for the costs of any UT and radiographic examinations found to be in compliance with specified requirements.
 7. Installer shall be responsible for the costs of UT and radiographic re-examinations of welds deemed defective Work and not in compliance with this Specification, and shall repair or replace said welds in accordance with specified requirements.
- F. Welding Rods: Submit a written list of materials and proposed type of welding rods.
- G. Backing Rings: Backing rings may be submitted for installation provided the Product Data is submitted with the material list.
- H. Qualification Tests for Low-pressure Welding:
1. Tests shall be performed on 3-inch standard weight pipe ASTM A53, Grade A, and shall be welded by acetylene and electric arc. Each sample shall consist of 2 pieces, each 10 inches long, with 30-degree bevel at point weld.
 2. Two 20-inch samples shall be performed in the 2G and two 20-inch samples in the 5G positions, with positions defined in Section IX, ASME Boiler and Pressure Vessel Code. Welds shall have the reinforcement ground or machined flush to the surface of the pipe before testing. Samples shall be tested as full section tensile.
 3. Weld shall develop a load of 90 percent of 50,000 psi, i.e., 45,000 psi or shall develop a fracture in parent metal.
 4. Each qualified welder shall carry an identification card listing welder's name, date of test, and type of welding tests passed; signed by the welder and the laboratory.
 5. A valid certificate of qualification issued in compliance with requirements of the ASME Boiler Pressure Vessel Code Section IX shall qualify a welder for issuance of a certificate for low-pressure pipe welding.
- I. Certificates of Qualification for Welding of Unfired Pressure Vessels:
1. Certificates of qualification shall be issued by a laboratory recognized by the OWNER in compliance with the requirements of the ASME Boiler Pressure Vessel Code Section IX. Qualifications shall be for both acetylene and arc welding of Schedule 40 ASTM A53, Type B, steel welded or seamless pipe in the Horizontal Position (2G) and the Horizontal Fixed Position (5G) as defined by said code.
 2. Certificate described above is not valid unless it has been issued while welder was working for his current employer, and unless welder has performed type of work described by certificate in the preceding three months. Requirements for possession of a valid certificate shall not be waived for welders fabricating unfired pressure vessels when the Specifications require compliance with ASME code or when welding pipe carries working pressures greater than 75 psi and temperatures greater than 250 degrees F.
- J. Pipe Joints and Connections:
1. Pipe and tubing shall be cut per IAPMO Installation Standards. Pipe shall have rough edges or burrs removed so that a smooth and unobstructed flow shall be provided.
 2. Hot tapping of gas lines is strictly prohibited.

3. Threaded Pipe: Joints in piping shall be installed according to the following service schedule:
 - a. Soap Piping: Litharge and glycerine, or Expando, Gasoila, or equal.
 - b. Plastic Piping: Teflon pipe joint compound tape.
 - c. Oxygen Piping: Wash treads with S.P., rinse, blow-dry and apply litharge and glycerine.
 - d. Cleanout Plugs: No compound shall be used. After inspection and test, plugs shall be removed, cleaned, greased, and replaced.
 - e. Other services furnish sealant, suitable and as reviewed by the ARCHITECT.
 4. Threads on pipe shall be cut with sharp, clean, unblemished dies and shall conform to ANSI/ASME B2.1 for tapered pipe threads.
 5. Joint compounds shall be smoothly placed on male thread and not in fittings. Threaded joints shall be installed tight with tongs or wrenches and sealant of any kind is not permitted. Failed joints shall be replaced with new materials. Installation of thread cement or sealant to repair a leaking joint is not permitted.
 6. Sharp-toothed Stillson, or similar wrenches, is not permitted for the installation of brass pipe or other piping with similar finished surfaces.
- K. Copper Tubing and Brass Pipe with Threadless Fittings:
1. Silver brazed joints shall be used for attaching fittings to non-ferrous metallic refrigerant piping.
 2. Non-pressure gravity fed condensate lines may be soldered with 95/5 solder.
 3. Silver brazing alloy, Class BCUP-5. Surfaces to be joined shall be free of oil, grease, and oxides. Socket of fitting and end of pipe shall be thoroughly cleaned with emery cloth and wiped to remove oxides. After cleaning and before assembly or heating, flux shall be installed to each joint surface and spread evenly. Heat shall be applied in accordance with instructions in the Copper Tube Handbook issued by Copper Development Associates. Joints constructed of rough bronze fittings shall be provided as recommended by manufacturer.
 4. Do not overheat piping and fittings when installing silver brazing.
 5. Joints in non-ferrous piping for services not covered above shall be installed with solder composed of 95/5 tin/antimony, ASTM B32, Grade 5A. Surfaces to be jointed shall be free of oil, grease, and oxides. Sockets of fitting and end of pipe shall be cleaned with emery cloth to remove oxides. Solder flux shall be sparingly installed and solder added until joint is completely filled. Do not overheat. Excess solder, while plastic, shall be removed with a small brush in order to provide an uninterrupted fillet completely around joint. Random inspection of joints shall be conducted by Project Inspector to ensure joints are lead-free.
 6. Grooved end joints for copper piping shall be assembled in accordance with the latest manufacturer recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic, RIDGID, MAG Tool, or equal.

7. Pressed fittings for copper or copper alloy pipe or tubing shall have an elastomeric O-ring that forms the joint. The pipe or tubing shall be fully inserted into the fitting, and the pipe or tubing marked at the shoulder of the fitting. Pipe or tubing shall be cut square, mechanically cleaned and reamed prior to joining to remove all burrs (interior and exterior) and restore full inside diameter and a smooth, chamfered exterior surface. The fitting alignment shall be checked against the mark on the pipe or tubing to ensure the pipe or tubing is inserted into the fitting. The joint shall be pressed using the tool recommended by the manufacturer.
- L. Ring-Type Pipe: Joints shall be installed in accordance with manufacturer's instructions with grooved couplings, fittings and rubber rings. Couplings and pipe shall be compatible and of the same manufacturer. Rings shall be accurately located and installed by grooves in coupling. Pipe shall be installed with zero deflection unless otherwise specified. Pressure pipe shall be furnished with thrust blocks at each offset point.
- M. Welded Pipe Joints:
 1. Joints in welded steel pipelines shall be installed by oxyacetylene or electric arc process. Welding shall be continuous around pipe and provided as specified.
 2. Butt welds shall be of the single V-type, with ends of pipe and fittings beveled approximately 37 ½ degrees. Piping shall be aligned before welding is started with the alignment maintained during welding.
 3. Welds for flanges and socket fittings shall be of the fillet type with a throat dimension not less than pipe wall thickness.
- N. Grooved End Pipe Joints: Grooved end joints for carbon steel piping shall be assembled in accordance with the latest manufacturer recommendations. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. Grooving tools shall be as manufactured by Victaulic, RIDGID, MAG Tool, or equal.
- O. Joints shall be Vic-Press 304TM, or equal, made with Victaulic Series 'PFT' tools and the appropriate sized jaw. Pipe shall be certified for use with Vic-Press 304TM system, and shall be square cut, properly deburred and cleaned, and marked at the required location to insure full insertion into the fittings and/or couplings.
- P. Polyethylene (Plastic) Pipe:
 1. Joints shall be installed by the heat fusion method, in accordance with manufacturer's recommendations and IAPMO installation standard IS 12, for natural gas.
 2. Pipe Riser at Meter, Regulator and Building Wall: Prefabricated, anodeless type, utilizing a grade level transition between underground polyethylene pipe and gas supply steel pipe of riser outlet, R. W. Lyall Co., or equal. Below grade to above grade transition shall be installed in a welded, epoxy coated, steel casing.
 3. Connections to Existing Pipe Line or Branch:
 - a. Steel-to-plastic (PE): Provide manufacturer's prefabricated standard transition fitting, transition from epoxy-coated steel pipe to plastic, R. W. Lyall Co., or equal.
 - b. Plastic-to-plastic, PVC to PE: Provide manufacturer's prefabricated standard transition fitting, transition from PVC to epoxy-coated steel pipe to PE; R.W. Lyall Co., or equal.

- c. Plastic-to-plastic, PE to PE: Provide manufacturer's standard fused tapping tee assembly with shut-off feature.
4. Provide PE reinforcing sleeves where PE pipe is fused to multi-saddles, service punch tee, reducing tees, transition fittings and anodeless risers.

Q. Valves: Valves shall conform to the following:

1. Piping systems shall be furnished with valves at points indicated on Drawings and specified, arranged to provide complete regulating control of piping system throughout building and the Project site.
2. Valves shall be installed in a neat grouping, so that parts are easily accessible and maintained.
3. Valves shall be full size of line in which they are installed, unless otherwise indicated on Drawings or otherwise specified, and shall be one of types specified.
4. Provide chain operators on valves 2-inch and larger located 7 feet or more above the servicing floor level.
5. Valves for similar service shall be of one manufacturer.
6. Except where otherwise specified, valves shall be Belimo, Victaulic, Stockham, Crane, Jenkins, Milwaukee, Hammond, American, NIBCO, Hoffman, or equal.
7. Ball valves below grade in yard boxes shall have stainless steel handles.
8. Hose bibs in dense garden areas shall be $\frac{3}{4}$ inch in size with one hose bib in the lunch pavilion 1 inch in size. Other hose bibs shall be $\frac{3}{4}$ inch lock shield type. Bibs shall be furnished with vacuum breaker protection.
9. Safety valves and pressure relief valves shall have stamp of approval as required by ASME and shall be provided with annual test lever. Where a hot water storage tank is heated by means of a coil, pressure relief valve shall have a steam BTU discharge rating of the coil. Discharge pipe from safety or pressure relief valves shall be not less than one pipe size larger than inlet pipe size of valve. Discharge pipe shall terminate as indicated and shall be free of traps. In addition to locations specified, pressure relief valves shall be installed in the following locations:
 - a. On discharge side of each pressure-reducing valve.
 - b. On each water heater connected to a hot water storage tank and other pressure vessels.
 - c. On cold water line to each water heater or hot water storage tank when there is a check valve, backflow prevention valve or similar device between water heater or hot water storage tank and meter or relief valve at the pressure reducing valve assembly.
 - d. On discharge side of each air compressor.
 - e. On each air receiver connected to an air compressor.
10. Temperature relief valves and combination temperature and pressure relief valves shall be as specified and furnished as set forth in this Section. Discharge pipe from relief valves shall be not less than discharge area of valve or valves it connects,

based on discharge area of valves, and shall terminate as indicated and free of any traps. Valves shall be installed at following locations:

11. A combination temperature and pressure relief valve or combination of valves on each heating hot water storage tank. Temperature sending element shall extend into water inside tank.
 12. Manual air vent valve assemblies shall be installed at each high point of hot water space heating and chilled water piping systems. Valves shall discharge through 1/4 inch diameter copper tubing and drain to nearest floor sink. Automatic type air vent valve shall only be installed where specifically indicated. Radiator, convectors, and finned pipe convectors shall be fitted with packless radiator valves, angle or straight pattern. Each convector or radiator installed as part of a space hot water heating system shall be furnished with a manual-type air vent valve.
- R. Strainers: Strainers shall be installed on each water main (except for fire line) downstream of the meter, above grade, when a pressure regulator assembly is not installed. Main strainer shall be of Y-flange or groove type. On closed loop chilled and heating hot water systems pump systems, a strainer shall be installed at each pump inlet and upstream of each flow control valve assembly. The control valve assembly may include a modulating temperature control valve and a flow-limiting valve, manufactured by Griswold, AutoFlow, Flow Control Industries, Inc., or equal.
- S. Hangers and Supports:
1. Vertical and lateral support of pipes including attachment to structure shall be per DSA approved drawings.
 2. Piping shall be securely fastened to building structure by approved iron hangers, supports, guides, anchors, and sway braces to maintain pipe alignment to prevent sagging and to prevent noise or excessive strain on piping due to uncontrolled or seismic movement under operating conditions. Hangers and supports shall conform to Manufacturer's Standardization Society Specification SP-69. Hangers shall be relocated as required to correct unsatisfactory conditions that may become evident when system is placed into operation. Appliances, heat exchangers, storage tanks, and similar equipment shall be securely fastened to structure in accordance with seismic requirements. Outdoor metal hangers and supports shall be hot-dipped galvanized steel, unless otherwise specified.
 3. Hose faucets, compressed air outlets, and similar items at ends of pipe branches shall be rigidly fastened to building construction near point of connection.
 4. Hangers and supports shall be designed to support weight of pipe, fittings, weight of fluid and weight of pipe insulation, and shall have a minimum factor of safety of five, based on ultimate tensile strength of material installed.
 5. Burning or welding of any structural member under load is not permitted. Field welding not specified on Drawings or reviewed Shop Drawings is not permitted without review by ARCHITECT and DSA.
 6. Burning holes in beam flanges or other structural members is not permitted without review by the ARCHITECT and DSA.
 7. Pipe hangers on piping covered with low temperature insulation shall be installed on outside of insulation and not in contact with pipe unless otherwise detailed on Drawings. Insulation shall be protected by 18 gage galvanized steel shield, with a minimum length of 10 inches, installed completely around pipe covering between

covering and hanger. Installing hangers directly on pipe and butting adjoining sections of insulation against hanger is permitted provided void and hanger rod are properly insulated and sealed so that no sweating occurs at hangers.

8. Hanger rods shall be fastened to structural steel members with suitable beam clamps. Clamps shall be Tolco, Carpenter & Patterson, Fee and Mason, or equal, as follows:
 - a. Tolco I beam, Fig.62 for maximum 1000 pounds.
9. Hanger rods shall be fastened to concrete inserts in concrete slabs or beams. Inserts shall be Tolco, Carpenter & Patterson, Fee and Mason, or equal, as follows:
 - a. Tolco Fig.310 for maximum of 600 pounds.
10. For fastening to wood ceilings, beams, or joists, furnish Grinnell Fig. 128R, Grinnell Fig. 153, Tolco 78, or equal pipe hanger flange fastened with drive screws. Under wood floors, 3/8 inch hanger rods shall be hung from 2-inch by 2-inch by 1/4 inch angle clips 3 inches long, with 2, staggered 10d nails, clinched over joist.
11. Hanger rod sizes for copper, iron, or steel pipe: 3/8 inch for pipe sizes 1/2 inch through 2-inch, 1/2 inch for pipe sizes 3-inch, 4-inch and 5-inch, 5/8 inch for pipe size 6-inch, and 3/4 inch for 8-inch and 10-inch pipe.
12. Turnbuckles, if furnished, shall provide a load carrying capacity equal to that of the pipe hanger with which they are being installed.
13. Pipe hangers shall be of same size, or nearest larger manufactured size available, as pipe or tubing on which they are being installed.
14. Hangers, clamps, and guides furnished for support of non-metallic pipe shall be padded with 1/8 inch thick rubber, neoprene, or soft resilient cloth.
15. Where special pipe-supporting requirements in the Specifications conflict with any standard requirements specified herein, the Specification requirements shall govern.
16. Vertical Piping:
 - a. Vertical pipe risers shall be securely supported with riser clamps of recognized type. Risers in reinforced concrete buildings shall be furnished with extension clamps fastened to pipe above each concrete floor slab with extended arms of clamp to rest on slab. Clamps shall be provided with lead or Teflon liners when installed on copper tubing. Clamps shall be plastic-coated when installed on non-ferrous pipe or tubing.
 - b. Copper tubing in sizes 1 1/2-inches and larger and steel pipelines passing up through building shall be supported at each floor of building or every 15 feet whichever is less.
 - c. Copper tubing sizes 1 1/4-inches and smaller shall be supported at not intervals not more than 6 feet on center. Special provisions shall be installed for vertical lines subject to expansion and contraction caused by operating temperature differences.

- d. Vertical cast iron pipelines shall be supported from each floor and at its base. Malleable iron or steel pipe clamps with minimum thickness of 1/4 inch shall be furnished and fastened around pipe for support.

17. Horizontal Piping:

- a. Roof Mounted Piping: Pressure and non-pressure piping shall be supported from channels, stands, clamps, trapezes, rollers, or structures mounted on 100% rubber, UV resistant rooftop supports with reflective strips, Dura-Block, or equal. Roller type supports shall be provided below and above pipe to prevent its dislodgement. Bottom of pipes shall clear the roof surface by 10 inches.
- b. Insulated steam and space heating hot water insulated condensate lines, insulated domestic hot water supply and return piping shall be supported with Tolco Figure 4, B-Line Figure B3140, Grinnell Figure 212, or equal, steel hangers with welded eye rods to permit hinge movement at point of attachment of hangers. Hinge movement at point of support shall be provided by welded eye linked rods Tolco Figure 101L, B-Line Figure B3211X, Grinnell Figure 278, or equal.
- c. Domestic cold water piping, water supply and return piping, condenser water piping, insulated refrigerant piping gas piping, compressed air piping, cast iron soil piping, galvanized steel vents, waste and downspout piping and glass to be supported with Tolco Figure 1, B-Line Figure B3100, Grinnell Figure 260, or equal, hangers with rods, turnbuckles and inserts suitable for above hangers.
- d. Maximum hanger and support spacing shall conform to CPC schedule for horizontal piping installed above grade.

18. A hanger or support shall be installed close to the point of change in direction of a pipe run, in either a horizontal or vertical plane.

19. When practicable, supports and hangers for cast iron soil pipe shall be installed as close as possible to joints and when hangers or supports are not located within one foot of a branch line fitting, an additional hanger or support shall be installed at fitting.

20. In systems where grooved piping is used, couplings shall be provided with angle pattern bolt pads to comply with support and hanging requirements of ANSI/ASME B31.1, ANSI/ASME B31.9, and NFPA Pamphlet 13.

T. Flashings:

1. Each pipe, duct, or gas-fired equipment vent passing through roof shall be installed with waterproof flashing.

2. Flashing or flanges on pipes, vents, and ducts passing through a tile or slate roof shall be constructed of sheet lead. Flashing for pipes and heater vents passing through a roof shall be 4 pound soft sheet lead. Flashing and flanges for ducts and heater vents passing through exterior walls shall be 22 gage sheet metal. Install caps on top of heater pipes. Flanges and flashing shall be installed waterproof at point of connection with pipe or duct. No soldered joints on roof flashings will be allowed. No Stoneman lead roof flashings will be allowed.3. Lead flashing and flanges shall be constructed of 4 pound sheet lead with burned joints. Flange of lead flashing or lead flange on a duct shall extend out onto roof a minimum of 12 inches from pipe or duct. Lead flashing shall extend up the pipe or duct not less than 8 inches.

3. Sheet metal flashing shall be constructed of 24 gage galvanized sheet steel. Flanges on these flashings shall extend out onto roof a minimum of 10 inches from pipe or duct. Flanges on ducts through exterior walls shall extend out from duct a minimum of 2 ½ inches. Flanges on gas-fired equipment single-wall vents shall be of ventilated type. Type B gas vents through a roof shall be furnished with non-ventilated flashing as per NFPA Pamphlet 211.
 4. Cast iron, steel, brass, and copper pipe, which terminates less than 18 inches above roof, shall be furnished with a combination counter-flashing and vandal-proof hood for protection against water, birds and foreign matter. Cast iron, steel, brass and copper pipe, which does not terminate within 18 inches of roof, shall be furnished with a counter-flashing sleeve. Pipe, which terminates more than 18 inches above roof, shall be furnished with protection against entrance of water, birds, and foreign matter.
 5. Counter-flashing and combination counter-flashing sleeves and vandal-proof hoods shall be cast iron, vandal-proof, threaded, sealed or approved gas-heated sleeve type. Counter-flashing sleeves on each of these items shall extend down over flashing a minimum of ¾ inch.
 6. Flashing and flanges on ducts shall be installed waterproof at point of connection to the duct by riveting and soldering. Storm collars shall be securely screwed and installed waterproof around appliance vent pipe immediately above flashing.
 7. Vent piping above roof shall be furnished with a combination counter-flashing sleeve and vandal-proof hood.
- U. Equipment Installation: Install roof or floor mounted equipment on level platforms, housekeeping pads or curbs and provide sound, vibration and seismic control measures per Section 23 0548 even if not indicated on Drawings.

END OF SECTION

SECTION 22 05 53

PLUMBING IDENTIFICATION

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes: Marking and identification on mechanical piping systems, ducts, controls, valves, and apparatus.
- B. Related Requirements:
 - 1. Division 01: General Requirements
 - 2. Section 22 05 13: Basic Plumbing Materials and Methods.
 - 4. Section 22 10 00: Plumbing.
 - 5. Section 22 20 13: Plumbing Piping.

1.02 SUBMITTALS

- A. Submit in accordance with Division 01 and Section 22 05 00: Common Work Results for Plumbing.
- B. Submit product data and installation instructions for each item specified.
- C. Submit Samples of materials.

1.03 QUALITY ASSURANCE

- A. Comply with provisions of:
 - 1. Section 22 05 00: Common Work Results for Plumbing.
 - 2. ANSI/ASME A13.1: Scheme for the Identification of Piping Systems.
 - 3. APWA: Uniform Color Code.
 - 4. IAPMO: Uniform Plumbing Code (UPC)

PART 2 – PRODUCTS

2.01 MATERIALS

- A. General: Piping systems, controls, valves, apparatus, etc., except those that are installed in inaccessible locations in partitions, walls, and floors, shall be permanently identified.

2.02 VALVES

- A. Furnish prepared chart or diagram for each piping system, indicating by identifying letter or model number of each valve in the system, its location, and function.

- B. Install charts in aluminum frame with clear glass front and secure on wall where designated by the Project Inspector.
- C. Bind copies of each chart in operating instructions manual.
- D. Provide each valve with a brass, aluminum, or plastic disc, not less than 1-1/4 inches diameter bearing engraved numbers corresponding to those indicated on chart. Fasten discs to valve with No. 14 brass wire.
- E. Provide an additional tag for safety valves and other valves that could be hazardous to safety and health of occupants. Distinguish these tags from regular valve tags by color (such as yellow with black letters and marked "Danger"); submit Sample tag to the Architect for review.

2.03 INSTRUMENTS AND CONTROLS

- A. Identify panel-mounted instruments and controls with engraved bakelite nameplates permanently affixed to panel boards.
- B. Identify alarm indicating devices and alarm reset devices by nameplates.
- C. Identify automatic valves, flow switches, and pressure switches, with embossed aluminum or plastic tape affixed to controller, indicating service and setting.

2.04 EQUIPMENT

- A. Identify each major piece of equipment with engraved bakelite nameplates permanently affixed to the equipment, indicating the room numbers it services, Equipment identification designation shall be the same to its designation indicated on the "As-Built Drawings". Room numbers in the nameplates shall correspond to the final room numbers.

2.05 ABOVE GRADE PIPE IDENTIFICATION

- A. Identify pipes by means of colored labels with directional flow arrows and identification of the pipe content, in conformance to ANSI/ASME A13.1 or the UPC.
- B. Materials: Precoiled acrylic plastic with clear polyester coating, all-temperature, self-adhering, as manufactured by Brady, Brimar Industries, Seton, Stranco, Inc., or equal.
- C. Size:

Outside Diameter of Pipe or Insulation (in inches)	Length of Color Field (in inches)	Size of Letter (in inches)
¾ to 1 ¼	8	½
1 ½ to 2	8	¾
2 ½ to 6	12	1 ¼
8 to 10	24	2 ½
over 10	32	3 ½

- D. Locations:

1. On accessible piping, whether insulated or not (including mechanical rooms, attic and ceiling spaces); except that labels shall be omitted from piping where contained material is obvious due to its connection to fixtures (such as faucets, water closets, etcetera.).
 2. Near each valve and branch connection in such accessible piping.
 3. At each pipe passage through wall or floor.
 4. At not more than 20 feet spacing on straight pipe run between bands required in 2 and 3 above.
 5. At each change in direction.
- E. Application: Install on clean surfaces free of dust, grease, oil, or any material that will prevent proper adhesion. Replace non-adhering or curling labels with new labels.

F. Color Schedule:

Content of Pipe	Legend	Background Color	Lettering Color
Domestic cold water	Domestic. C.W.	Green	White
Non-potable cold water	Caution: Non-potable Water Do Not Drink (1)(2)	Purple	Black
Domestic hot-water 140°F	Domestic H.W. 140°F	Blue	Black
Sanitary waste	San waste	Green	White
Sanitary vent	San vent	Green	White
Indirect drain	Ind drain	Green	White

H. Notes on Schedule:

1. Note (1) indicates 2 ¼ inch by 1 inch yellow label with ½ inch letters reading UNSAFE WATER at one end of primary label.

Note (2) words should read “CAUTION: NONPOTABLE WATER DO NOT DRINK.” with international *do not drink* symbol.

Note (3) words should read “CAUTION: RECLAIMED WATER DO NOT DRINK.” with international *do not drink* symbol.

2.06 UNDERGROUND PIPE

A. Detectable Marking Tape:

1. Provide and install detectable marking tape along buried piping. Tape shall be specifically manufactured for marking and locating underground utilities with electronic equipment. Tape shall be acid and alkali resistant, and manufactured with integral wires or foil backing, encased with protective cladding. Tape shall be a minimum of two inches in width.
2. Manufacturer: Reef Industries, Inc., Advantage Brands, Inc., Northtown Company, Mutual Industries, Inc., or equal.
3. Detectable marking tape shall be color-coded per APWA Color Code:

- a. Yellow: Oil and gas.
 - b. Blue: Water, irrigation and slurry lines.
 - c. Green: Sewer and drain lines.
- B. Tracer Wire:
- 1. Solid copper wire type THWN, 12 AWG gauge, with heat and moisture resistant insulation.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Correct detrimental conditions prior to commencing the Work of this Section. Install markers and identification tags as specified with materials and installation procedures recommended by manufacturer.
- B. Place tracer wire on top of non-metal utility lines allowing some slack. Do not wrap tracer wire around pipe. Fasten tracer wire in place at approximately 10 feet on centers with non-metal ties.
- C. Install underground detectable pipe marking tape continuously buried 8 to 10 inches above the buried utility pipe. Wrap tape on pipe risers up to a height of 12 inches above grade.

3.02 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 22 10 00

PLUMBING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Labor, materials, tools, and equipment to install plumbing systems as indicated.
- B. Related Sections:
 - 1. Division 01 - General Requirements.
 - 2. Section 07 92 00: Joint Sealants.
 - 3. Section 10 44 13: Fire Extinguishers and Cabinets.
 - 4. Section 11 40 13: Food Service Equipment.
 - 5. Section 12 35 53: Laboratory Casework.
 - 6. Section 22 05 00: Common Work Results for Plumbing.
 - 7. Section 22 05 13: Basic Plumbing Materials and Methods.
 - 8. Section 22 05 48: Vibration and Seismic Control for Plumbing Piping and Equipment.
 - 9. Section 22 05 53: Identification for Plumbing piping and Equipment.
 - 10. Section 22 07 00: Plumbing Insulation.
 - 11. Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.
 - 12. Section 31 23 23: Excavation, Backfill for Utilities.
 - 13. Section 33 30 00: Site Sanitary Sewer Utilities

1.02 SUBMITTALS

- A. Provide in accordance with Division 01 and Section 22 05 00: Common Work Results for Plumbing.
- B. Provide necessary documentation to Owner for processing rebates for water efficient fixtures.

1.03 QUALITY ASSURANCE

- A. Unless otherwise noted, the California Plumbing Code is hereby made part of this section.
- B. Conform to provisions of Section 22 05 00: Common Work Results for Plumbing.
- C. Manufacturer of plumbing products must be third-party certified to ANSI/NSF Standard 61, Section 9 certification, and ANSI/NSF 372 to demonstrate compliance with the federal requirements for lead contribution to drinking water, the Safe Drinking Water Act SDWA, and the California Health and Safety Code Section 116875.

1.04 PRODUCT HANDLING

- A. Conform to provisions of Section 22 05 13: Basic Plumbing Materials and Methods.

PART 2 - PRODUCTS

2.01 PIPING SYSTEMS

- A. Materials: Refer to Section 22 05 13: Basic Mechanical Materials and Methods.
- B. Insulation for Piping: Refer to Section 23 07 00: Plumbing Insulation.

2.02 HOSE BIBBS

- A. Schedule Numbers:

HB-1: Furnish with bent nose and loose key handle.

ACORN	ZURN	CHAMPION	PRIER	OR EQUAL
8121-LF	Z-1343-VB-LK	B-401LK	C-255NP	

2.03 PIPE HANGERS

- A. Refer to Section 22 05 13: Basic Plumbing Materials and Methods.
- B. Schedule Numbers:

1. PH-1: Complete with clamps, inserts, etc.

SUPERSTRUT	UNISTRUT	TOLCO	B-LINE	OR EQUAL
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PART 2 - PRODUCTS

2.04 PIPING SYSTEMS

- A. Materials: Refer to Section 22 05 13: Basic Mechanical Materials and Methods.
- B. Insulation for Piping: Refer to Section 23 07 00: Plumbing Insulation.

2.05 HOSE BIBBS

- B. Schedule Numbers:

HB-1: Furnish with bent nose and loose key handle.

ACORN	ZURN	CHAMPION	PRIER	OR EQUAL
8121-LF	Z-1343-VB-LK	B-401LK	C-255NP	

2.06 PIPE HANGERS

- A. Refer to Section 22 05 13: Basic Plumbing Materials and Methods.
- B. Schedule Numbers:

- 1. PH-1: Complete with clamps, inserts, etc.

SUPERSTRUT	UNISTRUT	TOLCO	B-LINE	OR EQUAL
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PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which Work of this section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General:

- 1. Unless otherwise specified, plumbing fixtures, equipment and appliances that require connections to plumbing line shall be connected. This shall include fixtures specified or indicated as furnished by others, furnished by Owner, or specified in other related sections. Install supplies, stops, valves, traps, wall flanges, or pipe casing for connection of this equipment.
- 2. Install equipment as indicated on reviewed and accepted Shop Drawings.
- 3. Avoid interference with Work of other trades. Do not deviate from Drawings without review of the Architect.

- B. Examination: Check each piece of equipment in system for defects verifying that parts are properly furnished and installed.
- C. For piping Work, refer to Section 22 05 13: Basic Plumbing Materials and Methods.
- D. Plumbing Fixture and Equipment Installation:
1. Unless otherwise indicated, fixtures shall be installed with 5/16 inch brass bolts or screws of sufficient length to securely fasten fixture to backing, wall, or closet ring.
 2. Fixtures installed against concrete or masonry walls shall have their hangers fastened with 5/16 inch brass bolts, Philip Shield type anchors, or 2 unit cinch anchors. Wood or plastic plugs are not permitted.
 3. Fixtures installed against wood or metal stud walls shall have their hangers fastened to metal backing plates with 5/16 inch brass bolts screwed into plate. Fixture hangers for urinals shall be fastened centered vertically on metal backing plate with three 5/16 brass bolts each for small individual hangers and six, for larger one piece hangers. Lavatories shall be hung with not less than four 5/16 inch brass bolts or not less than five 1/4 inch brass bolts. Each sink hanger shall be hung with not less than four 5/16 inch brass bolt or not less than five 1/4 inch brass bolts.
 4. Pan type drinking fountains shall be hung with 5/16 inch cadmium plated bolts with a bolt in each bolt opening in hanger. Hangers for pan type drinking fountains shall provide 2 inches (plus or minus 1/4 inch) between pan and wall. Spaces due to irregularities between fixtures and tile walls shall be neatly filled with white cement or silicone filler.
 5. Backing for hanging of plumbing fixtures and equipment shall be installed in supporting wall at time rough piping is installed. Backing for stud walls shall be steel plate 1/4 inch thick, not less than 4 inches wide. Backing for urinals shall be 1/4-inches thick by 6-inch wide steel plate. Steel plate shall be attached to stud at each end of plate and to each stud it crosses. Plate shall be attached to metal studs by bolting with two 1/4 inch U-bolts per stud with bolts through plate and around stud flange or by welding with a 1/8 inch fillet weld full width of stud flange, top and bottom of plate. At wood studs, plate shall be carefully recessed flush with face of stud and attached to each stud with 2 No. 14 flat-head wood screws, 2 inches in length into pre-drilled 1/8 inch holes. Backing for stud walls supporting wall-hung closets shall be as detailed.
 6. Rough-in for fixtures, equipment and appliances shall be as indicated on Drawings and as specified, including those items indicated as furnished by others, furnished by Owner, or future capacity. When connections to equipment from capped or plugged lines are required, caps or plugs shall be removed at time equipment is set and stops or valves installed and connections provided as specified.
 7. Piping materials for trap arms shall be Brass, Cast Iron or DWV copper
 8. Piping shall be stubbed out to exact location of fixtures and stubs shall be installed symmetrical with fixtures. Hot and cold water supplies for center set faucets on

lavatories shall be installed on 8-inch centers, unless otherwise specified or required.

3.03 GAS SERVICE

- A. Above Grade Service: Pipe shall be steel, hammered, free of dirt and scale, and blown out with oil-free air or nitrogen to a clean, dry condition. Piping shall not be installed in or through a ventilation duct or plenum.
- B. Underground Service, Gas approved (yellow) Polyethylene Plastic Pipe: Refer to Section 22 05 13: "Basic Plumbing Materials and Methods".
 - 1. Pipes shall be joined with polyethylene fitting and joined together by thermal fusion in accordance with procedures recommended by Polyethylene plastic pipe and fitting manufacturer.
 - 2. Plastic pipe shall be installed not less than 30 inches below grade..
 - 3. Underground Warning Tape shall be installed 12 inches above buried gas piping. Warning tape shall be yellow with caution statement as follows: "CAUTION – BURIED GAS LINE BELOW".
 - 4. Plastic pipe shall not be installed in or under a building or structure. Pipe shall be installed under bituminous surfacing or compacted soil area, free from large stones. Pipe may be installed under sidewalks or driveways, as long as no joint occurs. Pipe installed under paved covered areas wider than 40 feet shall be installed in ventilated conduits extending 2 feet past paving.
 - 5. Pipe shall be installed on a 6 inches deep sand bed. After required pressure-leak test, pipe shall be covered with sand not less than 6 inches thick.
 - 6. Piping shall not support weight of valves, metal fittings or other items. Pipe shall be installed strain free.
 - 7. Plastic pipe fittings shall not be stored or left exposed to sunlight. Pipe in open trenches shall be shielded. A sand envelope of 6 inches minimum shall be placed around pipe, with exception of joints, until inspection by IOR is completed. Protection for pipe shall be provided when necessary to leave pipe exposed overnight.
 - 8. Installer of piping is required to have training and to have attained a certification. Non-trained/Non-certified installer must contact the manufacturer or manufacturer's representative to provide on-site fusion training and certification, prior to work commencement
 - 9. Polyethylene plastic pipe shall connect to a steel epoxy coated anodeless type riser to minimum of 6 inches above grade, when exiting the underground installation and transitioning to steel pipe connection.
 - 10. Where a steel pipe riser passes into a structure or building, a double swing or double-offset joint shall be furnished. Pipe shall pass into structure 6-inches above

grade and through a sleeve with a minimum one inch clearance. An isolation valve is required before pipe entering the building.

3.04 CLEANING - PLUMBING PIPING SYSTEMS AND FIXTURES

- A. Plumbing lines and fixtures shall be flushed to remove dirt and foreign material until water runs clear and no foreign substance or odor is present. Strainers and screens on faucets shall be removed during this cleaning operation.
- B. After satisfactory cleaning of strainer and screen replacements has been witnessed by the Project Inspector, post and maintain signs stating: "CAUTION - Water at this construction project has not yet been certified for human consumption." Signs shall be furnished with letters at least 1/2 inch in height, and shall be conspicuously posted at entrances to the Project site. Signs shall be paneled, black and yellow, in conformance with OSHA Section 1910.1455.

3.05 DISINFECTING DOMESTIC WATER PIPING SYSTEMS

- A. Newly installed or replaced piping and/or fixtures dispensing potable water shall be disinfected and undergo an approved bacteriological analyses before water system is allowed for public use.
- B. Work shall be performed by Technicians Certified by the American Water Works Association (AWWA) and/or the State of California Department Health Services, Grade II Water Treatment Operator Certification or higher issued by the Department of Health Services (DHS) for the State of California. Comply with Title 22, Code of Regulations Division 4, Chapter 13, and Article 2 Operator Certification Grades.
- C. Method:
 - 1. A Reduced Pressure Backflow assembly shall be installed to protect from cross contamination of the local water purveyor's meter service supply when at any time there is any type of water connection with the piping to be disinfected (Chlorinated) and the water meter service supply.
 - 2. System is to be flushed to remove any materials that may have entered the system.
 - 3. Using a chemical feed metering pump and a chlorine tank, the chlorine solution is injected into the water system.
- D. Disinfection and De-chlorination procedure (24 or 3 Hour Contact Time):
 - 1. 24-hour Test Method:
 - a. Prior to disinfection, post signs on all water outlets of the system to be disinfected. Sign or tags shall read, "Water System Being Chlorinated- "Danger Do Not Drink Water" or similar warning.
 - b. Piping system shall then be adequately flushed with water to remove any particles and eliminate air pockets.

- c. Using the continuous feed method, sodium hypochlorite conforming to ANSI/ AWWA B300 will be injected into the water system at a minimum of 50 PPM. A water flow meter provided by the water treatment technician will be used to determine the rate of injection and a chlorine test kit, Hach or equivalent, will be used to monitor the residual.
- d. Chlorine residual test will be taken at all appropriate points and outlets to verify 50 PPM residual levels.
- e. The chlorinated system shall be shut down for any use and the chlorinated water shall remain in the water system for retention of 24 hours.
- f. After 24 hours, chlorine residual levels will again be tested at various points throughout the system to insure a minimum of 25 PPM residual. If the system has not met the minimum of a 25 PPM residual, the above disinfection process shall be repeated.
- g. After satisfactory completion of the residual testing, flush out system until Hach or equivalent test reveal the water outlets have a free chlorine residual concentration less than 0.5 PPM. The procedure shall be in accordance with the AWWA standard C651-05.
- h. The OAR may allow temporary use of the water system for construction purposes pending results of the bacteriological test analysis. Sign or Tags shall be left on all outlets stating water system is not safe for consumption until laboratory results are complete and meet these specifications.

2. 3 Hour Test Method:

- a. If the water systems must be turned on for use as soon as possible, a 3 hours chlorine contact time to allow for disinfection is permitted with the OAR's approval.
- b. Prior to disinfection, post signs on all water outlets of the system to be disinfected. Sign or tags shall read, "Water System Being Chlorinated- "Danger Do Not Drink Water" or similar warning.
- c. Piping system shall be then adequately flushed with water to remove any particles and eliminate air pockets. Using the continuous feed method, sodium hypochlorite conforming to ANSI/ AWWA B300 will be injected into the water system at a minimum of 200 PPM. A water flow meter provided by the water treatment technician will be used to determine the rate of injection and a chlorine test kit, Hach or equivalent, will be used to monitor the residual.
- d. Chlorine residual test will be taken at all appropriate points and outlets to verify 200 PPM levels. The chlorinated system shall be shut down for any use and the chlorinated water shall remain in the water system for retention of 3 hours.
- e. After satisfactory completion of a 3 hour disinfection period, flush out system until Hach or equivalent test reveal the water outlets have a free chlorine residual concentration less than 0.5 PPM. The procedure shall be in accordance with the AWWA standard C651-05.

- f. The OAR may allow temporary use of the water system for construction purposes pending results of the bacteriological test analysis. Sign or Tags shall be left on all outlets stating water system is not safe for consumption until laboratory results are complete and meet these specifications.

3.06 VALVES ON PLUMBING SYSTEM

- A. Furnish and install gates, ball, globes, angles, and check valves on plumbing Work at following locations whether indicated on drawings or not.
- B. Hot and cold valves shall be:
 - 1. Lead free complying with AB1953.
 - 2. Above the ground copper water system, 2-inch and larger, may utilize Victaulic butterfly valves and fittings for their connections. A 2-inch or larger Victaulic valve may be in a wall if an adequately sized access panel is provided for maintenance or removal.
- C. Valves shall be accessible and installed within an access panel approximately 3 feet above floor and no more than 7 feet above floor, or in a marked yard box to prevent tampering.
 - 1. Immediately after each water meter, in addition to any valve furnished by utility company, there shall be an accessible valve on the inlet side for a strainer assembly, dual backflow device assembly and/or possibly a dual pressure reducing valve assembly.
 - 2. A gate or ball valve on each water supply before it enters building. Valves shall be accessible from outside building and shall be installed in a marked yard box, unless otherwise indicated on drawings. Ball valves 2 ½-inch size or larger shall omit gate valve handle and furnish 2-inch square operating nut.
 - 3. At multi story buildings, provide an isolation-valve or multiple valves for both hot and cold water in access panel to isolate and control each floor level.
 - 4. For classrooms, shops, offices and boiler or mechanical room, install a gate or ball valve to control hot and cold water lines to each group of fixtures, a group of fixtures shall be considered to be 2 or more fixtures in the same room. When practical, valves shall be installed on the same wall as group of fixtures. Valves shall control only fixtures in rooms in which they are installed.
 - 5. For restrooms, a gate or ball valve shall be installed in each restroom to isolate the hot and cold water supply into a restroom regardless of the number of fixtures. These valves shall control and be accessible only from within the restroom in which fixtures are installed. Valves shall be installed on the same wall as the group of fixtures it serves. Valves shall control only fixtures in restroom in which they are installed. Back to back restrooms shall be isolated separately and individually.
 - 6. Install a gate or ball valve on each building branch line, which serves two or more fixtures, when these fixtures are not provided with a group isolation valve as specified above. These valves shall be located approximately 3 feet but not more than 7 feet above finish floor.

7. Install a gate, ball valve or partition stop for a drinking fountain or a group of drinking fountains.
8. Install a gate, ball valve or partition stop for hot and cold water supply to plumbing fixtures with no accessible supply stops, such as wall mounted faucets.
9. Install a gate, ball valve or partition stop for stops adjacent to, and controlling water flow to each sill cock and hose bib except as follows:
 - a. A sill cock immediately below an exterior drinking fountain may be controlled by the same gate, ball valve or partition stop as drinking fountain.
 - b. Valves or stops will not be required for individual hose bibs when these hose bibs are on a branch line serving only hose bibs and branch line is furnished with a shut-off valve.
10. Install a loose key angle stop, on each exposed fixture supply, and for each flush valve unless otherwise specified,
11. Install gate or ball valve at each location where a water line is connected to a piece of equipment other than items mentioned above.
12. Install a check valve on each hot water return line where it connects to a hot water storage tank or a water heater.
13. Handles, hand wheels (including dishwasher fill valve handles) and operating nuts shall be furnished of steel, brass, or cast iron and shall be removable. Unless specified to be loose key type, handles shall be securely fastened to their stems. On exposed outdoor valves, omit operating handles and provide operating nuts.
14. Provide a handle or a key for each five, or fraction thereof, loose key valves, bibs, or stops and deliver them to the project OAR.

3.07 VALVES - GAS SERVICE

- A. A gas readily accessible shut-off stop shall be installed on each gas line entering a building immediately prior to the point it enters the building. Unless otherwise specified or indicated, shut-off valves for lines entering a permanent structure, buildings or portable buildings, shall be installed in a vertical riser above grade.
 1. Gas shut off valve for portable buildings – A dedicated Gas shut off valve shall be provided in a marked Yard Box, for each portable building to facilitate relocation/removal of building without the need to shut off gas to entire school.
- B. Gas Shut off valve within a building – A gas shut off valve with handles shall be accessible and serviceable within an access panel. Install valve minimum 3 feet above floor but less than 7 feet above floor.
- C. In addition to locations specified, gas shut off valve shall be installed at following locations:

1. Install a lubricated plug gas shut off valve on any line connected to gas main or header at master assembly.
 2. Install a lubricated plug gas shut off valve before entering any building or structure.
 3. Install a gas valve on each outlet, in addition to any gas stop furnished with equipment.
 4. Service to laboratory gas cocks shall be furnished with a special precision check valve, located downstream from gas stop servicing room outlet at each laboratory cock. Unless otherwise specified, 1/8-inches bore shall be provided for each outlet cock.
 5. Install a gas shut-off valve on each gas line serving 2 or more gas outlets in same room. Service stop shall be installed not more than 7 feet above floor, and shall be in the room it serves.
 6. Install a gas shut-off valve on inlet side of each gas pressure regulating valve.
 7. Gas shut-off valves to be furnished with equipment.
 8. Install gas shut-off valve at not more than 1,000 foot intervals on each gas main.
 9. At multi-story buildings, provide gas-shut off valve(s) to isolate and control each floor or level. Install valves in a concealed manner in walls with access panels.
 10. Gas shut-off valves in classrooms and locations subject to tampering shall be protected while remaining accessible.
- D. When a gas-shut off valve adjacent to gas-fired equipment is indicated in Contract Documents it shall be furnished and installed as part of Work of this section.
- E. When electrical wall switches with emergency push button are specified for controlling gas outlets at Laboratory Classrooms, provide main shut-off gas valve with normally closed electric solenoid valve within an accessible access panel.

3.08 COMPRESSED AIR SYSTEMS

- A. Compressed air systems including compressors, air line filters, receivers, piping and appurtenances shall be installed as indicated and specified.
- B. Component parts of compressor unit shall be installed on a base firmly attached to receiver; motor and compressor shall be properly aligned auxiliary equipment and controls specified, furnished with necessary controls, automatic moisture eliminator fittings, piping, conduits and wiring properly installed and connected in a professional manner. Lubricant shall be furnished to fill until ready for operation. Safety valves shall be installed to permit normal operation and properly protect equipment. Thermal units shall be installed in motor starter to trip at 125 percent of motor nameplate rating. Pressure switches shall be installed to cut in and cut out of settings indicated.

- C. Compressor shall be installed on vibration dampers and flexible connections installed in piping to isolate vibration. Dampers shall be furnished with transmissibility of less than 10 percent for grade installation and less than 5 percent for above grade floor installation.
- D. Furnished compressed air system shall comply with safety orders of Industrial Accident Commission of State of California, Building and Safety Department of Ventura, and electrical units shall be listed as UL approved. Piping between first downstream moisture eliminator and receiver shall pitch down to receiver and shall be not less than one pipe size larger than pipe leaving eliminator. Provide drip points at each building with piping pitching down to them. Drip leg at each drip point and moisture eliminator shall be not less than 6 inches long, capped 1 ½-inch pipe with drain petcock. Upon completion of compressed air piping installation and prior to testing of pipe and final connection to compressed air receivers, systems shall be blown out to a clean, dry condition.

3.09 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose off Project site.

3.10 PROTECTION

- A. Protect Work of this section until Substantial Completion.

END OF SECTION

Specification

General

The Powerex Scroll Enclosed Air Compressor System is designed to provide clean, dry air for applications where the quality of the compressed air is critical. The standard unit is rated for a maximum of 116 PSIG. The high pressure unit is rated for a maximum of 145 PSIG.

Air Compressor System

The package shall include multiple oil-less scroll air compressors and associated equipment. The only field connections required will be system intake if remote intake option is chosen, exhaust, and power connection at the control panel.

Oilless Scroll Compressor Pump

Each compressor pump shall be belt driven oil-less rotary scroll single stage, air-cooled with absolutely no oil needed for operation. The rotary design shall not require any inlet or exhaust valves within the compressor pump housing or structure and shall be rated for 100% continuous duty. Direct drive compressors shall not be used. Tip seals shall be of a composite PTFE material and be rated for 8,000 hours operation for standard units, and 4,000 hours operation for high pressure units. Compressor pump bearings shall be external to the air compression chamber and pin crank and moving scroll bearings shall be serviceable for extended compressor life. Bearing maintenance shall not be required until 8,000 run hours for standard units, and 4,000 run hours for high pressure units. Compressor pumps with bearings that are not accessible for service have a limited life span and shall not be accepted. Compressor pumps shall have an integral radial flow fan for cooling. Each compressor pump shall have flexible connectors on intake and discharge. Each compressor pump shall have a non-metallic heat insulating liner for the discharge air pipe where it threads into the compressor housing.

Each compressor pump shall be provided with an electric drive motor, discharge check valve, an air-cooled after-cooler, and a high discharge temperature shut down switch. Auxiliary cooling fans shall operate from 120 volt power provided by the transformer included in the system controls.

Approach Temperatures

The system is designed with 3 stages of internal aftercooling so that the approach temperature shall be no greater than 24°F above ambient at system discharge with the system running at maximum capacity. No additional external aftercooling is required for use with a dryer.

Motor

Each compressor shall be belt driven by a 2 pole, TEFC, NEMA construction motor that run at 3500 RPM. Motors are EISA compliant and premium efficient.

Motor Slide Base

Maintenance feature designed for easy adjustment of belt tension from the motor side on the basemount assembly.

- Robust single screw linear belt tension adjustment.
- Custom compact design.

System Controls

The controls operate the duplex or triplex air compressor modules as needed in response to a pressure signal from a pressure transducer located in the system manifold. An illuminated on/off push button controls power to the motor starters. When the button is in the off position, the system is merely in stand-by mode, not powered off.

The pressure transducer sends a signal to the programmable logic controller (PLC) which is programmed to operate two, three or four compressor modules as needed to maintain the system pressure requirements. An HMI touch screen interface displays system status and alarm conditions. Pressure settings are user adjustable within factory predetermined setting limits.

The PLC will alternate each compressor module based on demand as well as timed alternation. If a compressor module is running longer than ten minutes continuously, the control will alternate to the next available compressor module to equalize run time and synchronize maintenance intervals. On initial startup or if air pressure drops rapidly, simultaneous motor starts are prevented by a programmed three second stagger. One 120VAC control circuit transformer with primary and secondary fuses is installed for control circuit voltage.

Motor circuit breakers with lockable disconnects are provided for each compressor module. Operating hours, high temperature alarms, motor overload alarms, run indication, and hours to scheduled maintenance for each compressor module are displayed on the screen. All alarm history is kept in the alarm log. Easily navigated menus are provided to allow the user to select the display conditions and acknowledge the alarms. Remote alarm contacts are provided as shown on the system wiring diagram.

Inlet Filters

The system includes an inlet filter with a pleated element and a canister with silencing tubes for each pump. The filters are located on each pump inside the sound reducing cabinet protected by a convenient access panel.

Sound Reducing Enclosure

The system is constructed with an internal frame and steel base system with individual vibration isolation mounted compressor modules. The sound reducing enclosure has a front access panel to allow service of the electrical controls. The enclosure has rear cooling air intake and all exhaust air leaves the enclosure from the top.

Optional Desiccant Air Dryer

The twin-tower desiccant dryer(s) shall be sized for the peak calculated system demand to provide a pressure dew point of zero degrees F. Dryer controls shall include a re-pressurization cycle to prevent shocking of the desiccant bed prior to switching towers. An integral purge saving control system shall be provided and shall suspend the purge air loss during periods of low demand. When the dryer is in purge control mode, the tower switching valves shall not operate, and only one desiccant tower shall be on-line. Dryers that continue to operate the switching valves on a fixed cycle, while in purge control mode shall not be acceptable. (Dryers utilizing purge control require the optional dew point monitor listed below.) Each dryer is supplied with two stages of filtration. The pre-filter removes

particulates and liquids and includes an element change indicator and automatic condensate drain. The 0.5 micron after filter includes an element change indicator. Dryers shall be powered through a separate control circuit and not through the compressor controls.

Optional Refrigerant Air Dryer

The refrigerated air dryers are non-cycling, direct expansion type, using R-134 A refrigerant (CFC free). A hot gas by-pass system maintains a consistent temperature at all load conditions. Heat exchangers are made of copper tube construction and fully insulated. Dryers shall have power on and high temperature lights, suction pressure gauge, internal 3-micron filter/separator with stainless steel bowl, and timed electric condensate drain. Refrigerated dryers are to be powered from a separate supply, not through the compressor controls.

Optional Dewpoint Monitor

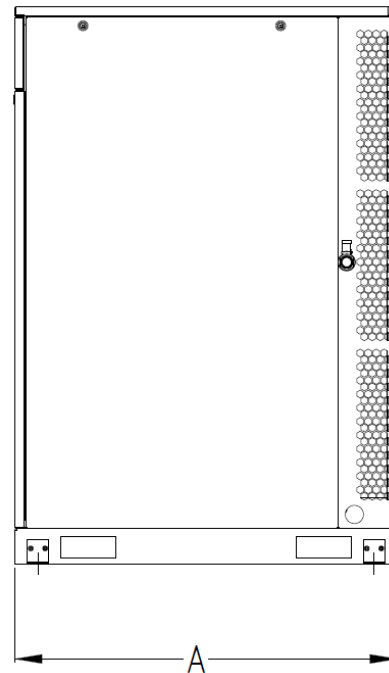
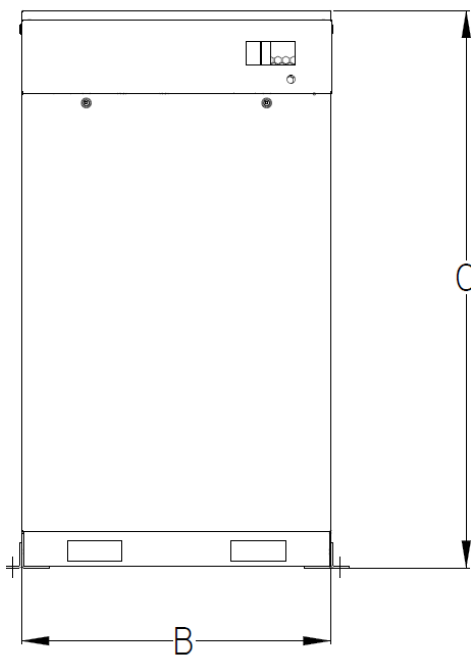
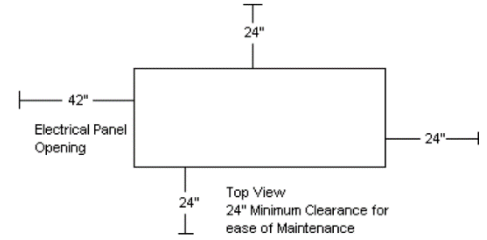
NOTE: Installed on desiccant dryer.

The system-integrated hygrometer shall be equipped with an LCD dewpoint display and high dewpoint alarm with dry contacts for remote monitoring. The sensor shall include an auto calibration feature to ensure the accuracy of the dewpoint measurement.

Optional Moisture Separator

The moisture separator shall be sized for the peak calculated demand and shall include an auto float drain to purge the collected moisture.

Dimensions				
Model	Dim. A	Dim. B	Dim. C	Outlet
SED15B	42"	34"	62"	1"
SED15BHP	42"	34"	62"	1"
SED20B	42"	34"	62"	1"
SED20BHP	42"	34"	62"	1"
SET225	42"	34"	62"	1"
SET225HP	42"	34"	62"	1"
SET30B	42"	34"	62"	1"
SET30BHP	42"	34"	62"	1"



Enclosed Scroll Air Compressors										
Model ⁴	Total System HP	Pump HP ¹	SCFM @ 100 PSIG ⁴	Maximum Pressure (PSIG)	BTU/Hr	dB(A) Level	System F.L.A.			System Weight (lbs)
							208V	230V	460V	
SED15B	15	7.5 (2)	46.2	116	38,200	63	40.2	36.6	19.3	840
SED15BHP	15	7.5 (2)	34	145	38,200	63	40.2	36.6	19.3	840
SED20B	20	10 (2)	62.4	116	50,934	64	52.8	48	25	840
SED20BHP	20	10 (2)	49	145	50,934	64	52.8	48	25	840
SET225	22.5	7.5 (3)	69.3	116	57,350	65	59.3	53.9	27.9	1110
SET225HP	22.5	7.5 (3)	51	145	57,350	65	59.3	53.9	27.9	1110
SET30B	30	10 (3)	93.6	116	76,401	66	78.2	71	36.5	1110
SET30BHP	30	10 (3)	73.5	145	76,401	66	78.2	71	36.5	1110

Notes:

- 1 – Actual BHP is less than rated name plate. Contact Powerex for BHP rating.
- 2 – 3 Year Limited Warranty
- 3 – UL/CSA Certified
- 4 – HP after a model number indicates high pressure model. SCFM for high pressure units are @ 145 PSIG.

Refrigerated Compressed Air Dryers

HPR & HPRN VALUE SERIES



Reliable Operation...

Customers around the world have relied on Hankison for great value in air treatment solutions. Hankison Value Line Refrigerated Dryers offer a simple solution based on a long history of industry leading technology.



Efficient Smooth Copper Heat Exchangers

HPR5/10 – HPR50 5/10 – 50 scfm

BETTER BY DESIGN

- Smooth bore, copper tube-on-tube heat exchangers deliver low pressure dew point performance
- Centrifugal separator efficiently captures liquid condensate at varying inlet loads
- Static condenser design – provides trouble free , quiet operation

RELIABLE CONDENSATE MANAGEMENT

- Models 10-15 scfm: Pneumatically operated internal float drain
- Models 25-50 scfm: Electronic drain valve

EASE OF MONITORING

- Models 10-15 scfm: Lighted On/Off switch
- Models 25-50 scfm: Lighted On/Off switch and dew point temperature indicator

OPTIONS

- Air bypass valve allows ease of service
- Wall mount bracket enables flexible installation

SAFETY FIRST – ENVIRONMENTAL FRIENDLY

- CFC free R134a refrigerant
- CSA approved



Air Bypass Valve

HPR75 – HPR400

75 – 400 scfm

TIME PROVEN DESIGN

- 316 stainless steel, brazed plate heat exchangers efficiently dry the air to the specified pressure dew point.
- Hot gas by-pass valve maintains constant evaporator temperature
- Replaceable ambient air filter protects the condenser from airborne contaminants
 - » *Maintenance kits include ambient air filter*

CONDENSATE MANAGEMENT

- Integral stainless demister/separator captures liquid condensate and solid particles
- Electronic drain valve automatically discharges condensate from the dryer

STAY IN CONTROL

- Model 75-150 scfm: Lighted On/Off switch and dew point indicator
- Models 200-400 scfm: Lighted On/Off switch, LED dew point temperature indicator, timer drain adjustment on the panel

SAFETY FIRST – ENVIRONMENTAL FRIENDLY

- CFC free R134a refrigerant
- CSA approved

Value at its finest...

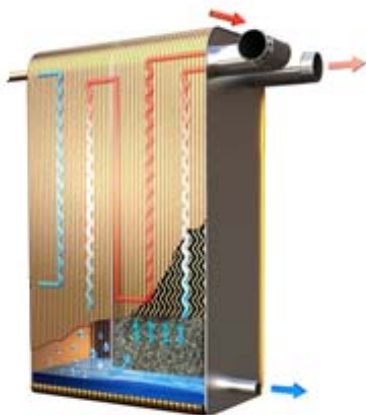


Adjustable Timed Electric Drain



Controls: Models 200-400 scfm

Performance at its best...



Stainless Steel Demister/Separator



Controls: Models 200-1200 scfm

HPRN75 – HPRN1200 75 – 1200 scfm

GLOBALLY PROVEN PERFORMANCE

- Stainless steel, cross flow heat exchangers optimize heat transfer and service life
 - » *ISO 8573-1 Air Quality: Class 4-5 pressure dew point*
 - » *Smooth, non-fouling channels promote low pressure drop*
- Herringbone geometry stamped into the stainless steel plates creates turbulent flow, for a self-cleaning effect
 - » *No pre-filter required for full 2 year warranty*
 - » *5 year heat exchanger warranty*
- Compact design saves floor space

EFFICIENT CONDENSATE MANAGEMENT

- Increased calming zone and integral demister/separator captures liquid condensate and solid particles
 - » *Effectively removes condensate from 0 to 100% flow conditions without moisture carry-over*
- Furnished with a timed electric condensate drain
 - » *Includes a Y-strainer to protect the valve from rust and scale*

EASY TO MONITOR

- Models 75-150: Illuminated On/Off Switch; dew point temperature display indicator to monitor inlet load conditions
- Models 200-1200 scfm: Illuminated On/Off Switch; LED dew point temperature display; dry alarm contact
 - » *Equipped with panel mounted drain timer control*

SAFETY FIRST – ENVIRONMENTAL FRIENDLY

- Models 75-125 scfm CFC free R134a
- Models 150-1200 scfm R407c refrigerant
- CSA approved

International Air Quality Class Standards

ISO 8573-1 AIR QUALITY STANDARD

ISO 8573-1, the international standard for compressed air quality, defines the amount of contamination permissible in compressed air.

The ISO standard identifies three primary forms of contamination in compressed air systems – solid particles, water and oil. Contaminants are classified and assigned a quality class, ranging from Class 0, the highest purity level, to Class 6, the most relaxed.

HPR and HPRN series refrigerated air dryers offer the perfect balance between technology and simplicity to dry compressed air systems to ISO 8573-1 Air Quality Class 4 to 5 – pressure dew points.



OPTION PRE-FILTRATION

NGF series – PF grade filtration – removes solid and oil contaminants from the air stream before entering the dryer.

ISO Air Quality Class:

- Solids – Class 2
- Remaining Oil – Class 4
- Removes solids 1.0 micron and larger
- Remaining oil content 2.0. mg/m³

OPTION AFTER-FILTRATION

NGF series – HF grade filtration – provides high efficiency oil removal protecting downstream equipment .

ISO Air Quality Class:

- Solids – Class 1
- Remaining Oil – Class 1
- Removes 99.999+% of solids \geq 0.01 micron
- Remaining oil content < 0.01 mg/m³

Product Specifications

MODEL ¹	RATED FLOW SCFM ²	RATED FLOW M ³ /H	REFRIGERANT	VOLTAGE	POWER KW	INLET/OUTLET CONNECTIONS	DIMENSIONS (INCHES)			WEIGHT LBS
							H	W	D	
HPR5-10	5	17	R 134a	115/1/60	0.2	3/8" OD	15	13	13	64
HPR15	15	25	R 134a	115/1/60	0.24	3/8" OD	15	13	13	69
HPR25	25	42	R 134a	115/1/60	0.41	3/4" NPT	22	16	15	88
HPR35	35	59	R 134a	115/1/60	0.46	3/4" NPT	22	16	15	92
HPR50	50	85	R 134a	115/1/60	0.57	3/4" NPT	22	20	20	101
HPRN75	75	127	R 134a	115/1/60	0.52	1" NPT	24	14	32	123
HPRN100	100	170	R 134a	115/1/60	0.65	1" NPT	24	14	32	129
HPRN125	125	212	R 134a	115/1/60	0.68	1" NPT	24	14	32	135
HPR150-1	150	255	R 134a	115/1/60	1.11	1" NPT	21	13	30	161
HPRN150-2	150	255	R 407c	230/1/60	0.91	1" NPT	24	14	35	152
HPRN200-2	200	340	R 407c	230/1/60	1.53	2" NPT	30	18	37	196
HPR200-4	200	340	R 134a	460/3/60	1.42	1 1/2" NPT	30	17	36	183
HPRN250-2	250	425	R 407c	230/1/60	1.87	2" NPT	30	18	37	181
HPR250-4	250	425	R 134a	460/3/60	1.98	1 1/2" NPT	30	17	36	211
HPRN300-2	300	510	R 407c	230/1/60	2.09	2" NPT	32	19	44	252
HPR300-4	300	510	R 134a	460/3/60	2.05	1 1/2" NPT	30	20	38	219
HPRN400-2	400	680	R 407c	230/1/60	2.83	2" NPT	32	19	48	270
HPR400-4	400	680	R 134a	460/3/60	2.5	2" NPT	30	21	38	232
HPRN500-4	500	850	R 407c	460/3/60	3.18	2" NPT	32	21	48	328
HPRN600³	600	1,020	R 407C	460/3/60	3.8	2" NPT	32	22	50	353
HPRN800³	800	1,360	R 407C	460/3/60	5.4	3" FLG	59	30	42	687
HPRN1000³	1,000	1,700	R 407C	460/3/60	6.6	4" FLG	64	29	45	786
HPRN1200³	1,200	2,040	R 407C	460/3/60	8.7	4" FLG	64	29	45	810

¹ 1 = 115V (HPR150-1); 2 = 230V (HPRN150-2); 4 = 460V (HPR200-4)

² Rated Flow Capacity – Conditions for rating dryers are in accordance with ISO 7183 (Option A2). Compressed air at dryer inlet: 100 psig (6.7 barg) and 100°F (38°C); ambient air temperature: 100°F (38°C); operating on 60 Hz power supply.

³ Available in water cooled

At rated conditions, pressure drop is less than 5 psig.

Operating Conditions

FLOW MODEL	MAX INLET AIR PRESSURE		MIN INLET AIR PRESSURE		MAX INLET AIR TEMPERATURE		MIN INLET AIR TEMPERATURE		MAX AMBIENT AIR TEMPERATURE		MIN AMBIENT AIR TEMPERATURE	
	PSIG	BARG	PSIG	BARG	°F	°C	°F	°C	°F	°C	°F	°C
5-10 to 50	250	17	30	2	120	49	40	4	110	43	45	7
75 to 500	232	16	10	1	120	49	40	4	110	43	45	7
600-1200	232	16	43	3	120	49	45	7	110	43	34	1

Capacity Correction Factors

To adjust the dryer capacity for non-standard conditions, use the Capacity Correction Factors (multipliers) from Tables 1 & 2.

-sizing example:

What is the capacity of an HPRN100 at 100F inlet air temperature, 150 psig working pressure, and 110F ambient air temperature?

ANSWER:

100 scfm (rated flow from product specification table) x 1.08 (correction factor for inlet air temperature, table 1) x 0.94 (correction factor for ambient air temperature, table 2) = 102 scfm

Table 1 - Capacity Correction Factors

INLET AIR PRESSURE		INLET AIR TEMPERATURE			
PSIG	BARG	90°F/32°C	100°F/38°C	110°F/43°C	120°F/49°C
80	5.6	1.19	0.95	0.77	0.63
100	6.9	1.25	1	0.82	0.68
125	8.6	1.3	1.05	0.86	0.72
150	10.3	1.34	1.08	0.9	0.75
175	12.1	1.37	1.11	0.92	0.78
200	13.8	1.39	1.14	0.95	0.8
250	17.2	1.43	1.17	0.98	0.83

Table 2 - Ambient Air Temperature

AMBIENT AIR TEMPERATURE	80°F/ 27°C	90°F/ 32°C	100°F/ 38°C	110°F/ 43°C
Multiplier	1.12	1.06	1	0.94



Global locations

SPX FLOW USA

HANKISON HEADQUARTERS

4647 SW 40th Avenue
Ocala, Florida 34474-5788 U.S.A.
P: (724) 745-1555
F: (724) 745-6040
E: hankison.americas@spxflow.com

HANKISON RENTAL

NORTHEAST

100 Commerce Drive, Suite 40
Washington, PA 15301
P: (724) 225-1470
F: (724) 222-1317
E: hankison.rental@spxflow.com

SOUTHWEST

1486 Champion Drive
Terrell, TX 75160 U.S.A.
P: (800) 379-3711
F: (972) 563-9991
E: hankison.rental@spxflow.com

SPX FLOW

CANADA

1415 California Avenue
Brockville, ON, Canada
k6v 7h7
T: (800) 267-3884
F: (800) 318-0952
E: ft.canada@spxflow.com

SPX FLOW

SOUTH AMERICA

Rua Joao Daprat, 231 b
09600-010-SÃO Bernardo
Do Campo, SP
Brazil
T: +55 (11) 2166-4050
F: +55 (11) 2166-4070

SPX FLOW

GERMANY

Konrad-Zuse-Str. 25
D-47445 Moers Germany
T: (+49) 2841-8190
F: (+49) 2841-87112
E: info@spxdehydration.de

SPX FLOW

INDIA

SPX India PVT, LTD
Manufacturing G-72/73
Riico Industrial Area
Mansarovar, RAJASTHAN
Jaipur 302 020
India
T: (+91) 141-2396759
F: (+91) 141-2395048

SPX FLOW

ASIA PACIFIC

5th Floor, Park Center,
No.1568 Huashan Road,
Shanghai China
T: +86 (021) 2208-5840
F: +86 (021) 2208-5866

SPX FLOW

KOREA

#940-1 Yerim-Ri
Jeonggwan-Myeon
Gijang-Gun
Busan
Rep. of Korea
T: +82 (51) 728-5360
F: +82 (51) 728-5359

SPX FLOW

4647 SW 40th Avenue
Ocala, Florida 34474-5788 U.S.A.
P: (724) 745-1555
F: (724) 745-6040
E: hankison.americas@spxflow.com
www.spxflow.com/hankison

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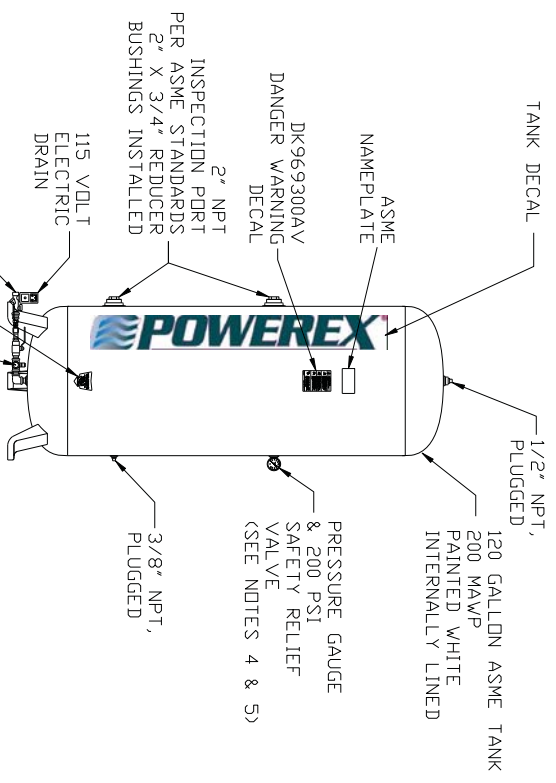
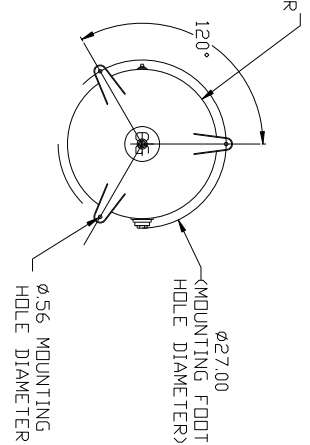
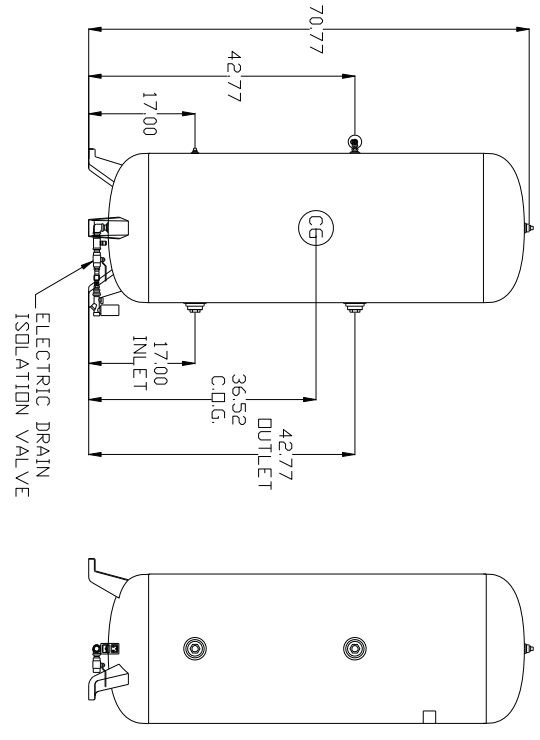
Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing. Please contact your local sales representative for product availability in your region. For more information visit www.spxflow.com.

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Bulletin: HPR-HPRN_NA Version: 09/2016 Issued: 07/2015

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REV	DATE	DESCRIPTION	DATE	BY	CHKD
B-1	REV	INCLUDE TO PRODUCTION	8/15/12	POWEREX	DES
C-1	REV	ASME NAMEPLATE REMOVED	9/10/12	POWEREX	DES
D-1	REV	UPDATED POWEREX DECAL	7/20/14	POWEREX	DES



- NOTES:
- 1) READ THE SAFETY GUIDELINES IN THE GENERAL MANUAL.
 - 2) RELEASE ALL PRESSURE AND DEPRESSURE VESSEL PER ASME STANDARDS PERFORMING MAINTENANCE.
 - 3) MAXIMUM WORKING PRESSURE = 200 PSI
 - 4) SAFETY RELIEF VALVE PRESSURE MUST NOT EXCEED TANK PRESSURE RATING ON THE ASME LABEL.
 - 5) SAFETY RELIEF FLOW CAPACITY MUST BE GREATER THAN THE COMPRESSOR SYSTEM FLOW CAPACITY.
 - 6) DRAIN WATER FROM TANK DAILY, ADJUST E-DRAIN ACCORDING TO WATER PRODUCED FROM SYSTEM.
 - 7) DO NOT WELD OR ALTER THE PRESSURE VESSEL IN ANY WAY, THIS WILL VOID THE ASME CERTIFICATION AND MAY CAUSE SERIOUS SAFETY HAZARDS.

See DSA approved plans for anchorage to concrete slab-on-grade

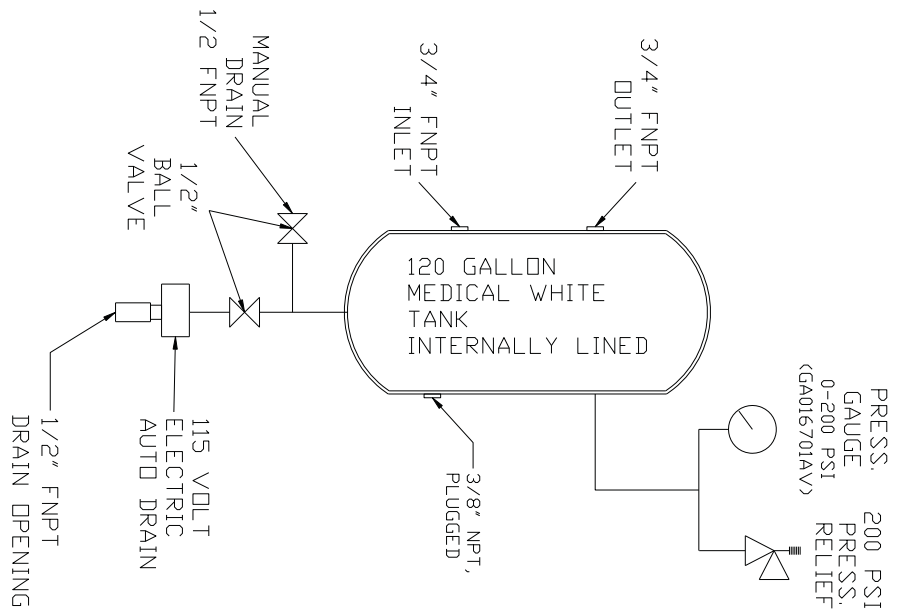
center of gravity (CG)
TANK WEIGHT: 240 LBS.

REV	DATE	DESCRIPTION	DATE	BY	CHKD
B-1	REV	INCLUDE TO PRODUCTION	8/15/12	POWEREX	DES
C-1	REV	ASME NAMEPLATE REMOVED	9/10/12	POWEREX	DES
D-1	REV	UPDATED POWEREX DECAL	7/20/14	POWEREX	DES

TITLE: POWEREX 1200 PART NAME: POWEREX 1200 PACK-OUT RECEIVER	SHEET: 1 OF 3 SCALE: 1:1.0
DESIGNED BY: [Name] CHECKED BY: [Name] DATE: 8/15/12	APPROVED BY: [Name] DATE: 8/15/12

8 7 6 5 4 3 2 1

REV	DATE	BY	CHK	DESCRIPTION
B-1	8/15/12	RES	RES	INCLUDE TO PRODUCTION
C-1	8/15/12	RES	RES	ADDED MANUAL DRAIN BRANCH
B-1	7/26/10	RES	RES	UPDATES PROTECT SEAL

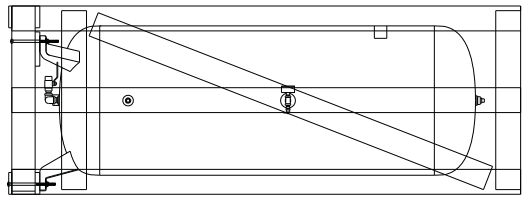
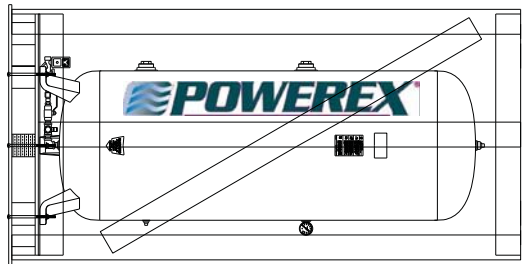
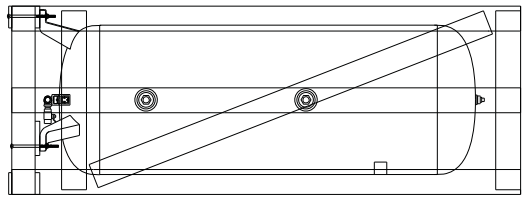
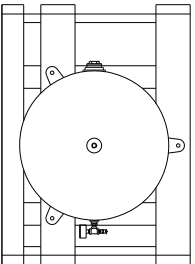


PACK-OUT RECEIVER 120G FLOW SCHEMATIC PART NAME: N/A		POWEREX 120 GALLON MEDICAL WHITE TANK 120 GALLON MEDICAL WHITE TANK 120 GALLON MEDICAL WHITE TANK	
DATE: 8/15/12 TIME: 10:00 AM DRAWN BY: RES CHECKED BY: RES APPROVED BY: RES	DATE: 8/15/12 TIME: 10:00 AM DRAWN BY: RES CHECKED BY: RES APPROVED BY: RES	DATE: 8/15/12 TIME: 10:00 AM DRAWN BY: RES CHECKED BY: RES APPROVED BY: RES	DATE: 8/15/12 TIME: 10:00 AM DRAWN BY: RES CHECKED BY: RES APPROVED BY: RES

120 GALLON MEDICAL WHITE TANK INTERNALLY LINED	3/4" FNPT INLET	3/4" FNPT OUTLET	3/8" NPT, PLUGGED
1/2" FNPT MANUAL DRAIN VALVE	1/2" FNPT BALL VALVE	115 VOLT ELECTRIC AUTO DRAIN	1/2" FNPT DRAIN OPENING

120 GALLON MEDICAL WHITE TANK INTERNALLY LINED	3/4" FNPT INLET	3/4" FNPT OUTLET	3/8" NPT, PLUGGED
1/2" FNPT MANUAL DRAIN VALVE	1/2" FNPT BALL VALVE	115 VOLT ELECTRIC AUTO DRAIN	1/2" FNPT DRAIN OPENING

REV	DATE	DESCRIPTION	DATE	BY	CHK	NAME	CRIB
B-1	REL.	INCLUDE TO PRODUCTION	8/15/12	PRESTON	DES	SPR	
C-1	REL.	ADDED HOLEY REBAR BRIDGES	9/10/13	PRESTON	DES	SPR	
B-1	REL.	UPDATED POWEREX LOGO	7/26/16	PRESTON	REL	SPR	



CN677400AJ
HEAT TREATED
WOOD SKID

8 7 6 5 4 3 2 1

PACK-OUT RECEIVER

120G CRATED LAYOUT

Part No: AR027400ML

DATE: 8/15/12

POWEREX

120G CRATED LAYOUT

Part No: AR027400ML

120G CRATED LAYOUT

Part No: AR027400ML

DATE: 8/15/12

POWEREX

120G CRATED LAYOUT

Part No: AR027400ML

Location: _____

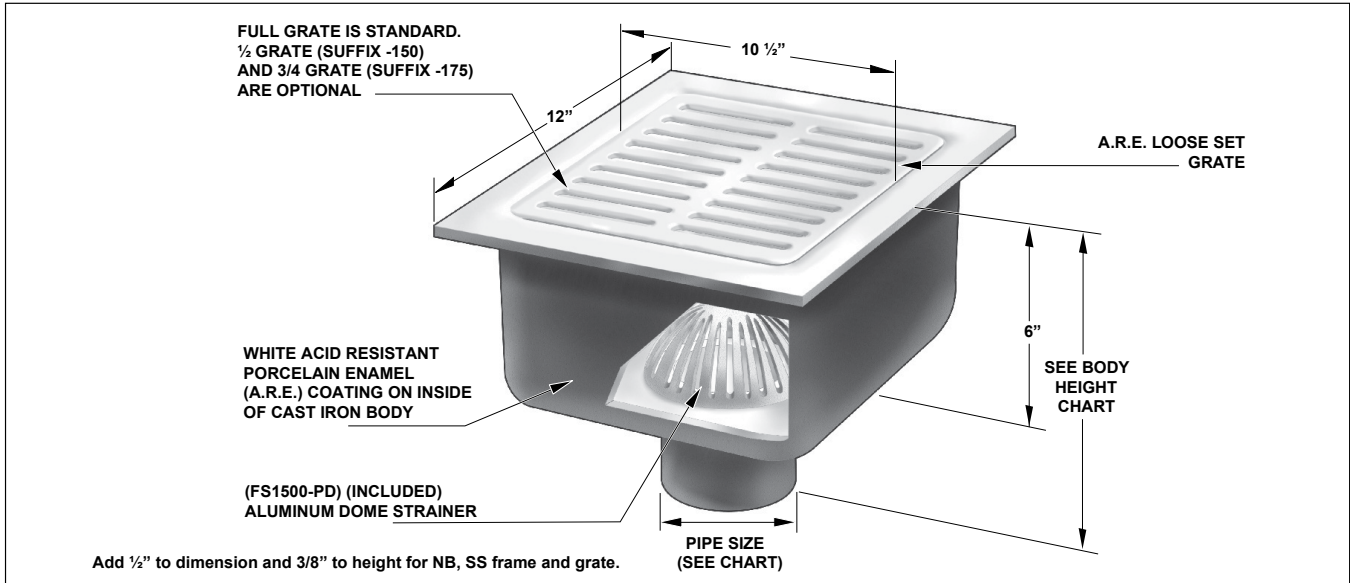


FS1720

12" X 12" X 6" FLOOR AREA AND INDIRECT SANITARY WASTE DRAIN

Specification: MIFAB® Series FS1720, 12" x 12" x 6" deep cast iron floor area and indirect sanitary waste drain complete with white acid resistant porcelain enamel coated interior and loose set grate. Anti-splash aluminum dome strainer included.

Function: Used in kitchens, restaurants, grocery stores, hospitals, schools, and other areas that require a large volume sanitary drain. The light duty grate is not suitable for foot traffic.



*Indicates outlet size and connection available with transition outlet body only

**4" Inside Caulk Outlet body only available with -FL anchor flange Outlet sizes indicated by the * are available with the transition outlet body only

PIPE SIZE	BODY HEIGHT				
	NO HUB (STANDARD)	PUSH ON (P)	INSIDE CAULK (X)	THREADED (T)	PVC (-30) / ABS (-31)
○ 2" (51)	<input type="checkbox"/> 7 3/4" (197)	<input type="checkbox"/> 7 3/4" (197)	<input type="checkbox"/> 8 5/8" (219)	<input type="checkbox"/> *8 1/2" (216)	<input type="checkbox"/> *9 1/4" (235)
○ 3" (76)	<input type="checkbox"/> 7 3/4" (197)	<input type="checkbox"/> 7 3/4" (197)	<input type="checkbox"/> 8 5/8" (219)	<input type="checkbox"/> *8 7/8" (225)	<input type="checkbox"/> *9 1/4" (235)
○ 4" (102)	<input type="checkbox"/> 7 3/4" (197)	<input type="checkbox"/> *8 7/8" (225)	<input type="checkbox"/> 8 5/8" (219)	<input type="checkbox"/> *8 7/8" (225)	<input type="checkbox"/> *9 1/4" (235)

*Indicates outlet size and connection available with transition outlet body only. Outlet sizes indicated by the * are available with the transition outlet body only.

Suffix	Description
<input type="checkbox"/> -1	Full NB grate and frame
<input type="checkbox"/> -3	Full SS grate and frame
<input type="checkbox"/> -5	Sediment bucket (FS1700-PB)
<input type="checkbox"/> -6	Security screws (H-1039A, 4 pcs) (-1, -3 only)
<input type="checkbox"/> -7	Trap seal primer connection
<input type="checkbox"/> -8	Backwater Valve (BV1250 Series) (2", 3", 4")
<input type="checkbox"/> -9	Hinged grate (-3 only)
<input type="checkbox"/> -21	Secondary flat strainer (FD-9600 Series)
<input type="checkbox"/> -22	Less grate
<input type="checkbox"/> -30	PVC socket connection W/A.R.E. Body (2", 3", 4")
<input type="checkbox"/> -31	ABS socket connection W/A.R.E. body (2", 3", 4")
<input type="checkbox"/> -32	Deep seal trap (2", 3", 4" no hub) (MI-950 Series)
<input type="checkbox"/> -50	A.R.E. coated cast iron funnel
<input type="checkbox"/> -51	2 1/2" round center hole in grate (-1, -3 only)
<input type="checkbox"/> -69	Stainless steel sediment bucket (FS1500-PB-3)
<input type="checkbox"/> -83	Stainless steel mesh screen over sediment bucket (add to S.S. Bucket)
<input type="checkbox"/> -90	Threaded side outlet
<input type="checkbox"/> -90NH	No hub side outlet
<input type="checkbox"/> -95	Client logo (-1, -3 only)
<input type="checkbox"/> -150	1/2 grate
<input type="checkbox"/> -175	3/4 grate
<input type="checkbox"/> -BA	Buy American Act compliant product
<input type="checkbox"/> -PA	Pennsylvania Steel Act compliant product
<input type="checkbox"/> -C	Membrane clamp
<input type="checkbox"/> -F4	4" round funnel
<input type="checkbox"/> -F6	6" round funnel
<input type="checkbox"/> -G	4" x 9" oval funnel
<input type="checkbox"/> -J	3" x 1" oval funnel
<input type="checkbox"/> P	Push on outlet (2", 3" or 4")
<input type="checkbox"/> (Standard)	No hub outlet
<input type="checkbox"/> T	Threaded outlet (2", 3" or 4")
<input type="checkbox"/> X	Inside caulk outlet (2", 3" or 4")
<input type="checkbox"/> -Z	Extended wide elastomeric flange (with -FL only)

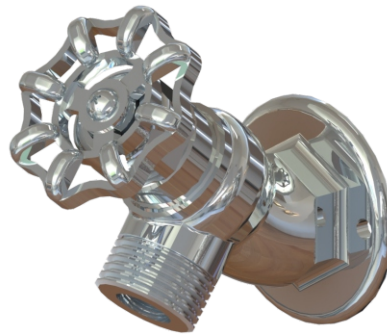
CALIFORNIA PROPOSITION 65 WARNING. This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Job Name: _____ Page No: _____
 Section No: _____ Contractor: _____
 Schedule No: _____ Purchase Order No: _____



Hose & Supply Boxes 8120-LF Series

Hose Valves



8120CP-LF



8125CR-LF

Fixture May Show Some Available Options

Please visit www.acorneng.com for most current specifications.

Acorn Hose Valves are CUPC certified by IAPMO for U.S. and Canada. Hose valves are recommended for installation in indoor and outdoor locations not subject to freezing. Hose valves include a heavy rough brass body, furnished with a lockshield bonnet and removable loose key wheel handle. Valves close with the water pressure and feature a replaceable cartridge which contains all wearing parts including the seat. Inlet is 3/4" NPTI, outlet is 3/4" NPSH. Vacuum breakers are atmospheric type and conform to the requirements of ASSE Standard 1011. Hose valves meets the lead free requirements where the wetted surface of this product contacted by water contains less than 0.25% lead. Check local code authority for vacuum breaker requirements

Installation: The 8120-LF and 8121-LF, horizontally supplied valves have integral wall flanges and both are used indoor and outdoor. 8125-LF and 8126-LF, vertically standpipe valves are normally used in outdoor planting areas and often provided in a rough brass finish.

GUIDE SPECIFICATION

Provide and install Acorn Hose Valves model (specify model number) cartridge - operated hose valve with lock shield bonnet and removable loose key handle. Interior wall hose valves shall be polished chrome finish, exterior valves shall be rough chrome-plated.



Hose & Supply Boxes 8120-LF: Hose Valves

BASE MODEL NUMBER (Must Specify)

HOSE VALVE

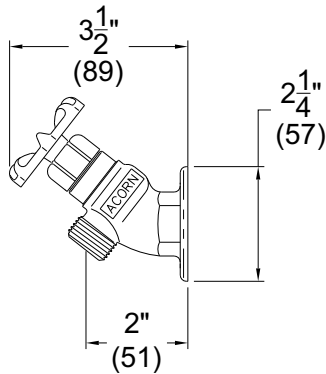
BENT NOSE WITH FLANGE

- 8120-LF Less Vacuum Breaker
- 8120CP-LF Polished Chrome-Plated Less Vacuum Breaker
- 8120CR-LF Rough Chrome-Plated Less Vacuum Breaker
- 8121-LF With Vacuum Breaker
- 8121CP-LF Polished Chrome-Plated With Vacuum Breaker
- 8121CR-LF Rough Chrome-Plated With Vacuum Breaker

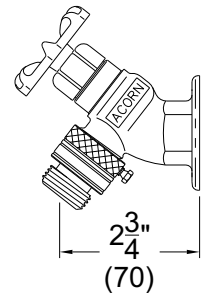
BENT NOSE

- 8125-LF Less Vacuum Breaker
- 8125CP-LF Polished Chrome-Plated Less Vacuum Breaker
- 8125CR-LF Rough Chrome-Plated Less Vacuum Breaker
- 8126-LF With Vacuum Breaker
- 8126CP-LF Polished Chrome-Plated With Vacuum Breaker
- 8126CR-LF Rough Chrome-Plated With Vacuum Breaker

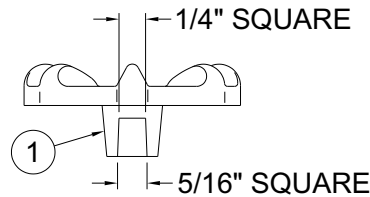
Please visit www.acorneng.com for most current specifications.



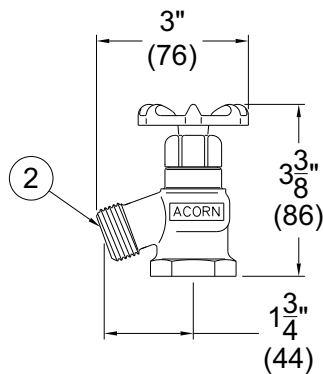
8120-LF



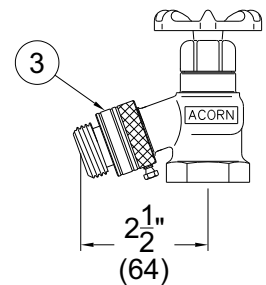
8121-LF



SCALE 2X



8125-LF



8126-LF

NOTES:

1. Wheel Handle (removable).
2. 3/4"-11.5 NHE Hose Connection.
3. Vacuum Breaker.

WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov

<p>Important: Installation instructions and current rough-in are furnished with each fixture. Do not rough in without certified dimensions. <small>Dimensions are subject to manufacturer's tolerance of plus or minus 1/4" and change without notice. Acorn assumes no responsibility for use of void or superseded data. © Copyright 2008 Acorn Engineering Company</small></p>	
<p style="text-align: center;">Selection Summary</p> <p>Model No. & Option _____</p> <p>Quantity _____</p>	<p style="text-align: center;">Approved for Manufacturing</p> <p>Company _____ Title _____</p> <p>Signature _____ Date _____</p>



DECORATIVE MOUNTING KIT
MODEL 85640 DECORATIVE REEL CABINET
MODEL 85641 UNIVERSAL MOUNTING KIT
MODEL 85642 DECORATIVE MOUNTING KIT

RETAIN THIS INFORMATION FOR FUTURE REFERENCE

MODEL 85640
DECORATIVE REEL CABINET
PARTS REQUIRED

PARTS	QTY	DESCRIPTION
247636	1	REEL CABINET ASSEMBLY
68298	1	DECAL SHEET

MODEL 85641
DECORATIVE REEL CABINET
PARTS REQUIRED

PARTS	QTY	DESCRIPTION
50015	48	SCREWS
66220	48	LOCK WASHER
243784	48	NUT, TWIRL 3/8-16
247642	2	MOUNTING STRUT (12 BANK

MODEL 85642
DECORATIVE MOUNTING KIT
PARTS REQUIRED

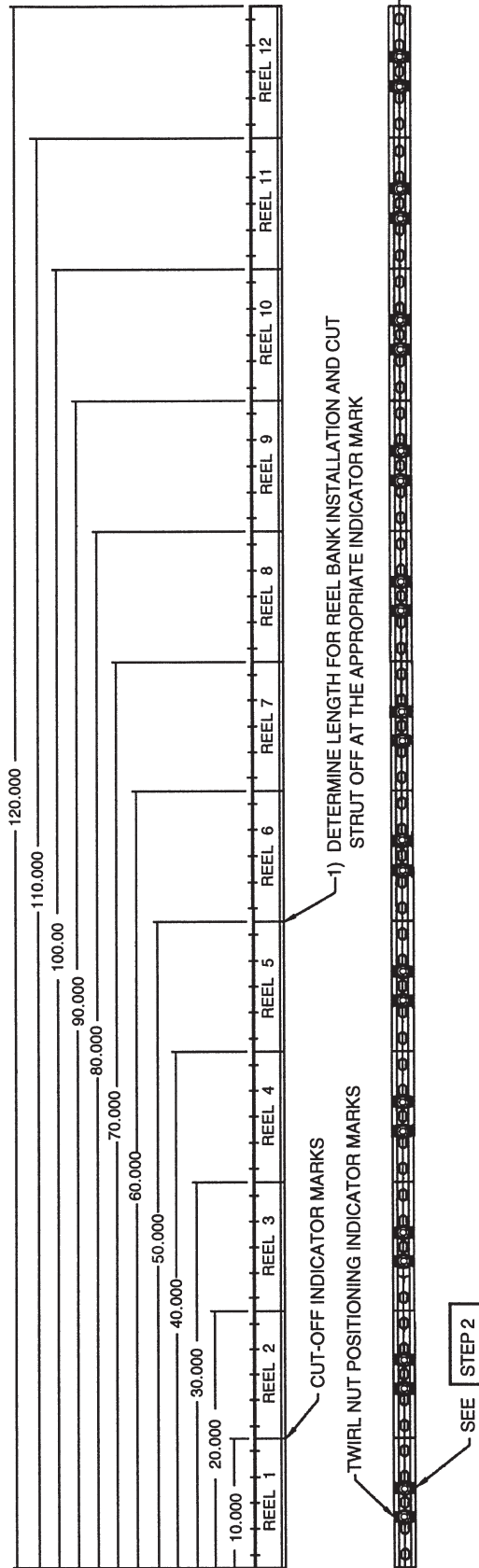
PARTS	QTY	DESCRIPTION
50033	4	HEX SCREW .250-20 X 1.00"
50052	1	HEX SCREW .375-16 X 2.00"
50060	4	HEX SCREW .250-20 X .562"
50165	4	HEX SCREW .375-16 X .75"
51005	1	HEX NUT
51010	4	NUT, HEX .250-20
51304	4	LOCK NUT .250-16
66220	5	LOCK WASHER .375 I.D.
243781	1	BRACKET, MOUNTING
247635	1	ROLLER HOUSING ASSEMBLY
260424	1	BRACKET, ASSEMBLY
260425	1	BRACKET, ASSEMBLY
273133	1	PLATE, ADAPTER ASSEMBLY
273137	1	PLATE, CLAMP

ASSEMBLY

Assemble the reel cabinet and mounting kits by performing Subsets (1) thru (17) in **STEP 1** thru **STEP 8**



STEP 1
 CUTTING MOUNTING STRUTS TO PROPER LENGTH



STEP 2 INSTALLING TWIRL NUTS INTO MOUNTING STRUTS

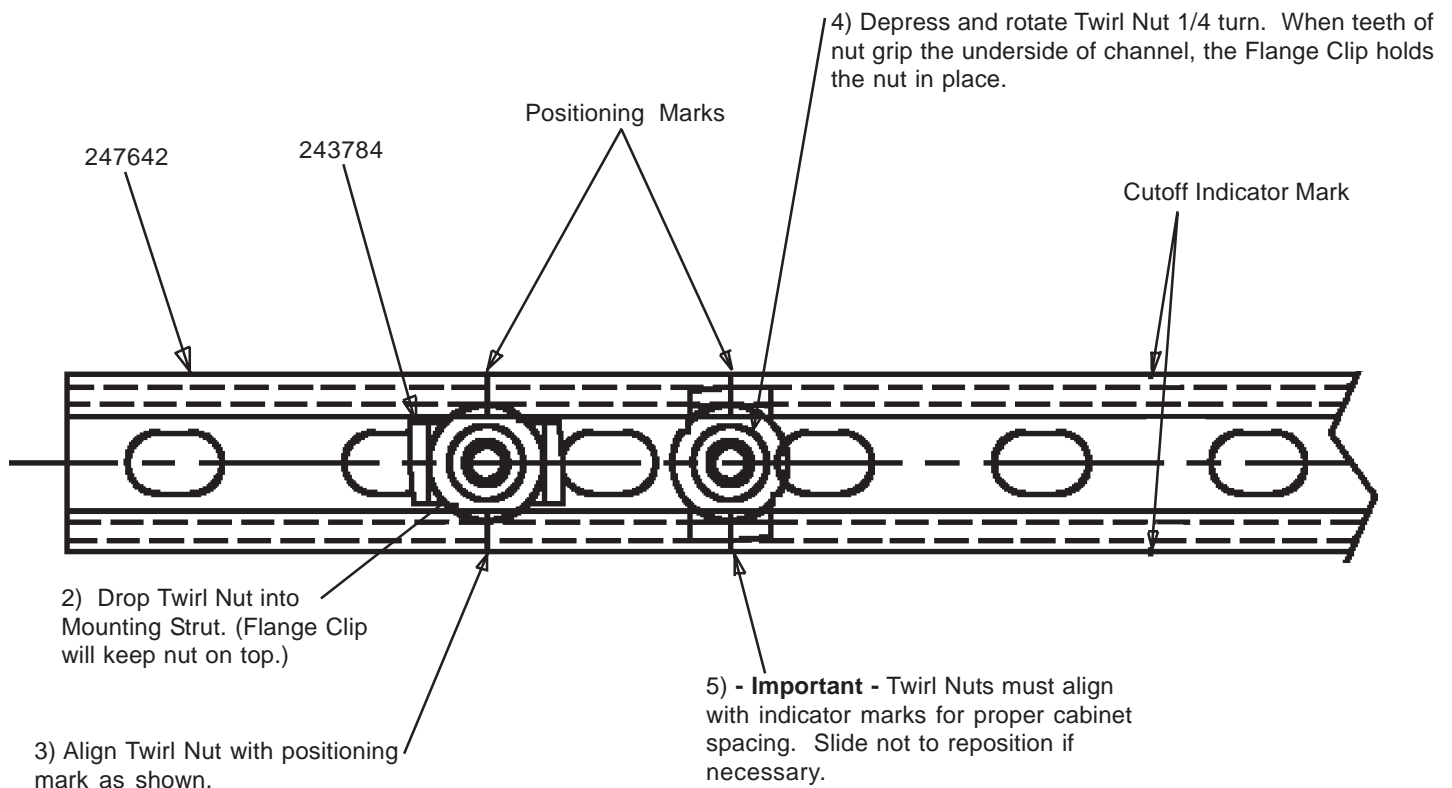
PARTS REQUIRED

PARTS	QTY	DESCRIPTION
50015	48	SCREWS
66220	48	LOCK WASHER
243784	48	NUT, TWIRL 3/8-16
247642	2	MOUNTING STRUT

NOTE:

Repeat Step 2 through 5 as required for multiple reel installation.

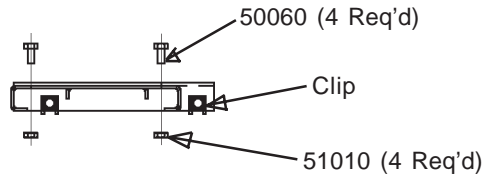
Part number 50015 and 66220 will be used later during the assembly process.



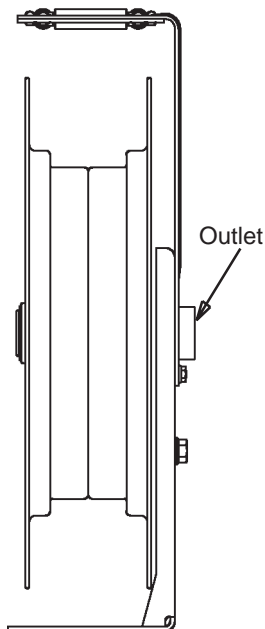
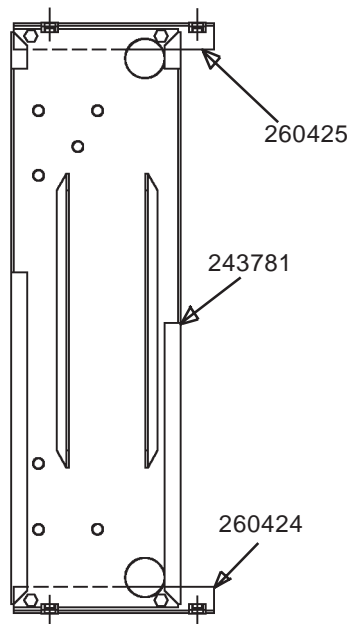
STEP 3 ASSEMBLY OF THE MOUNTING BRACKET

PARTS REQUIRED PER REEL

PARTS	QTY	DESCRIPTION
50060	4	HEX HEAD SCREW 1/4-20X9/16
51010	4	NUT, HEX 1/4-20
243781	1	BRACKET, MOUNTING
260424	1	BRACKET, ASSEMBLY
260425	1	BRACKET, ASSEMBLY



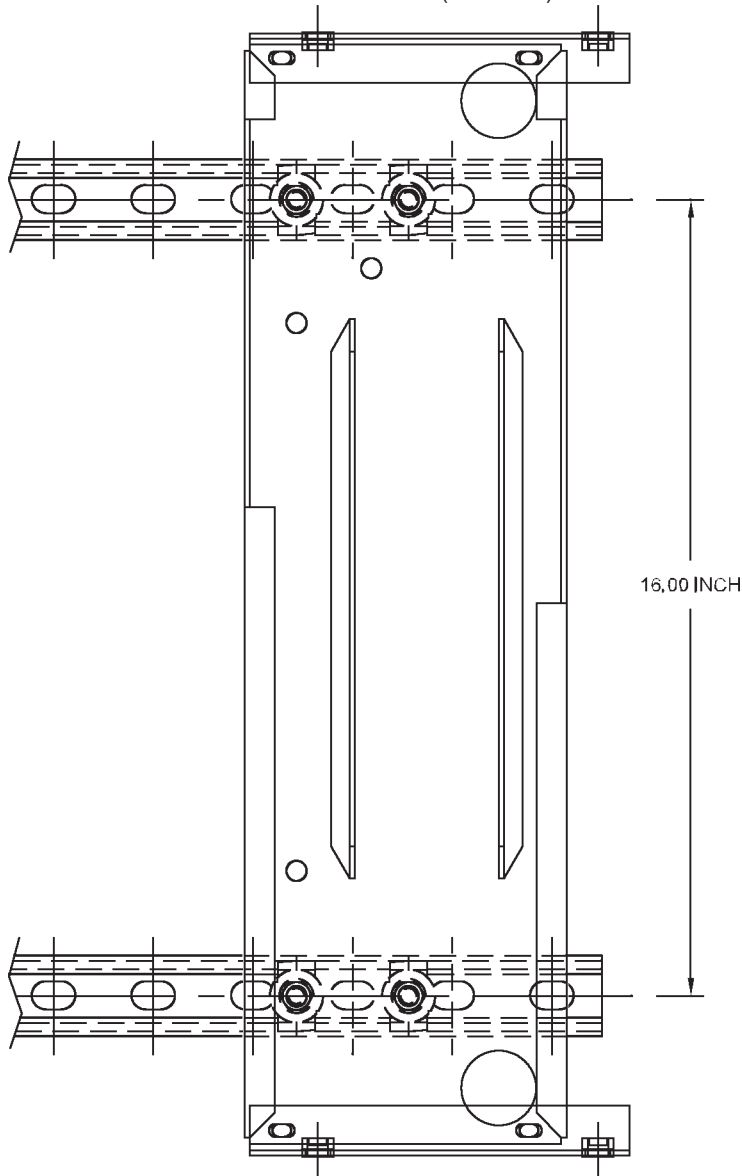
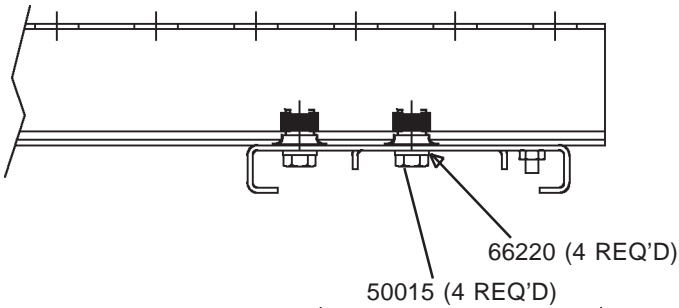
IMPORTANT
 Align Bracket
 Clips to cabinet



STEP 4 INSTALLING MOUNTING BRACKET TO STRUTS.

PARTS REQUIRED PER REEL

PARTS	QTY	DESCRIPTION
50015	4	HEX SCREWS .375-16x1-1/4"
66220	4	LOCK WASHER .375 I.D



6) Recheck Twirl Nut positioning. Align mating holes in Mounting Bracket with Twirl Nuts in mounting strut and assemble with four Lockwashers and four Hex Head screws. Hand tighten only at this time. Check referenced dimension and squareness of assembly. Tighten hex head screws to secure.

7) Repeat step 6 for each reel.

8) - **Important** - the Strut and Bracket assemblies can be mounted to i-beams, wood joists or suspended from the ceiling. The Mounting Struts are slotted to permit flexibility in location of anchor bolts.

Mounting struts must be securely anchored to mounting structure. Consult your local building code for proper specified materials and mounting.

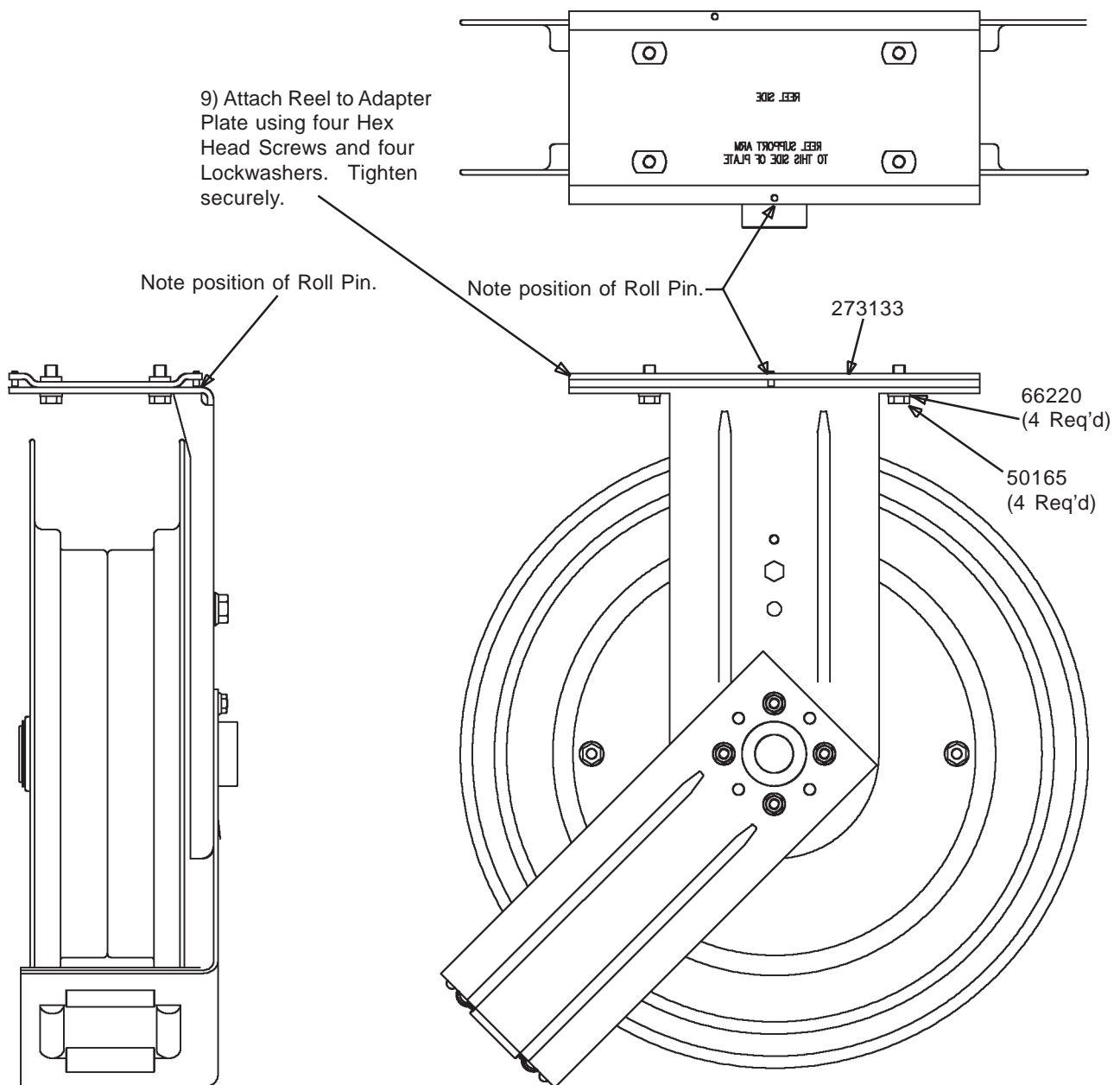
Note: Mounting structure must be anchored to support the following maximum weight of lubreel banks.

- Two unit 350 lbs.
- Four unit 700 lbs.
- Six unit 1050 lbs.
- Eight unit 1400 lbs.
- Ten unit 1750 lbs.
- Twelve unit 2100 lbs.

STEP 5 INSTALLING REEL TO MOUNTING BRACKET.

PARTS REQUIRED PER REEL

PARTS	QTY	DESCRIPTION
273133	1	ADAPTER PLATE
50165	4	HEX SCREWS .375-16x.75"
66220	4	LOCK WASHER .375 I.D

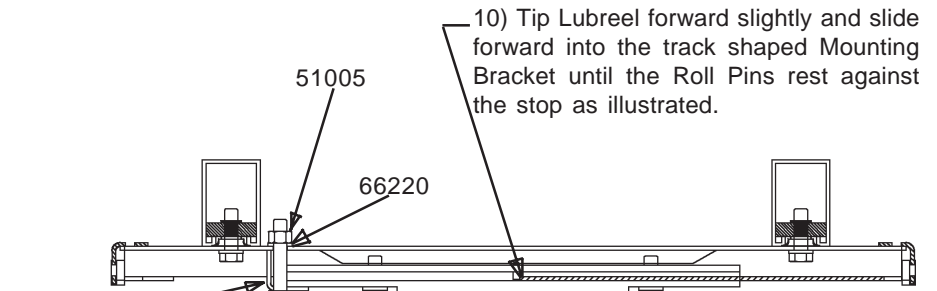
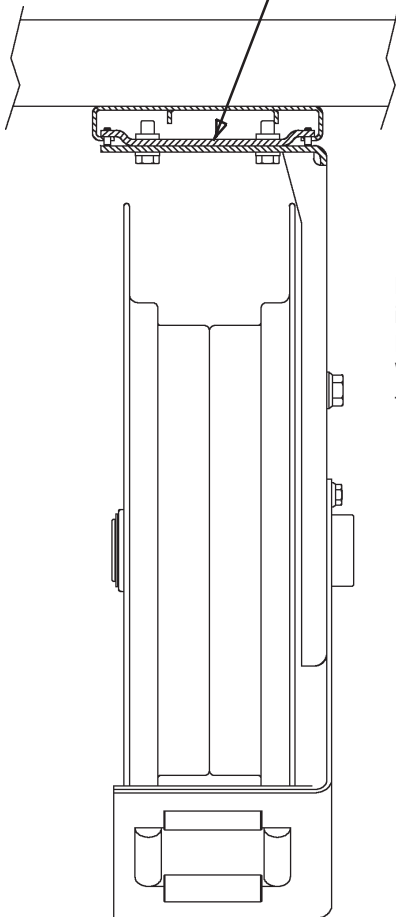


STEP 6 INSTALLING LUBREEL AND ADAPTER PLATE IN MOUNTING PLATE.

PARTS REQUIRED PER REEL

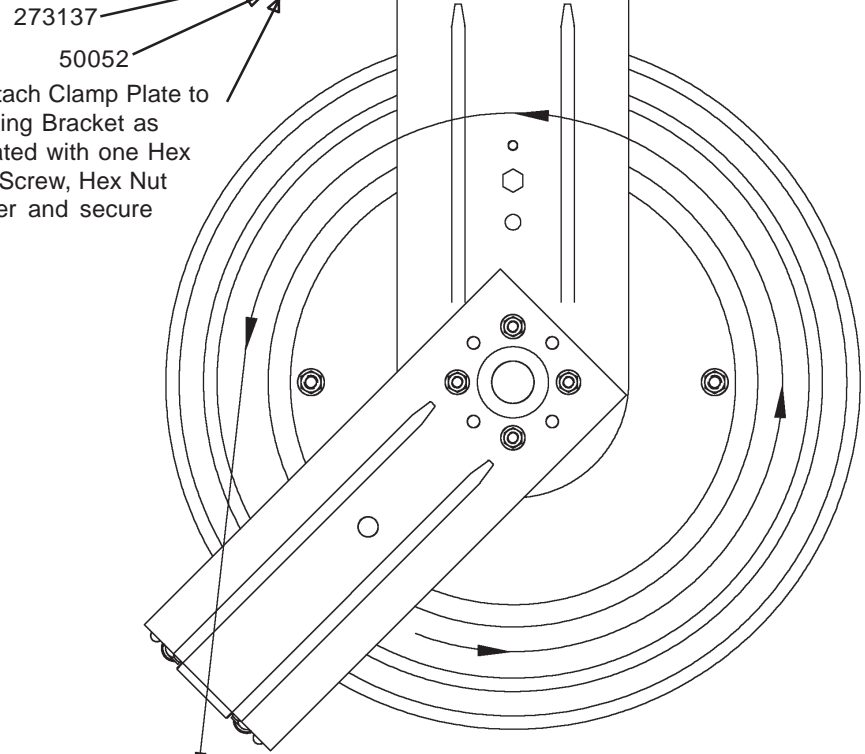
PARTS	QTY	DESCRIPTION
273137	1	CLAMP PLATE
50052	1	HEX SCREWS .375-16x2.00"
51005	1	HEX NUT .375 - 16
66220	1	LOCKWASHER .375 I.D.

Center Adapter Plate in track shaped Mounting Bracket.



10) Tip Lubreel forward slightly and slide forward into the track shaped Mounting Bracket until the Roll Pins rest against the stop as illustrated.

11) Attach Clamp Plate to Mounting Bracket as illustrated with one Hex Head Screw, Hex Nut Washer and secure tightly.

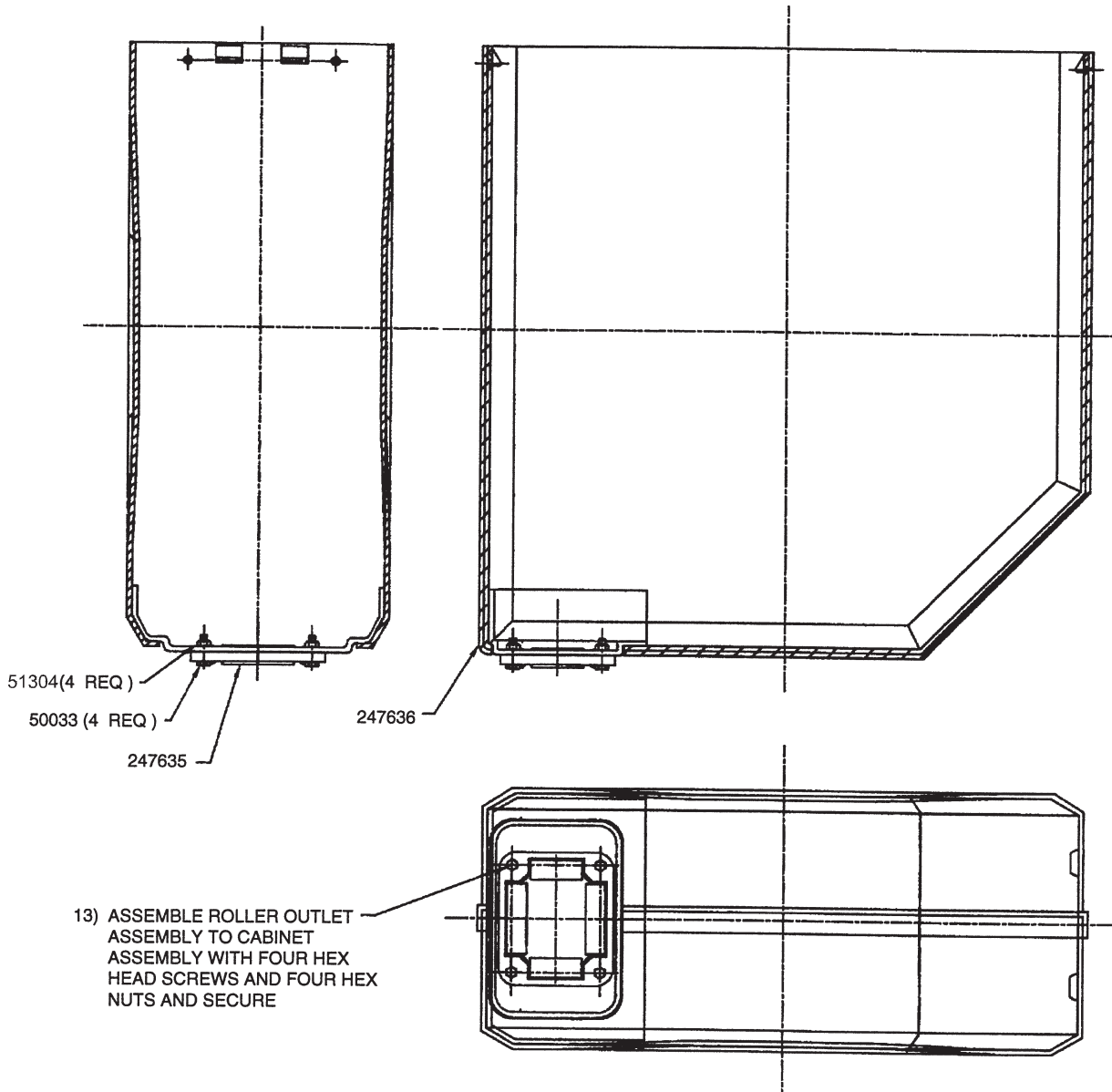


12) Install Connecting Hose and Delivery Hose to Reel at this time. The use of optional Elbow or Swivel Elbow is recommended for the Connecting Hose. Refer to the Owner's Manual on the Lubreel being used for proper installation and Hose Clamp positioning.

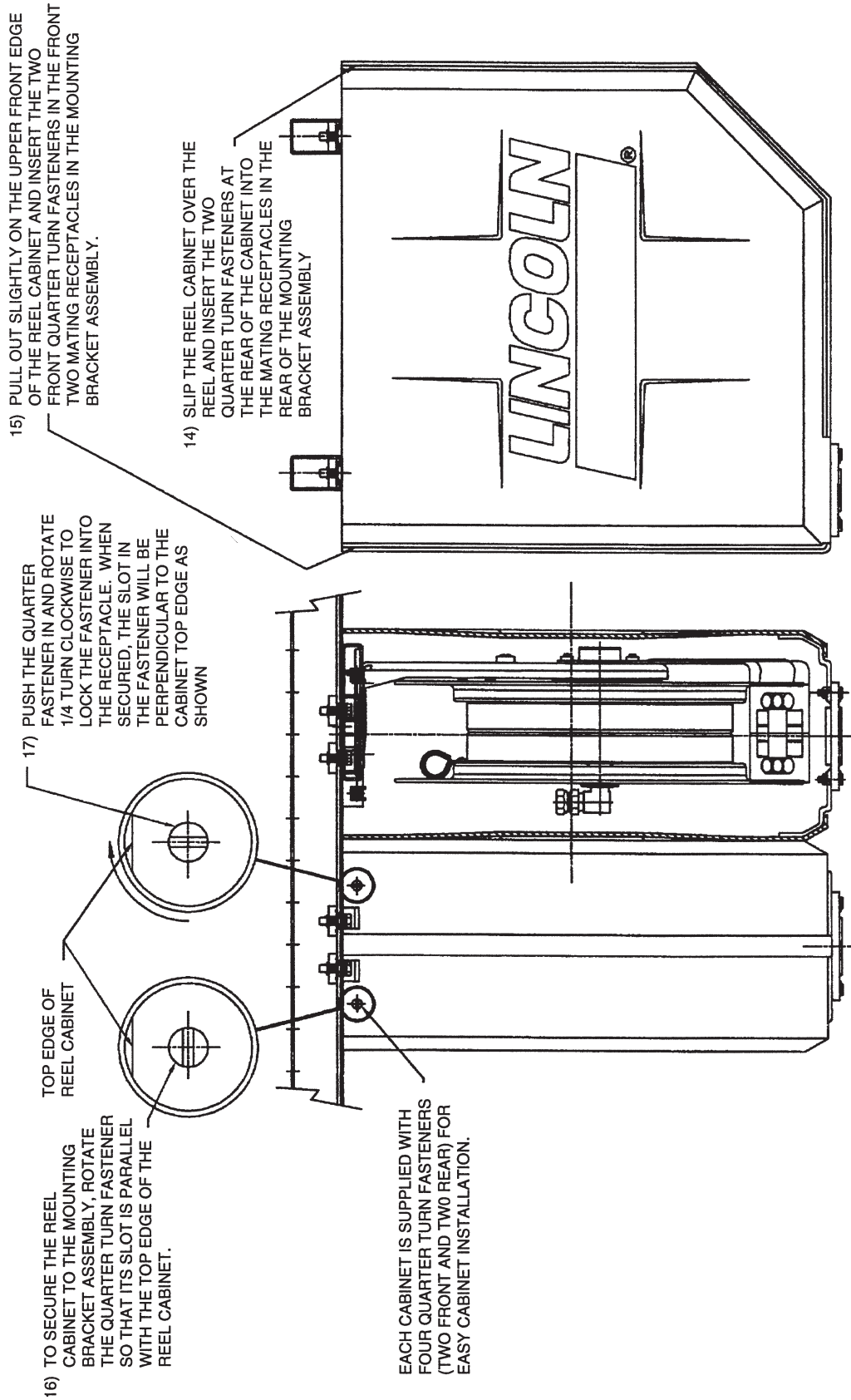
STEP 7 ASSEMBLE 247635 ROLLER HOUSING ASSEMBLY TO 247636
 CABINET ASSEMBLY.

PARTS REQUIRED PER REEL

PARTS	QTY	DESCRIPTION
50033	4	HEX SCREW .250-20 X 1.00"
51304	4	HEX LOCK NUT .250-20
247635	1	ROLLER HOUSING ASSEMBLY
247636	1	CABINET ASSEMBLY



STEP 8 INSTALLING CABINET ASSEMBLY TO MOUNTING BRACKET ASSEMBLY.



DECORATIVE MOUNTING KIT
MODEL 85640 DECORATIVE REEL CABINET
MODEL 85641 UNIVERSAL MOUNTING KIT
MODEL 85642 DECORATIVE MOUNTING KIT



Americas:
One Lincoln Way
St. Louis, MO 63120-1578
USA
Phone +1.314.679.4200
Fax +1.800.424.5359

Europe/Africa:
Heinrich-Hertz-Str 2-8
D-69183 Walldorf
Germany
Phone +49.6227.33.0
Fax +49.6227.33.259

Asia/Pacific:
25 Int'l Business Park
#01-65 German Centre
Singapore 609916
Phone +65.562.7960
Fax +65.562.9967

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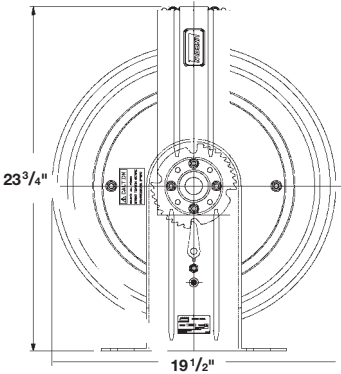
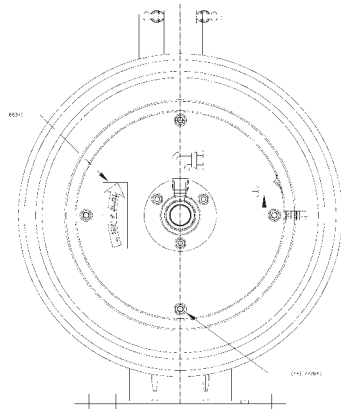
Web site:
www.lincolnindustrial.com



Lincoln's new 87000 Hose Reel family offers enhanced engineering design features to meet the needs of your demanding workplace with the value you require. An integral part of Lincoln's complete lubrication system, the 87000 Series serves your dispensing needs—low pressure for air or water, medium pressure for petroleum and synthetic based fluids (for example oil and transmission fluid) and high pressure for grease. Applications: New car/truck dealers, light duty lube trucks, fleet maintenance garages, oil change outlets, municipal garages, industry, truck stop oil change centers

Features

- Strong and reliable
- Seals are compatible with petroleum and synthetic based fluids
- Models for low, medium and high pressure
- Easy installation requirements
- Heavy gauge steel base and support provide exceptional strength to assembly
- Mounting base accepts both 6M/6H and HD 82206 mounting patterns and is slotted for easy installation
- Heavy duty polyurethane seals eliminate leakage
- Brass bushings provide long service life
- Baked-on powder coat finish creates a rugged corrosion resistant reel
- Stainless steel axle for air/water applications
- Low-, medium-, and high-pressure models
- Extra-wide hose guide eliminates flex
- 180° “opposed ratchet” design provides greater hose length adjustments
- Seven-position roller outlet arm with four-way roller assembly



Bare Reel Specifications

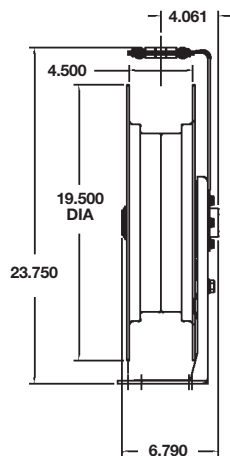
Model	Application	Rating	Hose Capacity		Working Pressure Bare Reel, psi	Inlet/Outlet(f)
			Type	Length		
87500	Grease	SAE100R2	75, 76	50'	8000	3/8" NPTF
87300	Oil	SAE100R3	73	60'	2500	1/2" NPTF
87700	Air, ATF, Water, WW	RMA	Class A	60'	2500	1/2" NPTF

Mounting Kit

Model 85641

Universal kit for mounting up to 12 reels, any series, open or decorative.

NOTE: For heavy duty lube truck applications, we recommend our Heavy Duty Reel series.



Basic Grease Assemblies *Less Hose End Control*

Model Number	Description	Included with Reel Assemblies				
		Bare Reel Model	Delivery Hose	Connecting Hose	Ball Stop	Control Valve or Meter
87532	1/4" x 30'	87500	75360	75024	85516	NA
87552	1/4" x 50'	87500	75600	75024	85516	NA

Complete Grease Assemblies with Universal Swivel & Control Valve

87532G	1/4" x 30'	87500	75360	75024	85516	81387 & 740
87552G	1/4" x 50'	87500	75600	75024	85516	81387 & 740

Medium Pressure Reels & Assemblies

Basic Fluid Lubricant Assemblies *Less Hose End Control*

87334	1/2" x 30'	87300	73360	73024	85517	NA
87354	1/2" x 50'	87300	73600	73024	85517	NA

Complete Fluid Lubricant, Antifreeze & WW Fluid Assemblies with Control Valve or Meter

30' OIL REEL MODELS						
87334C	1/2" x 30' with Control Valve	87300	73360	73024	85517	769
87334D	1/2" x 30' with Electronic Meter	87300	73360	73024	85517	977
87334E	1/2" x 30' with Liter Meter	87300	73360	73024	85517	899
87334L	1/2" x 30' with Pints Gear Lube Meter	87300	73360	73024	85517	878
87334M	1/2" x 30' with Quarts Meter	87300	73360	73024	85517	877
87334N	1/2" x 30' with Gear Lube Control Valve	87300	73360	73024	85517	780
87334R	1/2" x 30' with Control Valve	87300	73360	73024	85517	779
87334T	1/2" x 30' with Quarts ATF Meter	87300	73360	73024	85517	883

50' OIL REEL MODELS						
87354C	1/2" x 50' with Control Valve	87300	73600	73024	85517	769
87354D	1/2" x 50' with Electronic Meter	87300	73600	73024	85517	977
87354E	1/2" x 50' with Liter Meter	87300	73360	73024	85517	899
87354L	1/2" x 50' with Pints Gear Lube Meter	87300	73600	73024	85517	878
87354M	1/2" x 50' with Quarts Meter	87300	73600	73024	85517	877
87354N	1/2" x 50' with Gear Lube Control Valve	87300	73600	73024	85517	780
87354R	1/2" x 50' with Control Valve	87300	73600	73024	85517	779
87354T	1/2" x 50' with Quarts ATF Meter	87300	73600	73024	85517	883

Low Pressure Reels & Assemblies

Basic Air, Water *Less Hose End Control*

87732	1/4" x 30'	87700	72360	74024	85515	NA
87733	3/8" x 30'	87700	72360A	74024	85516	NA
87752	1/4" x 50'	87700	72600	74024	85515	NA
87753	3/8" x 50'	87700	72600A	74024	85516	NA
87754	1/2" x 50'	87700	74600	74024	85517	NA

Complete Air Assemblies with Air Coupler & Tire Chuck

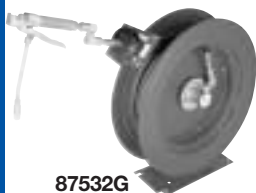
87732A	1/4" x 30'	87700	72360	74024	85515	815/11659/66951
87733A	3/8" x 30'	87700	72360A	74024	85516	815/11659/66951
87752A	1/4" x 50'	87700	72600	74024	85515	815/11659/66951
87753A	3/8" x 50'	87700	72600A	74024	85516	815/11659/66951
87754A	1/2" x 50'	87700	74600	74024	85517	815/11659/66951

Complete Water Assemblies with Water Bibb Cock

87732W	1/4" x 30'	87700	72360	74024	85515	846 Bibb Cock
87733W	3/8" x 30'	87700	72360A	74024	85516	846 Bibb Cock
87752W	1/4" x 50'	87700	72600	74024	85515	846 Bibb Cock
87753W	3/8" x 50'	87700	72600A	74024	85516	846 Bibb Cock
87754W	1/2" x 50'	87700	74600	74024	85517	846 Bibb Cock



87552



87532G



87334



87334R



87334T



87732



87732A

General Lubrication Products

Heavy Duty Series Hose Reels



The Heavy Duty Series reels are the finest Lincoln lube reels ever designed. Years of engineering, testing and experience preceded their introduction. The quality and reliability the professional expects from Lincoln is not only met but exceeded in form and function by the HD Series. Value, long-life and top performance were the criteria demanded before these incredible reels were released.

You should expect the best from Lincoln... the HD Series reel delivers it.

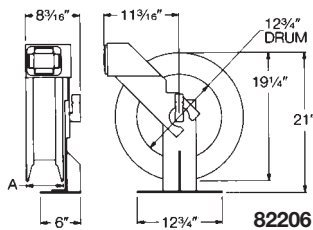


82206

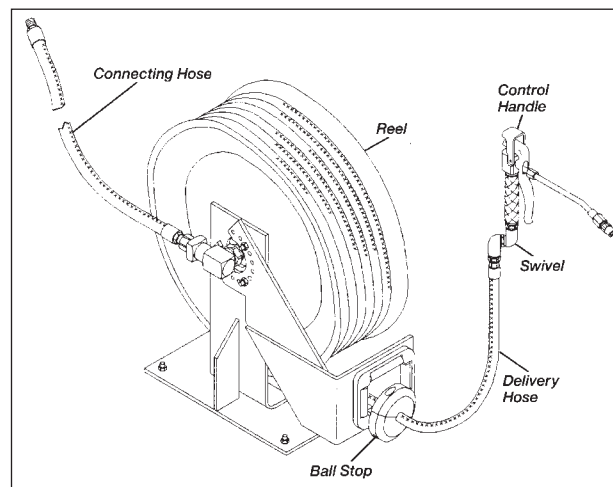
Features

- All bare reels rated for high, medium and low pressure
- Reel assemblies available in standard 30', 40' and 50' hose lengths
- Dual needle roller bearings
- Ball bearing inlet swivel design
- Quick disconnects on delivery and connecting hose
- Spring canister with seals
- Thirteen position roller outlet arm
- Delrin rollers
- Quarter-inch thick steel welded base and roller outlet arm
- Reel sheaves are rolled
- Components individually powder painted for long life and scratch resistance
- All reel assemblies factory assembled and pressure tested to insure a quality leak-free installation every time
- Basic reel assemblies can be ordered with one model number; include delivery hose, ball stop and connecting hose
- Complete reel assemblies with meter, control valve or air coupler are also available as one model number
- Backed by a five year limited warranty. See your Lincoln representative for details

Bare Reel Specifications



Model	Lincoln Reel Application	Hose Capacity			Working Pressure	Sheave Width	Inlet/Outlet
		Rating	Type	Length			
82206	Heavy duty long length	SAE100R2	75	50'	5000	5 1/2"	1/2" NPTF
		SAE100R2	76A	50'	5000	5 1/2"	1/2" NPTF
		SAE100R2	76B	50'	5000	5 1/2"	1/2" NPTF
		SAE100R3	73	50'	5000	5 1/2"	1/2" NPTF
		SAE100R1	78	50'	5000	5 1/2"	1/2" NPTF
		RMA	Class A	50'	5000	5 1/2"	1/2" NPTF



Typical Complete Hose Reel Assembly

Mounting Kits

Model 85641

Universal kit for mounting up to 12 reels, any series, open or decorative.

Lincoln’s decorative overhead hose reel cabinets are constructed of a lightweight, durable resin. This design offers dramatically reduced installation time and ease of maintenance. The modular design eliminates reel enclosure end panels. Decorative cabinet models are dent and scratch resistant, non-conductive and non-corrosive.



Features

Complete model assemblies include

- Reel
- Inlet and delivery hoses
- Ball stop
- Delivery kit (meter, etc.)
- Individual cabinet and base assembly
- Universal mounting bracket 85641 available. Allows installation of up to 12 different reel assemblies—open or decorative. Order separately.

Decorative Reel Assemblies

Reel Type	Hose Length	Cabinet	Mounting Kit (1 Reel)	Universal Mounting Kit (1-12 Reels)
Series 87000 Standard	30'	85640	85642	85641
Series 87000 Standard	50'	85640	85642	85641
Heavy Duty	30'	85240	85242	85641
Heavy Duty	50'	85240	85242	85641

Mounting Kit

Model 85242 Heavy Duty Reel Mounting Kit

Mounts any HD Reel in an overhead reel bank.

Model 85642 Series 87000 Reel Mounting Kit

Mounts any Series 87000 Standard Reel in an overhead reel bank. Includes adapter plate assembly 85345.

Model 85641 Universal Mounting Kit

Universal mounting kit allows installation of up to twelve reels, any series, open or decorative. Twelve reels can be installed side by side with this kit or cut to fit your reel installation needs. Includes 2 mounting struts and hardware to mount 12 reels.

Series D87000, Decorative 30 Feet

Model	Description	Bare Reel	Delivery Hose (30')	Connecting Hose	Ball Stop	Hose End Controls	Swivel	Coupler	Nipple
D87532G	Grease w/Control Valve & Swivel	87500	75360 1/4"	75024	85515	740	81387	NA	NA
D87334C	Motor Oil/Antifreeze w/Electronic Meter	87300	73360 1/2"	73024	85517	769	NA	NA	NA
D87334D	Motor Oil/Antifreeze w/Electronic Meter	87300	73360 1/2"	73024	85517	977	NA	NA	NA
D87334M	Motor Oil/Antifreeze w/Quarts Meter	87300	73360 1/2"	73024	85517	877	NA	NA	NA
D87334E	Motor Oil/Antifreeze w/Liter Meter	87300	73360 1/2"	73024	85517	899	NA	NA	NA
D87334L	Gear Oil w/Pints Meter	87300	73360 1/2"	73024	85517	878	NA	NA	NA
D87334N	Gear Oil w/Control Valve	87300	73360 1/2"	73024	85517	780	NA	NA	NA
D87334R	Gear Oil w/Control Valve	87300	73360 1/2"	73024	85517	779	NA	NA	NA
D87334T	ATF w/Quarts ATF Meter	87300	73360 1/2"	73024	85517	883	NA	NA	NA
D87732A	Air w/Air Chuck	87700	72360 1/4"	74024	85515	66951	NA	815	11659
D87733A	Air w/Air Chuck	87700	72600A 3/8"	74024	85516	66951	NA	815	11659
D87732W	Water w/Bibb Cock	87700	72360 1/4"	74024	85515	846	NA	NA	NA
D87733W	Water w/Bibb Cock	87700	72360A 3/8"	74024	85516	846	NA	NA	NA

Series D87000, Decorative, 50 Feet

Model	Description	Bare Reel	Delivery Hose (50')	Connecting Hose	Ball Stop	Hose End Controls	Swivel	Coupler	Nipple
D87552G	Grease w/Control Valve & Swivel	87500	75600 1/4"	75024	85515	740	81387	NA	NA
D87354C	Motor Oil/Antifreeze w/Control Valve	87300	73600 1/2"	73024	85517	769	NA	NA	NA
D87354D	Motor Oil/Antifreeze w/Electronic Meter	87300	73600 1/2"	73024	85517	977	NA	NA	NA
D87354M	Motor Oil/Antifreeze w/Quarts Meter	87300	73600 1/2"	73024	85517	877	NA	NA	NA
D87354E	Motor Oil/Antifreeze w/Liter Meter	87300	73600 1/2"	73024	85517	899	NA	NA	NA
D87354L	Gear Oil w/Pints Meter	87300	73600 1/2"	73024	85517	878	NA	NA	NA
D87354N	Gear Oil w/Control Valve	87300	73600 1/2"	73024	85517	780	NA	NA	NA
D87354R	Gear Oil w/Control Valve	87300	73600 1/2"	73024	85517	779	NA	NA	NA
D87354T	ATF w/Quarts ATF Meter	87300	73600 1/2"	73024	85517	883	NA	NA	NA
D87752A	Air w/Air Chuck	87700	72600 1/4"	74024	85515	66951	NA	815	11659
D87753A	Air w/Air Chuck	87700	72600A 3/8"	74024	85516	66951	NA	815	11659
D87752W	Water w/Bibb Cock	87700	72600 1/4"	74024	85515	846	NA	NA	NA
D87753W	Water w/Bibb Cock	87700	72600A 3/8"	74024	85516	846	NA	NA	NA

Series 3100 Heavy Duty, Decorative 30 Feet

Model	Description	Bare Reel	Delivery Hose (30')	Connecting Hose	Ball Stop	Hose End Controls	Swivel	Coupler	Nipple
3191	Grease w/Control Valve & Swivel	82206	75360 1/4"	75024	85515	740	81387		
3189	Motor Oil/Antifreeze w/Electronic Meter	82206	73360 1/2"	73024	85517	977	NA	NA	NA
3194	Motor Oil/Antifreeze w/Quarts Meter	82206	73360 1/2"	73024	85517	877	NA	NA	NA
3195	Gear Oil w/Pints Meter	82206	73360 1/2"	73024	85517	878	NA	NA	NA
3196	Gear Oil w/Control Valve	82206	73360 1/2"	73024	85517	780	NA	NA	NA
3197	ATF w/Quarts ATF Meter	82206	73360 1/2"	73024	85517	883	NA	NA	NA
3193	Air w/Air Chuck	82206	72360 1/4"	72024	85515	66951	NA	815	11659
3192	Water w/Bibb Cock, 30' Hose	82206	72360 1/4"	72024	85515	846	NA	NA	NA

Series 3200 Heavy Duty, Decorative, 50 Feet

Model	Description	Bare Reel	Delivery Hose (50')	Connecting Hose	Ball Stop	Hose End Controls	Swivel	Coupler	Nipple
3291	Grease w/Control Valve & Swivel	82206	75600 1/4"	75024	85515	740	81387	NA	NA
3289	Motor Oil/Antifreeze w/Electronic Meter	82206	73600 1/2"	73024	85517	977	NA	NA	NA
3294	Motor Oil/Antifreeze Quarts Meter	82206	73600 1/2"	73024	85517	877	NA	NA	NA
3295	Gear Oil w/Pints Meter	82206	73600 1/2"	73024	85517	878	NA	NA	NA
3296	Gear Oil w/Control Valve	82206	73600 1/2"	73024	85517	780	NA	NA	NA
3297	ATF w/Quarts ATF Meter	82206	73600 1/2"	73024	85517	883	NA	NA	NA
3198	Air w/Air Chuck	82206	72600 1/4"	72024	85515	66951	NA	815	11659
3199	Air w/Air Chuck	82206	72600A 3/8"	72024A	85516	66951	NA	815	11659
3190	Water w/Bibb Cock	82206	72600A 3/8"	72024A	85516	846	NA	NA	NA

Low Pressure Hose—Air & Water

Model	Size	Hose Industrial	Inches		Thread	Max Pressure psi (bar) Working
			ID	OD		
72024	2'	RMA Class A	1/4	5/8	1/4"NPT(m)	250 (17.01)
72036	3'	RMA Class A	1/4	5/8	1/4"NPT(m)	250 (17.01)
72060	5'	RMA Class A	1/4	5/8	1/4"NPT(m)	250 (17.01)
72120	10'	RMA Class A	1/4	5/8	1/4"NPT(m)	250 (17.01)
72240	20'	RMA Class A	1/4	5/8	1/4"NPT(m)	250 (17.01)
72480	40'	RMA Class A	1/4	5/8	1/4"NPT(m)	250 (17.01)
72600	50'	RMA Class A	1/4	5/8	1/4"NPT(m)	250 (17.01)
72024A	2'	RMA Class A	3/8	23/32	3/8"NPT(m)	250 (17.01)
72360A	30'	RMA Class A	3/8	23/32	3/8"NPT(m)	250 (17.01)
72480A	40'	RMA Class A	3/8	23/32	3/8"NPT(m)	250 (17.01)
72600A	50'	RMA Class A	3/8	23/32	3/8"NPT(m)	250 (17.01)
74024	2'	RMA Class A	1/2	27/32	1/2"NPT(m)	200 (13.61)
74060	5'	RMA Class A	1/2	27/32	1/2"NPT(m)	200 (13.61)
74480	40'	RMA Class A	1/2	27/32	1/2"NPT(m)	200 (13.61)
74600	50'	RMA Class A	1/2	27/32	1/2"NPT(m)	200 (13.61)

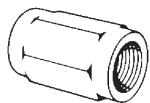
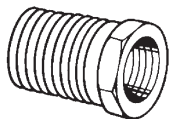
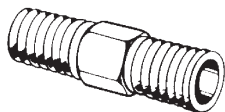
Lincoln High Pressure Replacement Hose

Cross Reference

Model	Original Threads	Replacement
Alemite	1/2"-27(f) x 1/2"-27(f)	Any Type 75 Hose
Aro	1/8" NPT(m) x 1/8" NPT(f)	Any Type 75 Hose, 10199 Nipple, 10200 Bushing
Balcrank	1/2"-27(f) x 1/2"-27(f)	Any Type 75 Hose
Graco	1/4" NPT(m) x 1/4" NPT(m)	Any Type 75 Hose, Two (2) 10198 Bushing

Hose Accessories

Nipples, Couplers & Bushings for Lincoln 75 Grease Hose



Nipples

Model	Thread
10198	1/4" NPT(m) x 1/2"-27(m)
10199	1/8" NPT(m) x 1/2"-27(m)
10202	1/2"-27 NPT(m) x 1/2"-27(m)
12957	1/2" NPT(m) x 1/2"-27(m)



Reducing Couplings

11852	1/8" NPT(f) x 1/2"-27(f)
10522	1/4" NPT(f) x 1/2"-27(f)

Bushings

10200	1/8" NPT (f) x 1/2"-27(m)
10204	1/4" NPT(f) x 1/2"-27(m)
12287	1/2"-27(f) x 1/2" NPT(m)

Modular Type Regulator Series AR

Regulator Series AR	Model	Port size	Accessory
 <p>Pages 36 through 40</p>	AR10	M5 x 0.8	Bracket Square embedded type pressure gauge (except for AR10) Round pressure gauge Panel mount
	AR20	1/8, 1/4	
	AR25	1/4, 3/8	
	AR30	1/4, 3/8	
	AR40	1/4, 3/8, 1/2	
	AR40-06	3/4	
	AR50	3/4, 1	
AR60	1		
 <p>Pages 43 through 48</p>	AR20K	1/8, 1/4	
	AR25K	1/4, 3/8	
	AR30K	1/4, 3/8	
	AR40K	1/4, 3/8, 1/2	
	AR40K-06	3/4	
	AR50K	3/4, 1	
	AR60K	1	

Regulator AR10 to 60

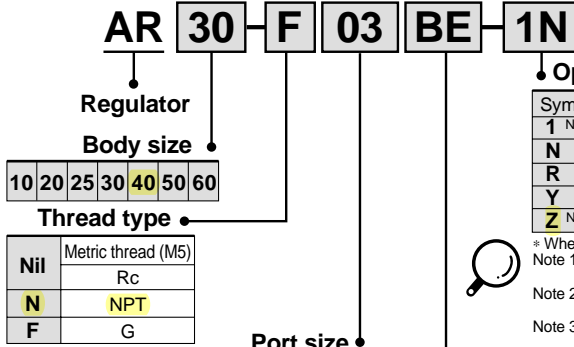
How to Order



AR20



AR40



Optional specifications

Symbol	Description	Applicable model
1 ^{Note 2)}	0.02 to 0.2MPa setting	AR10 to 60
N	Non-relieving	AR10 to 60
R	Flow direction: Right to left	AR10 to 60
Y	Upward handle	AR10 to 60
Z ^{Note 3)}	Name plate and pressure gauge in imperial units (PSI, °F)	AR10 to 60

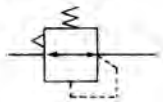
* When more than one specification is required, indicate in ascending alphanumeric order.
 Note 1) This product is for overseas use only according to the new Measurement Law.
 (The SI unit type is provided for use in Japan.)
 Note 2) The only difference from the standard specifications is the adjusting spring for the regulator. It does not restrict the setting of 0.2MPa or more.
 Note 3) For M5 and NPT thread types.

Accessories

Symbol	Description	Applicable model
Nil	—	—
B	With bracket	AR10 to 60
E	With square embedded type pressure gauge (with limit indicator)	AR20 to 60
G	With round pressure gauge (without limit indicator)	AR10
	With round pressure gauge (with limit indicator)	AR20 to 60
H	With set nut (for panel mount)	AR10 to 40

Note 1) Optional parts are not assembled and are supplied loose at the time of shipment (except for option E).

JIS symbol



Page 41

Accessory/Optional specification combinations

⊙ : Combination available
 ○ : Varies depending on the model
 ◻ : Combination not available
 △ : Available only with NPT thread

Accessories/Optional specifications	Combination Symbol	Accessory				Optional specification					Applicable regulator		
		B	E	G	H	1	N	R	Y	Z	AR10	AR20 to 40	AR50 to 60
Accessories	With bracket (with set nut)	B	○	○	○	○	○	○	○	△	○	○	○
	Square embedded type pressure gauge	E	⊙	⊙	⊙	⊙	⊙	⊙	⊙	△	⊙	⊙	⊙
	Round pressure gauge	G	⊙	⊙	⊙	⊙	⊙	⊙	⊙	△	⊙	⊙	⊙
	With set nut (for panel mount)	H	⊙	○	○	⊙	⊙	⊙	⊙	△	⊙	⊙	⊙
Optional specifications	0.02 to 0.2MPa setting	-1	⊙	○	○	○	⊙	⊙	⊙	△	⊙	⊙	⊙
	Non-relieving type	-N	⊙	○	○	○	⊙	⊙	⊙	△	⊙	⊙	⊙
	Flow direction: Right to left	-R	⊙	○	○	○	⊙	⊙	⊙	△	⊙	⊙	⊙
	Upward handle	-Y	⊙	○	○	○	⊙	⊙	⊙	△	⊙	⊙	⊙
	Name plate and pressure gauge in imperial units (PSI, °F)	-Z	△	△	△	△	△	△	△	△	△	△	△

Standard specifications

Model	AR10	AR20	AR25	AR30	AR40	AR40-06	AR50	AR60
Port sizes	M5 x 0.8	1/8, 1/4	1/4, 3/8	1/4, 3/8	1/4, 3/8, 1/2	3/4	3/4, 1	1
Fluid	Air							
Proof pressure	1.5MPa							
Maximum operating pressure	1.0MPa							
Set pressure range	0.05 to 0.7MPa	0.05 to 0.85MPa						
Pressure gauge port size ^{Note 1)}	Rc 1/16 ^{Note 2)}	Rc, NPT, G 1/8	Rc, NPT, G 1/8	Rc, NPT, G 1/8	Rc, NPT, G 1/4	Rc, NPT, G 1/4	Rc, NPT, G 1/4	Rc, NPT, G 1/4
Relief pressure	Set pressure + 0.05MPa ^{Note 3)} [at relief flow rate of 0.1L/min (ANR)]							
Ambient and fluid temperature	-5 to 60°C (with no freezing)							
Construction	Relieving type							
Weight (kg)	0.06	0.26	0.21	0.29	0.44	0.47	1.17	1.22

Note 1) Pressure gauge connection threads are not required for regulator with a square embedded type pressure gauge (AR20 to AR60).
 Note 2) Use a bushing (part no: 131368) when connecting the R 1/8 pressure gauge to the R 1/16 gauge port.
 Note 3) Except for AR10.

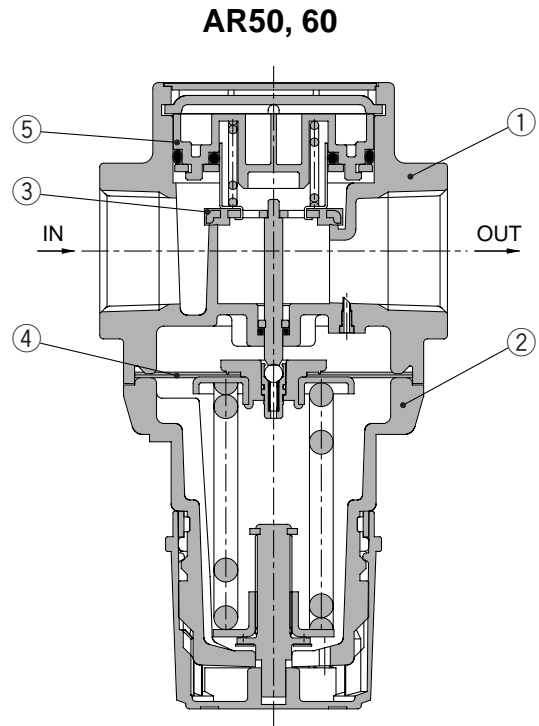
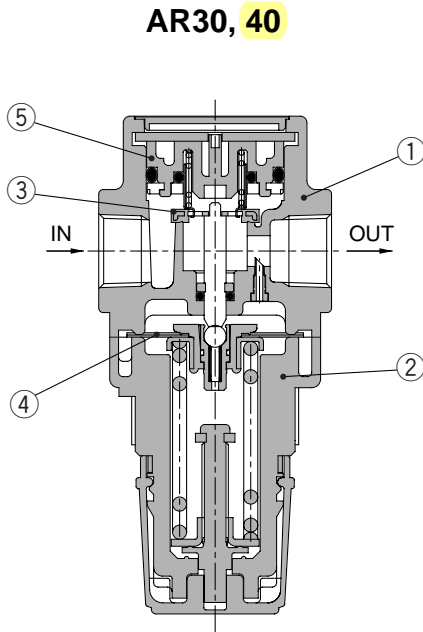
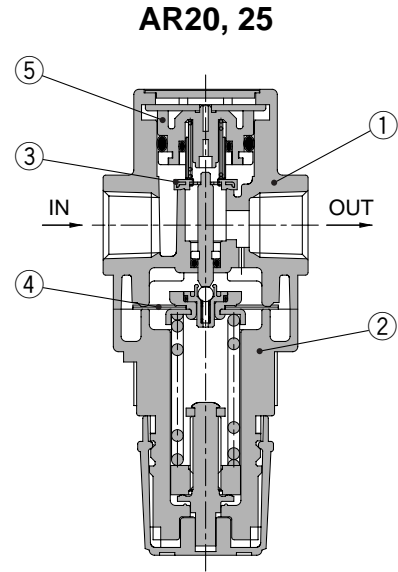
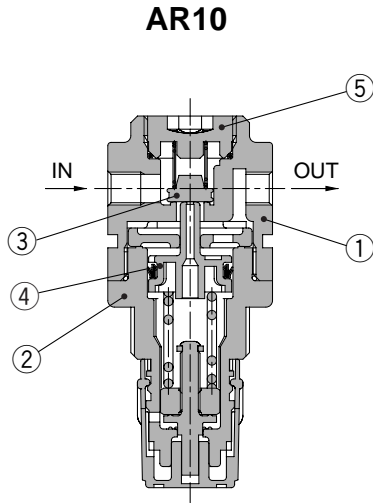
Accessory part no.

Applicable model		AR10	AR20	AR25	AR30	AR40	AR40-06	AR50	AR60	
Accessory										
Bracket assembly ^{Note 1)}		AR10P-270AS	AR20P-270AS	AR25P-270AS	AR30P-270AS	AR40P-270AS	AR40P-270AS	AR50P-270AS ^{Note 5)}	AR60P-270AS ^{Note 5)}	
Set nut		AR10P-260S	AR20P-260S	AR25P-260S	AR30P-260S	AR40P-260S	AR40P-260S	— ^{Note 6)}	— ^{Note 6)}	
Pressure gauge ^{Note 2)}	1MPa	Round	G27-10-R1	G36-10-□01	G36-10-□01	G36-10-□01	G46-10-□02	G46-10-□02	G46-10-□02	
		Square embedded type ^{Note 4)}	—	GC3-10AS	GC3-10AS	GC3-10AS	GC3-10AS	GC3-10AS	GC3-10AS	GC3-10AS
	0.2MPa	Round	G27-10-R1 ^{Note 3)}	G36-2-□01	G36-2-□01	G36-2-□01	G46-2-□02	G46-2-□02	G46-2-□02	G46-2-□02
		Square embedded type ^{Note 4)}	—	GC3-2AS	GC3-2AS	GC3-2AS	GC3-2AS	GC3-2AS	GC3-2AS	GC3-2AS

Note 1) Assembly includes a bracket and set nuts.
 Note 2) □ in part numbers for a round pressure gauge indicates a type of connection thread. No indication is necessary for R; however, indicate N for NPT.
 Note 3) For 1.0MPa.
 Note 4) Includes one O-ring and 2 mounting screws.
 Note 5) Assembly includes a bracket and 2 mounting screws.
 Note 6) Contact P/A regarding the set nuts for AR50 and AR60.
 Contact P/A regarding the connection thread NPT and pressure gauge supply for PSI unit specifications.

AR10 to 60

Construction



Parts list

No.	Description	Material			Note
		AR10, 20	AR25 to 40 (-60)	AR50, 60	
1	Body	Zinc die-cast	Aluminum die-cast		Platinum silver
2	Bonnet	Polyacetal		Aluminum die-cast	Black

Replacement parts

No.	Description	Materials	Part no.							
			AR10	AR20	AR25	AR30	AR40	AR40-06	AR50	AR60
3	Valve assembly	Stainless steel Brass, HNBR	AR10P-090S	AR20P-090AS	AR25P-090AS	AR30P-090AS	AR40P-090AS	AR40P-090AS	AR50P-090AS	AR60P-090AS
4	Diaphragm assembly	Weatherability NBR	AR10P-150AS (Note)	AR20P-150AS	AR25P-150AS	AR30P-150AS	AR40P-150AS	AR40P-150AS	AR50P-150AS	AR50P-150AS
5	Valve guide assembly	POM	131329	AR20P-050AS	AR25P-050AS	AR30P-050AS	AR40P-050AS	AR40P-050AS	AR50P-050AS	AR60P-050AS

Note) AR10 is a piston and gasket (KSYP-13) type assembly.

Location: _____



M-500

PRESSURE DROP ACTIVATED TRAP SEAL PRIMER

REPLACEABLE STAINLESS STEEL FILTER SCREEN



3 P.S.I PRESSURE DROP

Only a three p.s.i. line pressure drop is required to activate the primer, compared to five or ten p.s.i. by others. Lower water volume fixtures and faucets has resulted in lower line pressure drops. A three p.s.i. performance point ensures reliable water delivery to maintain the trap seal.

NO PRECHARGE

MIFAB's trap seal primers can be disassembled in the field for easy cleaning and repair, without risk of losing a precharge.

VIEW HOLES

Four view holes permit easy inspection of water delivery. The holes are across from each other, enabling light at the opposite end to illuminate the performance of the primer.

SEDIMENT FILTER

A replacement stainless steel sediment filter prevents line debris from entering the primer. This can be replaced after wear and build up of debris to ensure maximum life and performance of the primer.

NO ADJUSTMENTS (except for M3-500-NPB)

The replaceable and repairable cartridge tubes inside of the body are factory engineered to deliver enough water to service three, six or ten floor drain traps without adjustment. This eliminates confusion during field installation.

The M-500 Series of trap seal primers are tested and third party listed to the A.S.S.E. 1018 Standard.

FUNCTION AND DESCRIPTION: MIFAB's M-500 Series of pressure activated trap seal primers (MR-500-NPB, M1-500-NPB and M2-500-NPB, M3-500-NPB) can be connected to any cold water line, and will be automatically activated when a valve or faucet, that is on the line, is opened. A pressure drop of three p.s.i. will activate all of the trap seal primers. MIFAB's M-500 Series of trap seal primers can be disassembled in the field. Their unique design permits filter replacement without affecting the performance of the primer. The "O" ring seals are tested for reliability at a temperature range of -40 degrees to 450 degrees F. The M-500 Series of trap seal primers do not require adjustment. The opening range for all of MIFAB's M-500 Series of trap seal primers is 20 to 80 p.s.i. All three models are listed with I.A.P.M.O. and C.S.A. and are tested and certified to the A.S.S.E. Standard 1018 and are so marked. U.S. Patent # 6,152,164.



*The wetted surface of the -NPB Series of water hammer arrestors contacted by consumable water contains less than one quarter of one percent (0.25%) of lead by weight.

M-500 SERIES					
MODEL NO.	A	B	PIPE FLATS	DRAINS SERVED	WATER OUTPUT
○ MR-500-NPB	4-1/8"	1-1/4"	1-1/8"	6	1/2 ounce
○ M1-500-NPB	4-1/8"	1-1/4"	1-1/8"	10	1 ounce
○ M2-500-NPB	4-1/8"	1-1/4"	1-1/8"	3	1/4 ounce
○ M3-500-NPB	4-1/8"	1-1/4"	1-1/8"	10	1 ounce
○ MR-500-SS (Stainless Steel)	4-1/8"	1-1/4"	1-1/8"	6	1/2 ounce

OPTIONAL VARIATIONS

- -RC **REPLACEMENT CARTRIDGE**
- -RF **REPLACEMENT FILTER SCREEN**

CALIFORNIA PROPOSITION 65 WARNING. This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Job Name: _____ Page No: _____
 Section No: _____ Contractor: _____
 Schedule No: _____ Purchase Order No: _____

TRAP SEAL PRIMER TROUBLESHOOTING

Following are some things to trouble shoot when it comes to our M-500-NPB Series of Trap Seal Primers (M1-500-NPB, M2-500-NPB, MR-500-NPB, M3-500-NPB):

1) WHAT IS THE LINE PRESSURE FOR THE INSTALLATION?

The M-500-NPB Series of trap seal primers will work within a line pressure range of 35 – 80 psi. Do not subject the trap seal primer to pressure in excess of 80 psi. The trap seal primer must be installed on a cold fresh water line of 1 1/2" diameter or less.

2) HOW FAR AWAY IS THE TRAP PRIMER FROM THE SOURCE OF THE PRESSURE DROP?

Anything farther away than 20 feet is an issue, as the farther the primer is away from the source of the pressure drop, the less likely it will sense it and work.

3) WHAT IS THE PRESSURE DROP WHERE THE PRIMER IS?

MIFAB's M-500-NPB Series of primers will work with as little as 3 psi in pressure drop. With today's low flow and consumption faucets, there is less pressure drop being created when the faucets and toilets are used. Therefore, it is recommended to install the trap seal primer as close to the low flow fixture as possible.

4) WATER HAMMER ARRESTORS ON THE LINE CAN ALSO AFFECT PRESSURE DROP IN THE LINE.

It would be best to get a pressure reading where the trap primer is installed. The M-500-NPB series needs a fast, sharp pressure drop to activate. The long pipe run to the trap primer and the water hammer arrestor may not be allowing the trap primer to function properly.

5) LOOK AT THE GAUGE FLUCTUATION

Is it a quick and sharp pressure drop? Or did it gradually drop? The trap primers need a quick pressure drop to activate. A slow gradual pressure drop may not be enough to activate the M-500-NPB. That is why we state that they should be as close to the pressure drop source as possible. The M1-500-NPB has the most buoyant cartridge and should perform the best. If the trap primer looked good and was filled with water then it is the rate of the pressure drop that is causing the issue.

6) WATER HEATERS

Do not install the trap seal primer on a water heater line due to insufficient pressure drop.

7) NOT WORKING

In some cases, the installation conditions cannot deliver the required 3 psi pressure drop to activate MIFAB's MR-500-NPB, M1-500-NPB and / or M2-500-NPB trap seal primers. In such cases, MIFAB® recommends the use of the M3-500-NPB (page 4) adjustable trap seal primer which does not require a pressure drop to activate or the MI-100 (page 8) Series of electronic trap seal primers which also do not require a pressure drop and are electronically programmed to deliver a specific amount of water at specific time intervals.

Also refer to the copy in the Trap Seal Primer section (Pages 1-4).

M-500-NPB SERIES INSTALLATION INSTRUCTIONS

Use a 1 1/8" open end wrench to install the M-500-NPB Series of trap seal primers to the line by using the flats on the top of the trap seal primer. Water lines must be flushed before installing MIFAB's MR-500-NPB Series of trap seal primers. The leading cause of trap seal primer performance problems is interference from foreign debris. The trap seal primers should be cycled at least six times to reduce problems of interference from foreign debris. The following steps are highly recommended:

- Ensure that all flux and other debris is removed from supply line to the primer.
- Use only teflon tape around threads, NEVER use pipe dope.
- Do not solder fittings directly onto the inlet or outlet of the primer, as the primer uses a PE (polyethylene) cartridge.

Failure to follow these instructions will negatively affect performance of the product. MIFAB's primers have a unique design which allows the primer to be taken apart and cleaned before re-assembly. Do this in the event of excess water discharge.

Trap seal primers should be mounted one foot above the finished floor for every twenty feet of floor drain trap make-up water line. For easy access to the trap seal primer, install a union connection above it. Install a line shut off valve upstream of the trap seal primer in order to shut off the water supply when performing maintenance on the trap seal primer.

INSPECTION INSTRUCTIONS

After installing and pre-cycling the trap seal primer, use any of the four holes to view water discharge from the orifice. A light can be placed opposite the viewing hole to improve clarity in this inspection.

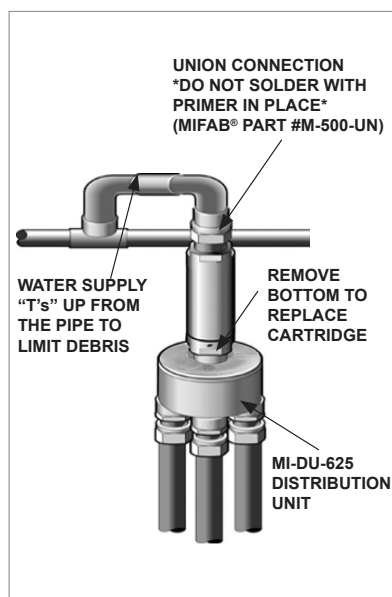
MAINTENANCE INSTRUCTIONS

In order to replace the filter screen, remove the trap seal primer by using an open end wrench on the top set of flats. Grasp the top of the filter screen with fingers, squeeze and remove the filter. Insert the new filter screen by squeezing and pushing it firmly down into the top of the trap seal primer. Re-install the trap seal primer using the top set of flats. In regions that experience heavy residual deposits such as calcium in the water supply, MIFAB's M-500-NPB Series of trap seal primers can be field refurbished by removing the bottom end of the primer, and replacing the cartridge.

Go to www.mifab.com for more information on maintenance of trap seal primers.

"The MIFAB® MR-500-NPB is a well proven product. We have sold many for many years and I don't recall any ever coming back or a customer being unsatisfied. The distribution boxes are a well thought out item also. Good job MIFAB®!"

— Rick Sharp, Sales Manager, Lion Plumbing Supply, Miami, FL



CALIFORNIA PROPOSITION 65 WARNING. This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Design and dimensions are subject to modification. Prices do not include applicable taxes.

Visit www.mifab.com for the most recent product information.

MIFAB®, Inc., 1321 West 119th Street, Chicago, Illinois 60643-5109, USA

Toll Free: 1-800-465-2736, Fax: 1-773-341-3049

All sales subject to MIFAB's® Terms and Warranties. Please refer to page 32.

sales@mifab.com Canada Toll Free: 1-800-387-3880

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- a. This Section includes the following:
 - 1) Piping materials and installation instructions common to most piping systems.
 - 2) Transition fittings.
 - 3) Dielectric fittings.
 - 4) Sleeves.
 - 5) Escutcheons.
 - 6) Grout.
 - 7) HVAC demolition.
 - 8) Equipment installation requirements common to equipment sections.
 - 9) Painting and finishing.
 - 10) Supports and anchorages.

1.3 DEFINITIONS

- a. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- b. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- c. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- d. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

- e. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- f. The following are industry abbreviations for plastic materials:
 - 1) CPVC: Chlorinated polyvinyl chloride plastic.
 - 2) PE: Polyethylene plastic.
 - 3) PVC: Polyvinyl chloride plastic.
- g. The following are industry abbreviations for rubber materials:
 - 1) EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2) NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- a. Product Data: For the following:
 - 1) Transition fittings.
 - 2) Dielectric fittings.
 - 3) Mechanical sleeve seals.
 - 4) Escutcheons.
- b. Welding certificates.

1.5 QUALITY ASSURANCE

- a. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- b. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- a. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.7 COORDINATION

- a. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

- b. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- c. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 PRODUCTS

2.1 MANUFACTURERS

- a. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1) Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 - 2) Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- a. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- b. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- a. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- b. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- c. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

2.4 DIELECTRIC FITTINGS

- a. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- b. Insulating Material: Suitable for system fluid, pressure, and temperature.
- c. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
 - 1) Manufacturers:

- a) Capitol Manufacturing Co.
 - b) Central Plastics Company.
 - c) Eclipse, Inc.
 - d) Epco Sales, Inc.
 - e) Hart Industries, International, Inc.
 - f) Watts Industries, Inc.; Water Products Div.
 - g) Zurn Industries, Inc.; Wilkins Div.
- 2) Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- d. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- 1) Manufacturers:
 - a) Calpico, Inc.
 - b) Lochinvar Corp.
- e. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
- 1) Manufacturers:
 - a) Perfection Corp.
 - b) Precision Plumbing Products, Inc.
 - c) Sioux Chief Manufacturing Co., Inc.
 - d) Victaulic Co. of America.

2.5 ESCUTCHEONS

- a. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- b. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- c. One-Piece, Cast-Brass Type: With set screw.
 - 1) Finish: Polished chrome-plated.

- d. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1) Finish: Polished chrome-plated.
- e. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- f. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw, and chrome-plated finish.
- g. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- h. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

PART 3 EXECUTION

3.1 HVAC DEMOLITION

- a. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- b. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.
 - 1) Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2) Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - 3) Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - 4) Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
 - 5) Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - 6) Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - 7) Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- c. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- a. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- b. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- c. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- d. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- e. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- f. Install piping to permit valve servicing.
- g. Install piping at indicated slopes.
- h. Install piping free of sags and bends.
- i. Install fittings for changes in direction and branch connections.
- j. Install piping to allow application of insulation.
- k. Select system components with pressure rating equal to or greater than system operating pressure.
- l. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1) New Piping:
 - a) Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b) Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c) Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d) Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e) Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - f) Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed hinge and set screw or spring clips.

- m. Permanent sleeves are not required for holes formed by removable PE sleeves.
- n. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1) Cut sleeves to length for mounting flush with both surfaces.
 - a) Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2) Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3) Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a) PVC Pipe Sleeves: For pipes smaller than NPS 6.
 - b) Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
 - c) Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
- o. Above ground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1) Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2) Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- p. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- q. Verify final equipment locations for roughing-in.
- r. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

- a. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- b. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- c. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- d. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- e. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

3.4 PIPING CONNECTIONS

- a. Make connections according to the following, unless otherwise indicated:
 - 1) Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2) Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 3) Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- a. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated. Anchorage of equipment to concrete pad shall be per DSA approved drawings.
- b. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- c. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- d. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

- a. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

- b. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- a. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.
- b. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- c. Attach to substrates as required to support applied loads.

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- a. This Section includes the following hangers and supports for HVAC system piping and equipment:
 - 1) Steel pipe hangers and supports.
 - 2) Trapeze pipe hangers.
 - 3) Metal framing systems.
 - 4) Thermal-hanger shield inserts.
 - 5) Fastener systems.
 - 6) Pipe stands.
 - 7) Equipment supports.
- b. Related Sections include the following:
 - 1) Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
 - 2) Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
 - 3) Division 23 Section(s) "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

- a. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- b. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

- a. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

- b. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- c. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

- a. Product Data: For the following:
 - 1) Steel pipe hangers and supports.
 - 2) Thermal-hanger shield inserts.
 - 3) Powder-actuated fastener systems.
- b. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
 - 1) Trapeze pipe hangers. Include Product Data for components.
 - 2) Metal framing systems. Include Product Data for components.
 - 3) Pipe stands. Include Product Data for components.
 - 4) Equipment supports.
- c. Welding certificates.

1.6 QUALITY ASSURANCE

- a. Welding: Qualify procedures and personnel according to the following:
 - 1) AWS D1.1, "Structural Welding Code--Steel."
 - 2) AWS D1.3, "Structural Welding Code--Sheet Steel."
 - 3) AWS D1.4, "Structural Welding Code--Reinforcing Steel."
 - 4) ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- a. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPE HANGERS AND SUPPORTS

- a. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- b. Manufacturers:
 - 1) AAA Technology & Specialties Co., Inc.
 - 2) Bergen-Power Pipe Supports.
 - 3) B-Line Systems, Inc.; a division of Cooper Industries.
 - 4) Carpenter & Paterson, Inc.
 - 5) Empire Industries, Inc.
 - 6) ERICO/Michigan Hanger Co.
 - 7) Globe Pipe Hanger Products, Inc.
 - 8) Grinnell Corp.
 - 9) GS Metals Corp.
 - 10) National Pipe Hanger Corporation.
 - 11) PHD Manufacturing, Inc.
 - 12) PHS Industries, Inc.
 - 13) Piping Technology & Products, Inc.
 - 14) Tolco Inc.
- c. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- d. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- e. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

- a. Shall be per DSA Approved drawings.

2.4 METAL FRAMING SYSTEMS

- a. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- b. Manufacturers:

- 1) B-Line Systems, Inc.; a division of Cooper Industries.
 - 2) ERICO/Michigan Hanger Co.; ERISTRUT Div.
 - 3) GS Metals Corp.
 - 4) Power-Strut Div.; Tyco International, Ltd.
 - 5) Thomas & Betts Corporation.
 - 6) Tolco Inc.
 - 7) Unistrut Corp.; Tyco International, Ltd.
- c. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
- d. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

- a. Shall be per DSA Approved drawings.
- b. Manufacturers:
 - 1) Carpenter & Paterson, Inc.
 - 2) ERICO/Michigan Hanger Co.
 - 3) PHS Industries, Inc.
 - 4) Pipe Shields, Inc.
 - 5) Rilco Manufacturing Company, Inc.
 - 6) Value Engineered Products, Inc.
- c. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.
- d. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- e. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- f. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature

2.6 FASTENER SYSTEMS

- a. Powder-Actuated Fasteners: Shall be per DSA Approved drawings.
 - 1) Manufacturers:

- a) Hilti, Inc.
 - b) ITW Ramset/Red Head.
 - c) Masterset Fastening Systems, Inc.
 - d) MKT Fastening, LLC.
 - e) Powers Fasteners.
- b. Mechanical-Expansion Anchors: Shall be per DSA approved drawings.

- 1) Manufacturers:
 - a) B-Line Systems, Inc.; a division of Cooper Industries.
 - b) Empire Industries, Inc.
 - c) Hilti, Inc.
 - d) ITW Ramset/Red Head.
 - e) MKT Fastening, LLC.
 - f) Powers Fasteners.

2.7 MISCELLANEOUS MATERIALS

- a. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- b. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1) Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2) Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- a. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- b. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- c. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

- d. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- e. Use padded hangers for piping that is subject to scratching.
- f. Horizontal-Piping Hangers and Supports: Shall be per DSA approved drawings.
 - 1) N/A
 - 2) N/A
 - 3) N/A
 - 4) N/A
 - 5) N/A
 - 6) N/A
 - 7) N/A.
 - 8) N/A
 - 9) N/A
 - 10) N/A
 - 11) N/A
 - 12) N/A
 - 13) N/A
 - 14) N/A
 - 15) N/A

- g. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
- 1) Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 - 2) Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
- h. Building Attachments: Shall be per DSA approved drawings.
- 1) N/A
 - 2) N/A
 - 3) N/A
 - 4) N/A
 - 5) N/A
 - 6) N/A
 - 7) N/A
 - 8) N/A
 - 9) N/A
 - 10) N/A
 - 11) N/A
 - 12) N/A
 - a) N/A
 - b) N/A
 - c) N/A
 - 13) N/A
 - 14) N/A

- 15) Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- i. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1) Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 - 2) Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 - 3) Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- j. Spring Hangers and Supports: Not used.
 - 1) N/A
 - 2) N/A
 - 3) N/A
 - 4) N/A
 - 5) N/A
 - 6) N/A
- k. N/A

3.2 HANGER AND SUPPORT INSTALLATION SHALL BE PER DSA APPROVED DWGS.

a. N/A

b. N/A

1) N/A

2) N/A

- c. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- d. Fastener System Installation:
 - 1) Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2) Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- e. Pipe Stand Installation:
 - 1) Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 - 2) Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.
- f. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- g. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- h. Install lateral bracing with pipe hangers and supports per DSA approved drawings.
- i. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- j. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- k. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- l. Insulated Piping: Comply with the following:
 - 1) Attach clamps and spacers to piping.
 - a) Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b) Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

- c) Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
- 2) Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a) Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3) Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a) Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4) Shield Dimensions for Pipe: Not less than the following:
 - a) NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - 5)
 - 6) Insert Material: Length at least as long as protective shield.
 - 7) Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS SHALL BE PER DSA APPROVED DRAWINGS.

- a. N/A

3.4 METAL FABRICATIONS

- a. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- b. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- c. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - 1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2) Obtain fusion without undercut or overlap.
 - 3) Remove welding flux immediately.
 - 4) Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- a. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- b. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches

3.6 PAINTING

- a. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1) Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- b. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.
- c. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 23 31 13

METAL DUCTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- a. Section Includes:
 - 1) Single-wall round ducts and fittings.
 - 2) Sheet metal materials.
 - 3) Sealants and gaskets.
 - 4) Hangers and supports.
- b. Related Sections:
 - 1) Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
 - 2) Division 23 Section "Nonmetal Ducts" for fibrous-glass ducts, thermoset fiber-reinforced plastic ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
 - 3) Division 23 Section "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
 - 4) Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- a. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated.
 - 1) Static-Pressure Classes:
 - a) Exhaust Ducts (Negative Pressure): 1-inch wg.
- b. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 - 1) Seismic Hazard Level A: Seismic force to weight ratio, 0.48.

- 2) Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
- 3) Seismic Hazard Level C: Seismic force to weight ratio, 0.15.

1.4 SUBMITTALS

- a. Product Data: For each type of the following products:
 - 1) Sealants and gaskets.
- b. Shop Drawings:
 - 1) Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2) Factory- and shop-fabricated ducts and fittings.
 - 3) Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
 - 4) Elevation of top of ducts.
 - 5) Dimensions of main duct runs from building grid lines.
 - 6) Fittings.
 - 7) Reinforcement and spacing.
 - 8) Seam and joint construction.
 - 9) Equipment installation based on equipment being used on Project.
 - 10) Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
 - 11) Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.
- c. Delegated-Design Submittal:
 - 1) Sheet metal thicknesses.
 - 2) Joint and seam construction and sealing.
 - 3) Reinforcement details and spacing.
 - 4) Materials, fabrication, assembly, and spacing of hangers and supports.
 - 5) Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports and seismic restraints.
- d. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

- 1) Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
- 2) Suspended ceiling components.
- 3) Structural members to which duct will be attached.
- 4) Size and location of initial access modules for acoustical tile.
- 5) Penetrations of smoke barriers and fire-rated construction.
- 6) Items penetrating finished ceiling including the following:
 - a) Lighting fixtures.
 - b) Air outlets and inlets.
 - c) Sprinklers.
 - d) Access panels.
 - e) Perimeter moldings.
- e. Welding certificates.
- f. Field quality-control reports.

1.5 QUALITY ASSURANCE

- a. Welding Qualifications: Qualify procedures and personnel according to AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- b. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1) AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2) AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 - 3) AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- c. Mockups:
 - 1) Before installing duct systems, build mockups representing static-pressure classes in excess of 3-inch wg. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 - a) Five transverse joints.
 - b) One access door(s).
 - c) Two typical branch connections, each with at least one elbow.

- d) Perform leakage tests specified in "Field Quality Control" Article. Revise mockup construction and perform additional tests as required to achieve specified minimum acceptable results.
- 2) Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 PRODUCTS

2.1 SINGLE-WALL ROUND DUCTS AND FITTINGS

- a. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - a) Lindab Inc.
 - b) McGill AirFlow LLC.
 - c) SEMCO Incorporated.
 - d) Sheet Metal Connectors, Inc.
 - e) Spiral Manufacturing Co., Inc.
 - f) Or Equal.
- b. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter (diameter of the round sides connecting the flat portions of the duct).
- c. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1) Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- d. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1) Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 - 2) Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- e. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable

sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SHEET METAL MATERIALS

- a. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- b. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- c. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- d. Factory- or Shop-Applied Antimicrobial Coating:
 - 1) Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
 - 2) Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 - 3) Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
 - 4) Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
 - 5) Shop-Applied Coating Color: Black.
 - 6) Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.
- e. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1) Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- f. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 SEALANT AND GASKETS

- a. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- b. Two-Part Tape Sealing System:

- 1) Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
- 2) Tape Width: 6 inches.
- 3) Sealant: Modified styrene acrylic.
- 4) Water resistant.
- 5) Mold and mildew resistant.
- 6) Maximum Static-Pressure Class: 10-inch wg, positive and negative.
- 7) Service: Indoor and outdoor.
- 8) Service Temperature: Minus 40 to plus 200 deg F.
- 9) Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

c. Water-Based Joint and Seam Sealant:

- 1) Application Method: Brush on.
- 2) Solids Content: Minimum 65 percent.
- 3) Shore A Hardness: Minimum 20.
- 4) Water resistant.
- 5) Mold and mildew resistant.
- 6) VOC: Maximum 75 g/L (less water).
- 7) Maximum Static-Pressure Class: 10-inch wg, positive and negative.
- 8) Service: Indoor or outdoor.
- 9) Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

d. Solvent-Based Joint and Seam Sealant:

- 1) Application Method: Brush on.
- 2) Base: Synthetic rubber resin.
- 3) Solvent: Toluene and heptane.
- 4) Solids Content: Minimum 60 percent.
- 5) Shore A Hardness: Minimum 60.
- 6) Water resistant.
- 7) Mold and mildew resistant.

- 8) VOC: Maximum 395 g/L.
 - 9) Maximum Static-Pressure Class: 10-inch wg, positive or negative.
 - 10) Service: Indoor or outdoor.
 - 11) Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- e. Flanged Joint Sealant: Comply with ASTM C 920.
- 1) General: Single-component, acid-curing, silicone, elastomeric.
 - 2) Type: S.
 - 3) Grade: NS.
 - 4) Class: 25.
 - 5) Use: O.
- f. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- g. Round Duct Joint O-Ring Seals:
- 1) Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 - 2) EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 - 3) Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.4 HANGERS AND SUPPORTS

- a. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- b. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- c. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- d. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- e. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- f. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- g. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- h. Trapeze and Riser Supports:

- 1) Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
- 2) Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
- 3) Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.5 SEISMIC-RESTRAINT DEVICES

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Ductmate Industries, Inc.
 - 3) Hilti Corp.
 - 4) Kinetics Noise Control.
 - 5) Loos & Co.; Cableware Division.
 - 6) Mason Industries.
 - 7) TOLCO; a brand of NIBCO INC.
 - 8) Unistrut Corporation; Tyco International, Ltd.
 - 9) Or Equal.
- b. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
 - 1) Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- c. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- d. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- e. Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod.
- f. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 EXECUTION

3.1 DUCT INSTALLATION

- a. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- b. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- c. Install round ducts in maximum practical lengths.
- d. Install ducts with fewest possible joints.
- e. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- f. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- g. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- h. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- i. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- j. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- k. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- l. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 SEAM AND JOINT SEALING

- a. Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements," unless otherwise indicated.
 - 1) For static-pressure classes 1- and 1/2-inch wg, comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Seal Class C, except as follows:
 - a) Systems for residential occupancy.

- b) Ducts that are located directly in zones they serve.
- b. Seal Classes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements."
 - 1) For static-pressure classes 1- and 1/2-inch wg, comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Seal Class C, except as follows:
 - a) Systems for residential occupancy.
 - b) Ducts that are located directly in zones they serve.

3.3 HANGER AND SUPPORT INSTALLATION

- a. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- b. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1) Where practical, install concrete inserts before placing concrete.
 - 2) Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3) Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4) Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5) Do not use powder-actuated concrete fasteners for seismic restraints.
- c. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- d. Hangers Exposed to View: Threaded rod and angle or channel supports.
- e. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- f. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- a. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

- 1) Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 - 2) Brace a change of direction longer than 12 feet.
- b. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
 - c. Install cables so they do not bend across edges of adjacent equipment or building structure.
 - d. Install cable restraints on ducts that are suspended with vibration isolators.
 - e. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.
 - f. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
 - g. Drilling for and Setting Anchors:
 - 1) Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2) Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3) Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4) Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 5) Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.5 CONNECTIONS

- a. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- b. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

- a. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7 FIELD QUALITY CONTROL

- a. Perform tests and inspections.

- b. Leakage Tests:
 - 1) Comply with SMACNA's "HVAC Air Duct Leakage Test Manual."
 - 2) Test the following systems:
 - a) Exhaust air.
 - 3) Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 4) Test for leaks before insulation application.
 - 5) Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
- c. Duct System Cleanliness Tests:
 - 1) Visually inspect duct system to ensure that no visible contaminants are present.
 - 2) Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a) Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- d. Duct system will be considered defective if it does not pass tests and inspections.
- e. Prepare test and inspection reports.

3.8 DUCT CLEANING

- a. Clean new and existing duct system(s) before testing, adjusting, and balancing.
- b. Use service openings for entry and inspection.
 - 1) Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
 - 2) Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3) Remove and reinstall ceiling to gain access during the cleaning process.
- c. Particulate Collection and Odor Control:
 - 1) When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.

- 2) When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- d. Clean the following components by removing surface contaminants and deposits:
- 1) Air outlets and inlets (registers, grilles, and diffusers).
 - 2) Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3) Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4) Coils and related components.
 - 5) Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6) Supply-air ducts, dampers, actuators, and turning vanes.
 - 7) Dedicated exhaust and ventilation components and makeup air systems.
- e. Mechanical Cleaning Methodology:
- 1) Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 - 2) Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 - 3) Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 - 4) Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
 - 5) Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
 - 6) Provide drainage and cleanup for wash-down procedures.
 - 7) Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 DUCT SCHEDULE

- a. Fabricate ducts with galvanized sheet steel except as follows:

- 1) Moist Environment Ducts: Aluminum.
- b. Intermediate Reinforcement:
- 1) Galvanized-Steel Ducts: Galvanized steel.
 - 2) Stainless-Steel Ducts: Galvanized steel.
 - 3) Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.
- c. Elbow Configuration:
- 1) Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - a) Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - b) Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
- d. Branch Configuration:
- 1) Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
 - a) Velocity 1000 fpm or Lower: 90-degree tap.
 - b) Velocity 1000 to 1500 fpm: Conical tap.
 - c) Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION

SECTION 23 33 00

AIR DUCT 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) Flange connectors.
 - 2) Duct accessory hardware.

1.3 SUBMITTALS

- a. Product Data: For each type of product indicated.
- b. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
 - 1) Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a) Special fittings.
 - b) Wiring Diagrams: For power, signal, and control wiring.
- c. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.
- d. Source quality-control reports.
- e. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

- a. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- b. Comply with AMCA 500-D testing for damper rating.

PART 2 PRODUCTS

2.1 MATERIALS

- a. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- b. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- c. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- d. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- e. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 FLEXIBLE CONNECTORS

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Ductmate Industries, Inc.
 - 2) Duro Dyne Inc.
 - 3) Ventfabrics, Inc.
 - 4) Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- b. Materials: Flame-retardant or noncombustible fabrics.
- c. Coatings and Adhesives: Comply with UL 181, Class 1.
- d. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
- e. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1) Minimum Weight: 26 oz./sq. yd..
 - 2) Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3) Service Temperature: Minus 40 to plus 200 deg F.
- f. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

- 1) Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
- 2) Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
- 3) Minimum Additional Travel: 50 percent of the required deflection at rated load.
- 4) Lateral Stiffness: More than 80 percent of rated vertical stiffness.
- 5) Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
- 6) Elastomeric Element: Molded, oil-resistant rubber or neoprene.
- 7) Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.3 DUCT ACCESSORY HARDWARE

- a. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- b. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 EXECUTION

3.1 INSTALLATION

- a. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- b. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- c. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- d. Set dampers to fully open position before testing, adjusting, and balancing.
- e. Install test holes at fan inlets and outlets and elsewhere as indicated.
- f. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1) On both sides of duct coils.
 - 2) Downstream from manual volume dampers, control dampers, and equipment.

- 3) Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 4) At each change in direction and at maximum 50-foot spacing.
 - 5) Upstream of turning vanes.
 - 6) Elsewhere as indicated.
- g. Install access doors with swing against duct static pressure.
- h. Access Door Sizes:
- 1) One-Hand or Inspection Access: 8 by 5 inches.
 - 2) Two-Hand Access: 12 by 6 inches.
 - 3) Head and Hand Access: 18 by 10 inches.
 - 4) Head and Shoulders Access: 21 by 14 inches.
 - 5) Body Access: 25 by 14 inches.
 - 6) Body plus Ladder Access: 25 by 17 inches.
- i. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- j. Install flexible connectors to connect ducts to equipment.
- k. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- l. Install duct test holes where required for testing and balancing purposes.
- m. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

- a. Tests and Inspections:
- 1) Operate dampers to verify full range of movement.
 - 2) Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3) Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 - 4) Inspect turning vanes for proper and secure installation.

- 5) Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- a. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.
- b. Related Sections include the following:
 - 1) Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
 - 2) Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

- a. Product Data: For each product indicated, include the following:
 - 1) Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2) Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.
- b. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1) Ceiling suspension assembly members.
 - 2) Method of attaching hangers to building structure.
 - 3) Size and location of initial access modules for acoustical tile.
 - 4) Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 5) Duct access panels.
- c. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

- d. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- a. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1) Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2) Products: Subject to compliance with requirements, provide one of the products specified.
 - 3) Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 4) Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GRILLES AND REGISTERS

- a. Adjustable Bar Grille:
 - 1) Manufacturers:
 - a) A-J Manufacturing Co., Inc.
 - b) Anemostat; a Mestek Company.
 - c) Carnes.
 - d) Dayus Register & Grille.
 - e) Hart & Cooley, Inc.; Hart & Cooley Div.
 - f) Krueger.
 - g) METALAIRE, Inc.; Metal Industries Inc.
 - h) Nailor Industries of Texas Inc.
 - i) Price Industries.
 - j) Titus.
 - k) Tuttle & Bailey.
 - 2) Material: Steel

- 3) Finish: Baked enamel, color selected by Architect
 - 4) Face Blade Arrangement: Fixed horizontal spaced 1/2 inch apart.
- b. Fixed Face Grille:
- 1) Manufacturers:
 - a) A-J Manufacturing Co., Inc.
 - b) Anemostat; a Mestek Company.
 - c) Carnes.
 - d) Dayus Register & Grille.
 - e) Hart & Cooley, Inc.; Hart & Cooley Div.
 - f) Krueger.
 - g) Nailor Industries of Texas Inc.
 - h) Price Industries.
 - i) Titus.
 - j) Tuttle & Bailey.
 - 2) Material: Steel.
 - 3) Finish: Baked enamel, color selected by Architect

2.3 SOURCE QUALITY CONTROL

- a. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 EXECUTION

3.1 EXAMINATION

- a. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- b. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- a. Install diffusers, registers, and grilles level and plumb.

- b. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- c. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- a. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION



PERFORMANCE & SELECTION

SIZING

SCHEDULE BUILDER

TUTORIALS

ELC445D based on 14" width, 22" height, and 420 cfm intake.

Combination

The values below are required.

Width (in)

Height (in)

Airflow (cfm)

Intake Exhaust
(Click the green plus to configure)

FREE AREA (ft ²)	FREE AREA %	FREE AREA VEL (fpm)	PRESSURE DROP (w.g.)	BEGINNING WATER PEN. (fpm)	WATER PEN. SAFETY FACTOR
0.57	27	739	0.06	974	1.32

Refresh Results

Tag

Quantity

Add to Schedule

MODEL	MATERIAL	FRAME THICK.	FRAME DEPTH	BLADE	SECT. WIDTH	SECT. HEIGHT
+ ELBD375E	Alum.	0.081"	6"	Horiz - Drainable - Single Drain	12"- 60"	12"- 96"
+ ELBD375I	Alum.	0.081"	6"	Horiz - Drainable - Single Drain	12"- 60"	12"- 96"
→ ELC445D	Alum.	0.081"	4"	Horiz - Drainable - Single Drain	12"- 48"	12"- 96"
+ ELC6375DAX	Alum.	0.125"	6"	Horiz - Drainable - Single Drain	12"- 60"	12"- 96"
+ ELC6375DXD	Alum.	0.125"	6"	Horiz - Drainable - Single Drain	12"- 55"	12"- 120"
+ ELC6375DXW	Alum.	0.125"	6"	Horiz - Drainable - Single Drain	12"- 60"	12"- 96"
+ LC6375D	Galv.	16 ga	6"	Horiz - Drainable - Single Drain	12"- 48"	12"- 96"

LEADS

ELC445D

Drainable Combination Louver Extruded Aluminum



APPLICATION

The ELC445D is an 4" deep extruded aluminum, combination louver. It includes a fixed front stationary blade and a rear adjustable blade that can be operated closed. This is beneficial when the occupant requires a tight air shut off for protection of air intake and exhaust openings in building exterior walls. The louver is designed with a drainable gutter system channeling water from the blades to downspouts in the jambs, where water is exhausted out of the front of the louver.

STANDARD CONSTRUCTION

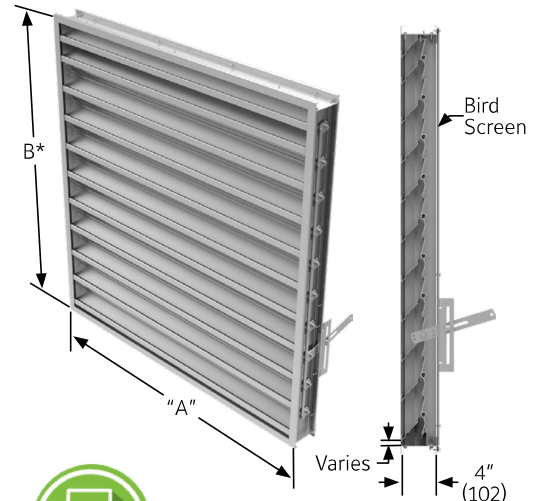
Frame	4" (102) deep, 6063T6 extruded aluminum with .080" (2.0) nominal wall thickness. Downspouts and caulking surfaces provided.
Blades	Front stationary drainable blades – 6063T6 extruded aluminum with .060" (1.5) nominal wall thickness, positioned at 45° angle and spaced approximately 47/16" (113) center to center. Rear adjustable blades – 6063T6 extruded aluminum, .080" (2.0) nominal wall thickness for operating section widths through 48" (1219).
Screen	3/4" x .051" (19 x 1.3) expanded, flattened aluminum bird screen in removable frame. Screen adds approximately 1/2" (13) to louver depth.
Seals	Extruded vinyl blade edge seals on rear adjustable blades and flexible, compressible aluminum jamb seals.
Linkage	Concealed
Bearings	Stainless steel sleeve pressed into frame.
Axles	1/2" (13) plated steel hex.
Actuator	Locking louver quadrant.
Finish	Mill.
Minimum Size	12"w x 12"h (305 x 305)
Approximate Shipping Weight	6 lbs./ft.2 (29.3 kg per m ²)
Maximum Factory Assembly Size	Shall be 48"w x 96"h (1219 x 2438). Louvers larger than the maximum factory assembly size will require field assembly of smaller sections.

FEATURES

- ▶ Published performance ratings based on testing in accordance with AMCA Publication 511.
- ▶ 39% Free Area.
- ▶ Low water penetration and low pressure drop.
- ▶ Beginning point of water penetration at .01 oz. /sq. ft. is 974 fpm (297 m/min).
- ▶ Concealed blade linkage is protected from weather exposure and reduces required installation depth.
- ▶ Adjustable rear blades provide desired shut off in the same 4" (102) deep frame normally required by a louver alone.
- ▶ Blade and jamb seals provide tight closure.
- ▶ A drain gutter in each front stationary blade and downspouts in jambs and mullions drain water from the louver with minimum water cascade from blade to blade.

NOTE:

- Dimensions in inches, parenthesis () indicate millimeters.
- Units furnished 1/4" (6) smaller than given opening dimensions.



YEAR LIMITED
WARRANTY

ISO9001
CERTIFIED

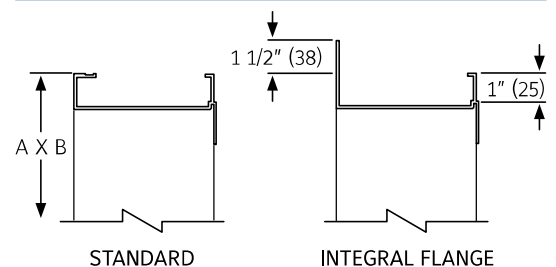
VARIATIONS

Variations to the basic design of these louvers are available at additional cost. They include:

- ▶ Extended sill.
- ▶ Electric or pneumatic actuators.
- ▶ Front or rear security bars.
- ▶ Jamb seals (optional).
- ▶ Blade edge seals (optional).
- ▶ Filter racks.
- ▶ A variety of bird and insect screens.
- ▶ Please provide rough opening dimensions for "A" and "B" dimensions. unless ordered as actual size, the louver will be provided 1/2" (12) smaller than "A" and "B" dimensions provided.
- ▶ Optional finishes available at additional cost: Prime coat, 50% PVDF (modified fluoropolymer), Epoxy, Pearledize, 70% PVDF, Clear and Anodized finishes. (Some variation in anodize color consistency is possible).

Consult Ruskin for other special requirements.

FRAME CONSTRUCTION



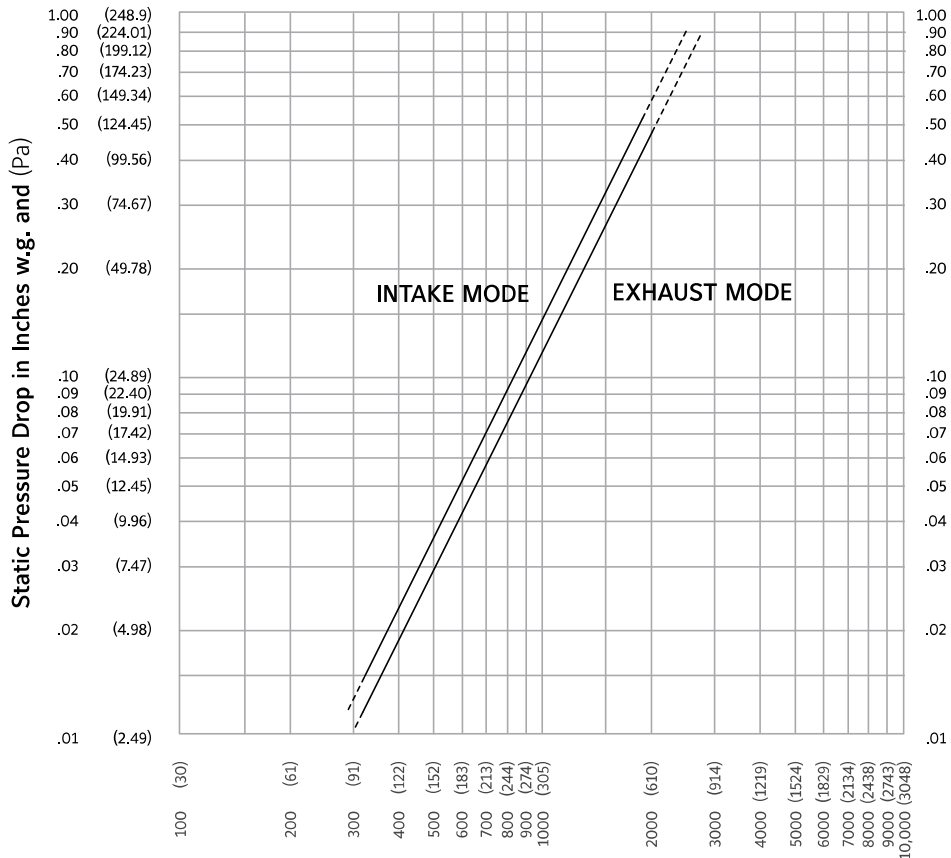
FREE AREA GUIDE

Free Area Guide shows free area in ft² and m² for various sizes of ELC445D.

Width – Inches and Meters

HEIGHT	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.65	1.80	1.95	2.10	2.25	2.40	2.55	2.70	2.85	3.00
12 0.30	0.16 0.01	0.26 0.02	0.36 0.03	0.45 0.04	0.55 0.05	0.65 0.06	0.75 0.07	0.85 0.08	0.94 0.09	1.04 0.10	1.14 0.11	1.24 0.12	1.34 0.12	1.44 0.13	1.53 0.14	1.63 0.15	1.73 0.16	1.83 0.17	1.93 0.18
18 0.45	0.33 0.03	0.54 0.05	0.74 0.07	0.95 0.09	1.15 0.11	1.36 0.13	1.56 0.15	1.77 0.16	1.97 0.18	2.18 0.20	2.38 0.22	2.59 0.24	2.80 0.26	3.00 0.28	3.21 0.30	3.41 0.32	3.62 0.34	3.82 0.36	4.03 0.37
24 0.60	0.51 0.05	0.82 0.08	1.13 0.11	1.44 0.13	1.76 0.16	2.07 0.19	2.38 0.22	2.69 0.25	3.00 0.28	3.32 0.31	3.63 0.34	3.94 0.37	4.25 0.40	4.57 0.42	4.88 0.45	5.19 0.48	5.50 0.51	5.81 0.54	6.13 0.57
30 0.75	0.75 0.07	1.21 0.11	1.67 0.16	2.13 0.20	2.59 0.24	3.05 0.28	3.51 0.33	3.97 0.37	4.43 0.41	4.89 0.46	5.36 0.50	5.82 0.54	6.28 0.58	6.74 0.63	7.20 0.67	7.66 0.71	8.12 0.76	8.58 0.80	9.04 0.84
36 0.90	0.92 0.09	1.49 0.14	2.06 0.19	2.63 0.24	3.19 0.30	3.76 0.35	4.33 0.40	4.90 0.46	5.46 0.51	6.03 0.56	6.60 0.61	7.17 0.67	7.73 0.72	8.30 0.77	8.87 0.82	9.44 0.88	10.01 0.93	10.57 0.98	11.14 1.04
42 1.05	1.10 0.10	1.77 0.16	2.45 0.23	3.12 0.29	3.80 0.35	4.47 0.42	5.14 0.48	5.82 0.54	6.49 0.60	7.17 0.67	7.84 0.73	8.52 0.79	9.19 0.85	9.87 0.92	10.54 0.98	11.22 1.04	11.89 1.11	12.57 1.17	13.24 1.23
48 1.20	1.34 0.12	2.16 0.20	2.98 0.28	3.81 0.35	4.63 0.43	5.45 0.51	6.28 0.58	7.10 0.66	7.92 0.74	8.75 0.81	9.57 0.89	10.39 0.97	11.22 1.04	12.04 1.12	12.86 1.20	13.69 1.27	14.51 1.35	15.33 1.43	16.16 1.50
54 1.35	1.51 0.14	2.44 0.23	3.37 0.31	4.30 0.40	5.23 0.49	6.16 0.57	7.09 0.66	8.02 0.75	8.95 0.83	9.88 0.92	10.81 1.01	11.74 1.09	12.67 1.18	13.60 1.27	14.53 1.35	15.47 1.44	16.40 1.52	17.33 1.61	18.26 1.70
60 1.50	1.69 0.16	2.72 0.25	3.76 0.35	4.80 0.45	5.83 0.54	6.87 0.64	7.91 0.74	8.95 0.83	9.98 0.93	11.02 1.02	12.06 1.12	13.10 1.22	14.13 1.31	15.17 1.41	16.21 1.51	17.24 1.60	18.28 1.70	19.32 1.80	20.36 1.89
66 1.65	1.93 0.18	3.11 0.29	4.30 0.40	5.48 0.51	6.67 0.62	7.86 0.73	9.04 0.84	10.23 0.95	11.41 1.06	12.60 1.17	13.78 1.28	14.97 1.39	16.16 1.50	17.34 1.61	18.53 1.72	19.71 1.83	20.90 1.94	22.08 2.05	23.27 2.16
72 1.80	2.10 0.20	3.39 0.32	4.69 0.44	5.98 0.56	7.27 0.68	8.56 0.80	9.86 0.92	11.15 1.04	12.44 1.16	13.74 1.28	15.03 1.40	16.32 1.52	17.61 1.64	18.91 1.76	20.20 1.88	21.49 2.00	22.79 2.12	24.08 2.24	25.37 2.36
78 1.95	2.34 0.22	3.78 0.35	5.22 0.49	6.67 0.62	8.11 0.75	9.55 0.89	10.99 1.02	12.43 1.16	13.87 1.29	15.31 1.42	16.76 1.56	18.20 1.69	19.64 1.83	21.08 1.96	22.52 2.09	23.96 2.23	25.40 2.36	26.84 2.50	28.29 2.63
84 2.10	2.52 0.23	4.06 0.38	5.61 0.52	7.16 0.67	8.71 0.81	10.26 0.95	11.81 1.10	13.35 1.24	14.90 1.39	16.45 1.53	18.00 1.67	19.55 1.82	21.10 1.96	22.64 2.11	24.19 2.25	25.74 2.39	27.29 2.54	28.84 2.68	30.39 2.83
90 2.25	2.69 0.25	4.35 0.40	6.00 0.56	7.66 0.71	9.31 0.87	10.97 1.02	12.62 1.17	14.28 1.33	15.93 1.48	17.59 1.64	19.24 1.79	20.90 1.94	22.55 2.10	24.21 2.25	25.86 2.41	27.52 2.56	29.17 2.71	30.83 2.87	32.49 3.02
96 2.40	2.93 0.27	4.74 0.44	6.54 0.61	8.34 0.78	10.15 0.94	11.95 1.11	13.75 1.28	15.56 1.45	17.36 1.61	19.17 1.78	20.97 1.95	22.77 2.12	24.58 2.29	26.38 2.45	28.18 2.62	29.99 2.79	31.79 2.96	33.60 3.12	35.40 3.29
102 2.55	3.11 0.29	5.02 0.47	6.93 0.64	8.84 0.82	10.75 1.00	12.66 1.18	14.57 1.36	16.48 1.53	18.39 1.71	20.30 1.89	22.21 2.07	24.12 2.24	26.04 2.42	27.95 2.60	29.86 2.78	31.77 2.95	33.68 3.13	35.59 3.31	37.50 3.49
108 2.70	3.28 0.30	5.30 0.49	7.31 0.68	9.33 0.87	11.35 1.06	13.37 1.24	15.39 1.43	17.40 1.62	19.42 1.81	21.44 1.99	23.46 2.18	25.48 2.37	27.49 2.56	29.51 2.74	31.53 2.93	33.55 3.12	35.56 3.31	37.58 3.50	39.60 3.68
114 2.85	3.52 0.33	5.69 0.53	7.85 0.73	10.02 0.93	12.19 1.13	14.35 1.33	16.52 1.54	18.69 1.74	20.85 1.94	23.02 2.14	25.18 2.34	27.35 2.54	29.52 2.75	31.68 2.95	33.85 3.15	36.02 3.35	38.18 3.55	40.35 3.75	41.52 3.95
120 3.00	3.69 0.34	5.97 0.55	8.24 0.77	10.51 0.98	12.79 1.19	15.06 1.40	17.33 1.61	19.61 1.82	21.88 2.03	24.15 2.25	26.43 2.46	28.70 2.67	30.97 2.88	33.25 3.09	35.52 3.30	37.80 3.51	40.07 3.73	42.34 3.94	44.62 4.15

PRESSURE DROP



Ratings do not include the effect of a bird screen.

Air Velocity in feet and (meters) per minute through Free Area
 (Data corrected to standard air density and AMCA figure or figures testes to 5.5)

PERFORMANCE DATA

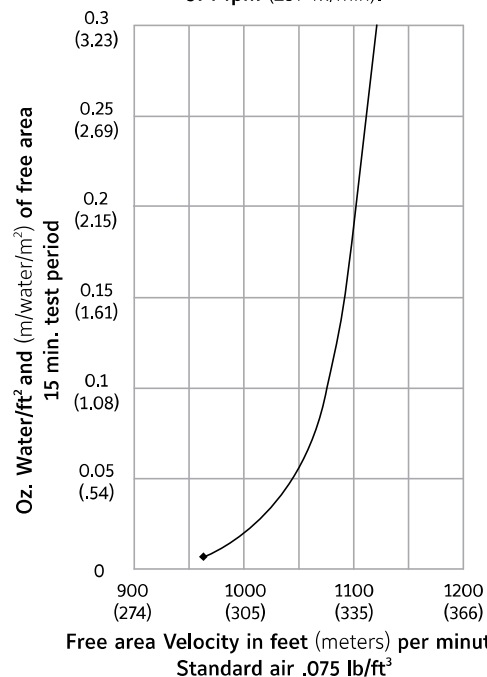
AMCA Standard 500 provides a reasonable basis for testing and rating louvers. Testing to AMCA 500 is performed under a certain set of laboratory conditions. This does not guarantee that other conditions will not occur in the actual environment where louvers must operate.

The louver system should be designed with a reasonable safety factor for louver performance. To ensure protection from water carry-over, design with a performance level somewhat below maximum desired pressure drop and .01 oz./sq. ft. of water penetration.

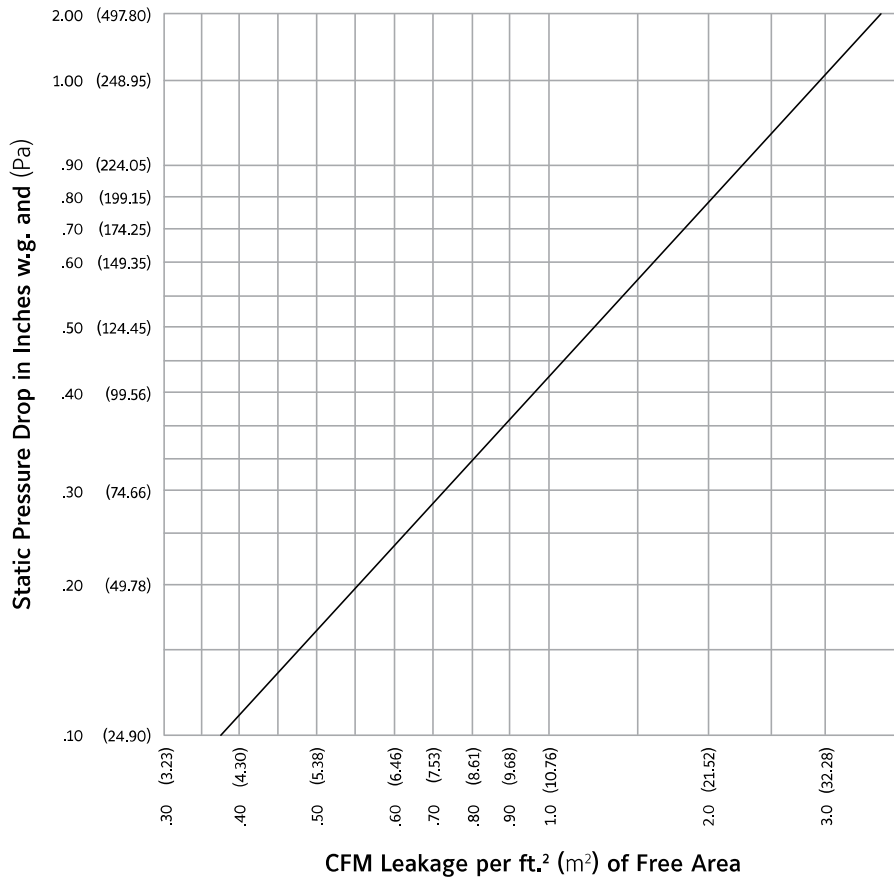


Ruskin Manufacturing Company certifies that the louver shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Standard 511 and comply with the requirements of the AMCA Certified Ratings Program. AMCA Certified Ratings Seal applies to air performance ratings and water penetration ratings only.

Water penetration
 Test size 48" wide X 48" high (1219 X 1219)
 Beginning point of water penetration at .01 oz. /sq. ft. is
 974 fpm (297 m/min).



AIR LEAKAGE



LINKS TO IMPORTANT DOCUMENTS

Document Title

Paint Finishes and Color Guide

Limited Warranty Document



3900 Doctor Greaves Road
Grandview, MO 64030
Website: www.ruskin.com
Phone: (816) 761-7476

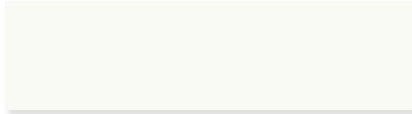
RUSKIN finishes enhance product appearance to blend with other colors selected.

These same finishes provide extended weathering resistance similar to adjacent building surfaces. RUSKIN provides most finishes available to architects and engineers. The standard finishes described herein represent those finishes usually selected, specified, or required for most applications.

Finishes and Color Guide

2 Coat - 50% and 70% PVDF - Standard Colors

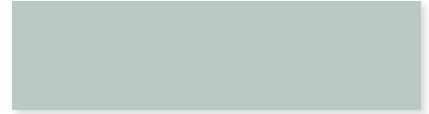
The 15 colors below are available in 2 Coat (50% PVDF) or 2 Coat (70% PVDF) finishes only.



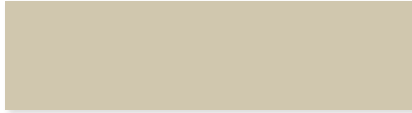
* BONE WHITE (24)



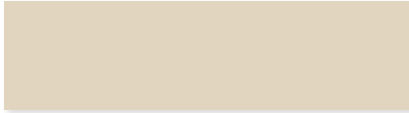
* DARK BRONZE (75)



* PORTLAND STONE (49)



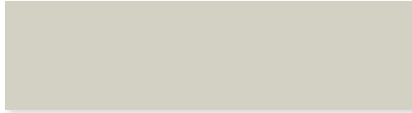
* LIGHT STONE (43)



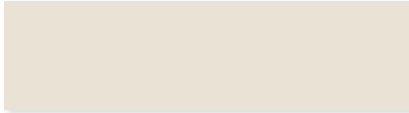
* SHELBURNE (69)



* FOREST GREEN (36)



* SANDSTONE (67)



* HERRINGBONE (37)



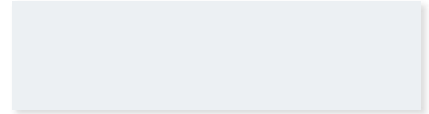
* CORONADO RED (34)



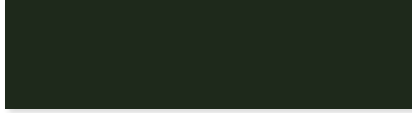
* SAHARA TAN (65)



* STONE GRAY (78)



* ASCOT WHITE (19)



* BLACK (89)



* MEDIUM BRONZE (72)



* TAUPE (52)

Pearledize 70 and Pearledize 50 Standard Colors

The 9 colors below are available in Pearledize 70, Pearledize 50, Clear or Color Anodize finishes only, and may be more expensive than the 50% and 70% PVDF colors shown above. *Italicized color names and codes are available in Anodized Finish.*



* DARK BRONZE (75)
* *DARK BRONZE (75)*



* MEDIUM BRONZE (72)
* *MEDIUM BRONZE (72)*



* CHAMPAGNE BRZ (71)
* *CHAMPAGNE BRZ (71)*



* BRIGHT SILVER (88)
* *Clear 204R1 & 215R1 (00)*



* WARM SILVER (96)



* ASTI (86)



* COPPER (92)



* CORAL REEF (93)



* BLUE (05)

* Denotes RUSKIN Color Code - Please use when ordering.

This color card is for reference only and is not meant to be used for color matching or final color approval. Shades may vary due to the color and resolution of monitors or print-outs. RUSKIN is not responsible for color matches made with this online color chart.



Finishes and Color Guide

Factory finishes by *RUSKIN* are designed for low VOC emissions and eliminate the risk of VOC emissions found in louver finishes that are applied on site. All *RUSKIN* manufacturing facilities operate in full compliance with all applicable air permitting regulations. All facilities maintain ISO 14001 Environmental Management Systems which include VOC emission reduction strategies including state of the art spray equipment and operator training.

Type of Finish

Finish Specifications

2 Coat - 70% PVDF

RUSKIN Superior Finish: 2 Coat 70% PVDF paint finishes provide maximum resistance against color fade and chalking. This carbon/fluorine bond, unique to the resin, when coupled with the finest inorganic pigments, produces the most durable and long lasting finish in the industry. These finishes are resistant to most chemicals, acid rain, salt spray and general air pollution. *RUSKIN* offers a twenty-year warranty on these finishes in standard colors on standard extruded aluminum products. All standard colors meet or exceed AAMA 2605-17a.*

Before paint application, louvers shall be thoroughly cleaned and pretreated to assure maximum performance. PVDF finish shall be applied to provide 1.2 mils (30µm) factory applied, baked-on film in accordance with AAMA 2605-17a* "Voluntary Specification Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Architectural Extrusions and Panels". Color shall be *RUSKIN* (specify color name and number).

2 Coat - 50% PVDF

RUSKIN'S High Performance Finish: 2 Coat 50% PVDF finishes provide fluoropolymer benefits such as long color life and resistance to chalking and chemicals. For optimization of the price-benefit ratio, they are appropriate coatings for today's non-monumental projects. Ten-year warranty for standard color on standard extruded aluminum products is also available for *RUSKIN'S* PVDF.

Louvers shall receive factory applied, baked-on 2 Coat 50% PVDF based color coating following thorough cleaning and pretreatment of metal. The finish shall be applied at 1.2 mils (30µm) total dry film thickness in accordance with AAMA 2604-17a† Color shall be *RUSKIN* (specify color name and number).

PRIME COAT

Preparation for field painting. Finish may be topcoated with epoxy, vinyl, urethane and other heavy-duty coatings within six months of applications. Prime coat contaminations always occurs before field painting and requires thorough field cleaning prior to painting.

Louvers shall receive prime coating following thorough cleaning and pretreatment of metal. Field topcoat with epoxy, vinyl, urethane or other heavy-duty coating within six months of application. Prime coat shall be a minimum of .3 ± .1 mils (8 ± 3µm) thick.

PEARLEDIZE 70 AND PEARLEDIZE 50

RUSKIN'S High Pearlescent Finish. Pearledize is a PVDF-based finish that utilizes pearlescent mica flakes to simulate the metallic appearance of anodized and metallic paint finishes.

Pearledize 50 (50% PVDF):

Meets the AAMA 2604-17a† specification. A ten-year warranty is available on standard colors on standard extruded aluminum products.

Pearledize 70 (70% PVDF): Pearledize 70 meets the AAMA 2605-17a* specification. A twenty-year warranty is available on standard colors on extruded aluminum products.

Louvers shall receive thorough cleaning and pretreatment as described above. Pearledize coating shall be applied and baked to achieve a hard durable finish in compliance with either AAMA 2605-17a* or AAMA 2604-17a† as selected and specified. Color shall be *RUSKIN* (specify color name and number).

COLOR ANODIZE

Electrolytically deposited coating on aluminum: The color anodize process specified in Aluminum Association Code AA-C22A44 electrolytically deposits inorganic color pigment finish to a 0.7 mil (18µm) minimum surface depth on sulfuric acid anodized aluminum. Treated aluminum is sealed to convert a freshly formed aluminum oxide finish to a corrosion resistant, inert condition. Available only on aluminum. Some shade variation may occur.

Louvers shall receive electrolytically deposited color anodized finish complying with Aluminum Association Code AA-C22A44. Finish is applied to 0.7 mils (18µm) minimum thickness onto chemically etched and pretreated aluminum. Color shall be *RUSKIN* (specify color name).

CLEAR ANODIZE

Clear oxide coating for aluminum: Clear anodize preoxidizes the aluminum surface for uniform clear finish not easily affected by natural oxidizing influences. Improved metallic luster appearance is similar to mill finish. 204-R1 (Aluminum Association Code AA-C22A31) provides 0.4 mi (10µm) minimum surface depth treatment recommended for normal weather exposure. 215-R1 (Aluminum Association Code AA-C22A41) provides 0.7 mils (18µm) minimum surface depth recommended for severely corrosive and abrasive atmospheric exposure. Both finish types available only on aluminum.

Louvers shall receive a 204-R1 clear anodize finish complying with Aluminum Association Code-C22A31. Finish is applied to chemically etched and pretreated aluminum to 0.4 mils (10µm) minimum surface depth by a 30 minute anodizing process. Louvers shall receive a 215-R1 clear anodize finish complying with Aluminum Association Code AA-C22A41. Finish is applied to chemically etched and pretreated aluminum to 0.7 mils (18µm) minimum surface depth by a 60 minute anodizing process.

For additional information regarding finish warranties, please reference the Ruskin Finishes Warranty document on www.ruskin.com

Dimensions in parentheses () indicate microns. Sheran 5000 is registered trademark of Sherwin-Williams.

*AAMA 2605-17a is the most stringent performance specification for organic coatings or exterior aluminum finishes in the industry, requiring 10 years south Florida exposure.

† AAMA 2604-17a supersedes AAMA 2604-10 and requires 5 years of south Florida exposure.

RUSKIN'S 50% PVDF fluoropolymer, 70% PVDF fluoropolymer based finishes (Pearledize 50 and Pearledize 70) and prime coat finishes are provided by Sherwin-Williams.

Twenty-year warranties are only available on extruded aluminum products, and are subject to restrictions. Consult *RUSKIN* for additional information.

RUS-L24(-S) Electric 24 Volt Control Damper & Louver Actuator

DIRECT COUPLED SPRING RETURN

DESCRIPTION

Ruskin model RUS-L24(-S) electric On/Off spring return actuator designed for factory mounting on dampers and operable louvers. Actuators can be mounted directly to a damper or louver shaft from 3/4 to 1-1/16 inch (19 to 27 mm) diameter with a universal clamp. An optional line voltage auxiliary switch indicates an end-stop position or performs switching functions within the field selected 0° to 95° rotation range.

FEATURES

- Designed specifically to operate damper and operable louver applications up to the square footage face area listed below.
- Reversible mounting design simplifies installation and enables the actuator to be spring return in either direction.
- Electronic stall detection through entire rotation range extends life by deactivating the motor when an overload condition is detected.
- 5 Year factory warranty



RUS-L24(-S) Electric Spring-Return Actuator

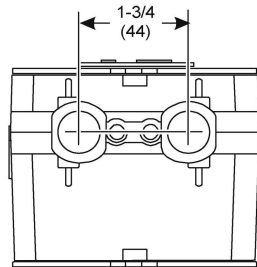
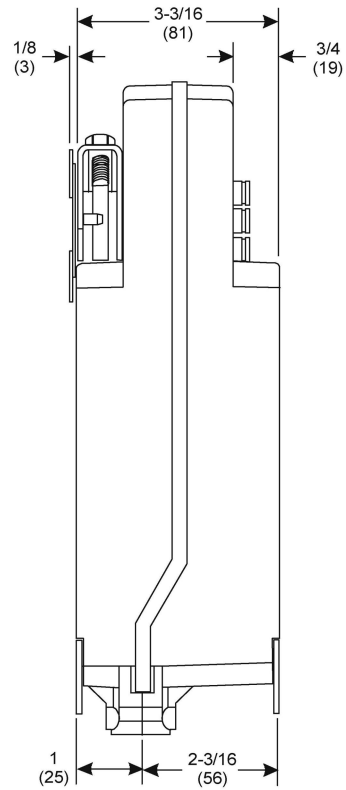
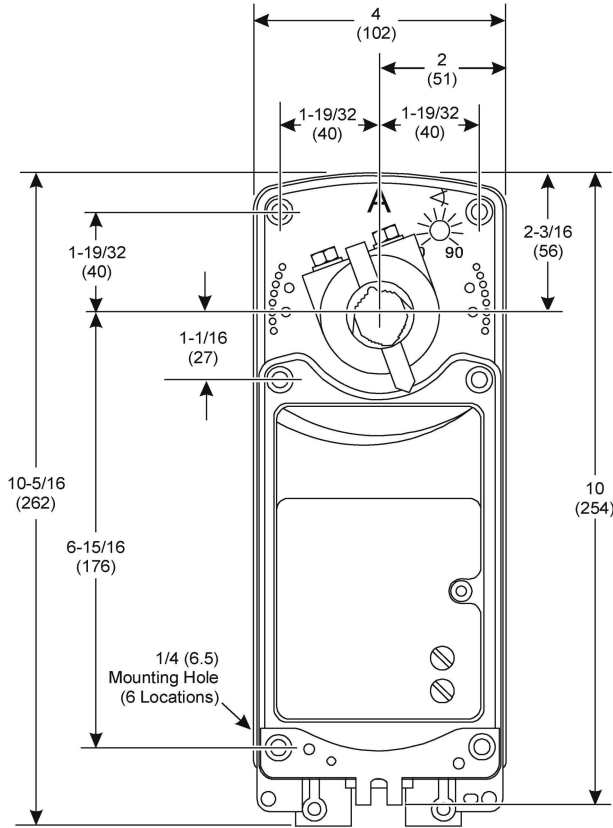
TECHNICAL INFORMATION	
COMMERCIAL DAMPER FACE AREA*	35 sq. ft. with seals 70 sq. ft. without seals
LOUVER FACE AREA	50 sq. ft. with seals 75 sq. ft. without seals
INDUSTRIAL DAMPERS	Dependent on model and system conditions (Consult Ruskin)
RUNNING TIME	Drive: 24 to 57 sec Spring: < 15 sec
POWER SUPPLY	AC 24 V 50/60 DC 24 V
POWER CONSUMPTION	AC: Running 26 VA, Holding 9.3 VA DC: Running 17.6 W, Holding 2.8 W
TRANSFORMER SIZE	25 VA
DIRECTION OF ROTATION	Reversible with cw/ccw mounting
POSITION INDICATION	Visual indication 0° to 95°
OPTIONAL AUXILIARY SWITCH (-S Models)	2 ea - SPDT 50 VA @ 24 V 5.8 A @ 120 V, 1/4 hp, 275 VA Pilot Duty 5.0A @ 240 V, 1/4 hp, 275 VA Pilot Duty
ELECTRICAL PROTECTION	Double insulated
ELECTRICAL CONNECTION	3 ft, 18 ga appliance cable (-S models have 2 cables) 1/2" conduit connector
OVERLOAD PROTECTION	Electronic throughout 0° to 95° rotation
ROTATION PROTECTION	Max 95° adjust. with mechanical stop (optional)
HOUSING	NEMA 2 (IP54) Aluminum
HUMIDITY	5 to 90% non-condensing

*Consult Ruskin for proper actuator sizing on TED50 series dampers

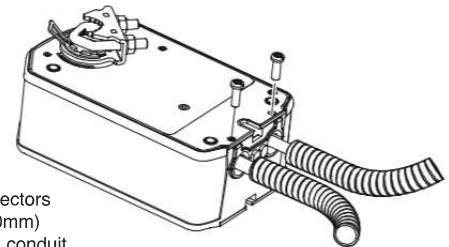
TECHNICAL INFORMATION	
AMBIENT TEMPERATURE	-40° to 131°F (-40° to 55°C)
STORAGE TEMPERATURE	-85° to 185°F (-65° to 85°C)
AGENCY LISTINGS	UL 60730-1A: 2003-08 UL 60730-2-14: 2002-02 UL 2043 C22.2 No. 24-93
NOISE LEVEL AT APPROX. 40" DISTANCE	Drive: <66 dba Holding: <18 dba Spring: <66 dba
WEIGHT	RUS-L24: 6.4 lb (3.5 kg) RUS-L24-S: 6.8 lb (3.6 kg)
SERVICING	Maintenance free
QUALITY STANDARD	ISO 9001

ACCESSORY	
ADJUSTABLE END STOP KIT	Part #M9220-603 From 35° to 95° in 5° increments
SMALLER SHAFT COUPLER	Part #M9220-601 1/2 to 3/4 in. or 12 to 19 mm Round Shafts, or 3/8 and 1/2 in. or 10, 12, and 19 mm Square Shafts
WEATHER SHIELDS	Part #M9000-320 NEMA3R, IP32 OR Part #M9000-340 NEMA 5, IP54 impact-grade plastic enclosure with UV inhibitors to extend life

DIMENSIONS



CONDUIT CONNECTION



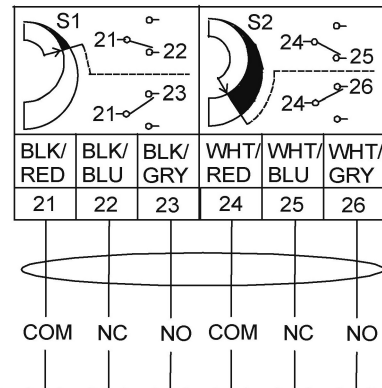
Integral connectors for 3/8 in. (10mm) flexible metal conduit

WIRING



Auxiliary Switches

The RUS models include two integral auxiliary switches with a switch adjuster accessible on either face of the actuator. The nominal factory setting for Auxiliary Switch No. 1 is 11° closing, and the nominal factory setting for Auxiliary Switch No. 2 is 81° opening (relative to a 0 to 90° rotation range).



SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 SUMMARY

- A. This Section specifies the basic requirements for electrical installations and includes requirements common to more than one section of Division 26. It expands and supplements the requirements specified in sections of Division 01.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Division 09 - Painting and Coating.
 - 3. Division 31 - Excavating, backfilling and compacting for utilities.
 - 4. Division 23 - HVAC.
- C. Applicable Standards
 - 1. ASTM D 709 (2007) – Laminated Thermosetting materials.
 - 2. ANSI/NEMA FB-1 (2010) – Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
 - 3. ANSI/NEMA 250 (2008) – Enclosure for Electrical Equipment (1000 Volts Maximum).
 - 4. California Electrical Code (CEC).
 - 5. UL 1 (2005) – Standard for Flexible Metal Conduit.
 - 6. UL 1242 (2007) – Standard for Electrical Intermediate Metal Conduit.
 - 7. UL 6 (2010) – Electrical Rigid Metal Conduit-Steel.
 - 8. UL 797 (2007) – Electrical Metallic Tubing-Steel.
 - 9. UL 870 (2008) – Standard for Wireways, Auxiliary Gutters, and Associated Fittings

1.2 BASIC ELECTRICAL REQUIREMENTS

A. DESCRIPTION

1. Provide all labor materials and equipment necessary for general electrical requirements where shown on the contract drawings and specified herein.
2. Included Work:
 - a) Provide all labor, materials, equipment, tools and appliances required to furnish and install all electrical work as shown on the Contract Drawing and the specifications. All systems must be constructed complete and operable. The scope includes but not limited to the following:
 - 1) All construction power and lighting and power for testing equipment and systems through final acceptance of test.
 - 2) Power, low voltage and lighting raceway(s) underground inside the property line boundaries.
 - 3) All underground power and low voltage conduits on and off site per the utility company's requirements, plans and provisions.
 - b) Complete lighting and power system(s) including branch circuits, fixtures, outlets, lamps, switches, controllers, and auxiliary equipment.
 - c) Complete distribution system(s) including switchboards, panel boards, transformers, feeders, and auxiliary equipment.
 - d) Complete system of exterior (vandal resistant) lighting.
 - e) Complete Grounding System.
 - f) All systems to be functional and tested.
 - g) All control wiring and devices for equipment specified in Sections of Division 26 and other technical Sections, except where specifically indicated or noted otherwise on the Contract Drawings or in the Specifications.
 - h) Complete, operable and certified fire alarm system.
 - i) All testing for all installed systems including all owner furnished items.
 - j) Applicable excavating, trenching and backfilling.

B. Quality Assurance:

1. Workers possessing the skills and experience obtained in performing work of similar scope and complexity shall perform the Work of this Division.
2. Refer to other sections of the Specifications for other qualification requirements.

C. Drawings and Specifications Coordination:

1. For purposes of clearness and legibility, Drawings are essentially diagrammatic and the size and location of equipment is indicated to scale whenever possible. Verify conditions, dimensions, indicated equipment sizes, and manufacturer's data and information as necessary to install the Work of this Division. Coordinate location and layout with other Work.
2. Verify final locations for rough-ins with field measurements and with the requirements of the equipment to be connected.
3. Drawings indicate required size and points of termination of conduits, number and size of conductors, and diagrammatic routing of conduit. Install conduits with minimum number of bends to conform to structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and comply with applicable code requirements.
4. Routing of conduits may be changed provided that the length of any conduit run is not increased more than 10 percent of length indicated on the Drawings.
5. Outlet locations shall be coordinated with architectural elements prior to start of construction. Locations indicated on the Drawings may be distorted for clarity.
6. Coordinate electrical equipment and materials installation with building components and the Work of other trades
7. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
8. Coordinate connection of electrical systems with existing underground utilities and services.

D. Terminology:

1. Signal Systems: Applies to bell, fire alarm, annunciator, sound, public address, buzzer, inter-communication and lighting control systems.
2. Low Voltage: Applies to signal systems operating at 120 volts and less, and power systems operating at less than 600 volts. Medium voltage: Applies to power systems operating at more than 600 volts.
3. UL: Underwriter's Laboratories Inc, Nationally Recognized Testing Laboratory (NRTL), or equal.

E. Regulations: Work shall comply with the requirements of authorities having jurisdiction and the California Electrical and Building Codes. Material shall conform to regulations of the National Board of Fire Underwriters for electrical wiring and apparatus. Materials shall be new and listed by UL, or another NRTL.

F. Structural Considerations for Conduit Routing:

1. Where conduits pass through or interfere with any structural member, or where notching, boring or cutting of the structure is necessary, or where special openings are required through walls, floors, footings, or other buildings elements, conform to

CBC, Part 2, Title 24, Section 1906.3 for conduits and pipes embedded in concrete and Sections 2308.9.10 and 2308.9.11 for notches and bored holes in wood; for steel, as detailed on the structural steel Shop Drawings.

2. Where a concrete encasement for underground conduit abuts a foundation wall or underground structure which the conduits enter, encasement shall rest on a haunch integral with wall or structure, or shall extend down to footing projection, if any, or shall be doveled into structure unless otherwise indicated. Underground structures shall include maintenance holes; pull boxes, vaults, and buildings.
3. Holes required for conduit entrances into speaker poles, floodlight poles or other poles, shall be drilled with the conduit nipple or coupling welded to poles. Welds shall be provided by the electric arc process and shall be continuous around nipple or coupling.

G. Electrically Operated Equipment and Appliances:

1. Furnished Equipment and Appliances:

- a. Work shall include furnishing and installing wiring enclosures for, and the complete connection of electrically operated equipment and appliances and electrical control devices which are specified to be furnished and installed in this or other sections of the Specifications, wiring enclosures shall be concealed except where exposed Work is indicated on the Drawings.
- b. Connections shall be provided as necessary to install equipment ready for use. Equipment shall be tested for proper operation and, if motorized, for proper rotation. If outlets are of incorrect electrical characteristics or any specified equipment fails to operate properly, repair and/or replace the outlet and/or equipment.

2. Equipment and Appliances Furnished by Others:

- a. Equipment and appliances indicated on Drawings as "not in contract" (NIC), "furnished by others," or "furnished by the Owner," will be delivered to the Project site. Required electrical connections shall be performed for such equipment and appliances. Motorized equipment will be furnished factory-wired to a control panel or junction box unless otherwise indicated. Appliances will be furnished equipped with portable cord and cap. Provide disconnect switches where required.
- b. Connections to equipment furnished under this Division shall be part of the Work of this section. Work shall include internal wiring, installation, connection and adjustment of bolted drive motors in which the motor is supplied as a separate unit, and connections only for equipment furnished with factory installed internal wiring, except as further limited by Drawings and this Specification. Work shall include furnishing and installing suitable outlets, disconnecting devices, starters, push-button stations, selector switches, conduit, junction boxes, and wiring necessary for a complete electrical installation. Work shall also include furnishing and installing conduit and boxes for HVAC control systems, furnished under Division 23. Devices and equipment furnished shall be of same type used elsewhere on the Work or as specified.

- c. Electrical equipment furnished under other sections, for installation and connection under Work of this section, will be delivered to the Project site ready for installation.
- d. Mechanical equipment furnished under other sections, and requiring electrical connection under this section, will be set in place as part of the Work of the section furnishing such equipment unless noted otherwise.
- e. Suitability and condition of equipment furnished under other sections shall be determined in advance of installation. Immediate notice of damage, unsuitability, or lack of parts shall be given to the entity providing such equipment.

H. Submittals:

1. Conform to applicable provisions of Division I of the General Requirements and as hereinafter specified.
2. Prepare, review and coordinate schedule of submittals, determining necessary lead time for preparation, submitting, checking, and ordering and delivering materials and equipment to the job-site for timely arrival and conformance with the overall Construction schedule.
3. All submittals will be checked for general compliance with Specifications only. Contractor will be responsible for deviations from the Drawings or Specifications and for errors or omissions of any sort in the Submittals.
4. All required submittals on electrical items and equipment shall include complete catalog information such as construction ratings. insulation systems, including manufacturer's certification that items or equipment meet or exceed and Trade Standards, and the Specifications. All items must be U.L. listed or listed per a recognized by code listing agency.
5. Conform to applicable provisions of Division I of the General Requirements and as hereinafter specified.
6. Prepare, review and coordinate schedule of submittals, determining necessary lead time for preparation, submitting, checking, and ordering and delivering materials and equipment to the job-site for timely arrival and conformance with the overall Construction schedule.
7. All submittals will be checked for general compliance with Specifications only. Contractor will be responsible for deviations from the Drawings or Specifications and for errors or omissions of any sort in the Submittals.
8. All required submittals on electrical items and equipment shall include complete catalog information such as construction ratings. insulation systems, including manufacturer's certification that items or equipment meet or exceed and Trade Standards, and the Specifications. All items must be U.L. listed or listed per a recognized by code listing agency.

9. Equipment Floor Plans: Submit after approval of material and/or equipment is secured. Prepare for each electrical equipment room drawn to 2" = 1'-0" scale. Layout drawing shall be to exact scale.
10. Materials list of items and equipment proposed to be provided for the work of this Division and shall include at least the following as applicable:
 - a. Service and distribution switchboard.
 - b. Lighting panel boards.
 - c. Lighting control panels.
 - d. Conduits.
 - e. Conductors.
 - f. Electrical equipment layout at scale indicating on drawings of equipment,
 - g. Clearances.
 - h. Disconnect switches, pull boxes and fuses.
 - i. Lighting fixtures.
 - j. Fire alarm and detection system.
 - k. Control devices, standard and special receptacles, switches and finish device plates.
 - l. All fabricated equipment.
 - m. Time clocks, contactors, control switches, etc. including wiring diagrams and sequence of operation.
11. Short Circuit, Arc flash and Coordination Study.
 - a. Submit, along with switchgear and distribution equipment submittal, system short circuit study based on the per unit method or in accordance with the latest IEEE recommendations, Report to be submitted with the shop drawings of the main service and the distribution system, each copy bound with a stiff cover.
 - b. Provide Arc flash calculations and provide a sticker with the value and the recommended protective gear.

- c. Submit, along with the short circuit study, a coordination study of all protective devices, including the utility company protective device through all feeder devices on the secondary of each transformer downstream to each panel board and motor control center. Settings shall be incorporated with the coordination study. Study both short circuit and coordination studies~ comprising the power systems study shall be signed by California Registered Electrical Engineer who shall determine the adjustable settings for protective devices. All switchgear and distribution equipment shall comply with the results and recommendations of the studies. The ampere interrupting capacity (A.I.C.) rating of devices shall be a minimum of at least ten percent greater than the calculated value of symmetrical three-phase fault current at that respective device. All circuit breakers shall be fully rated. Series rated breakers shall not be accepted. Feeder lengths and materials shall be determined independently by the installing contractor, and documented in the study. Studies shall include entire system from normal utility source, emergency source down to panel boards, and individual feeder loads serving specific equipment.
- d. Studies to be done by switchgear manufacturer and shall include a tabular form indicating calculated fault value, the A.I.C. value and the available arc flash energy and the recommended protective gear at each equipment.

12. Special Submissions:

I. Test Reports for the following:

- a. Megger Readings: Ground system, motors and feeders.
- b. Voltage Readings: Distribution, service and motors.
- c. Fire alarm system.

I. Protection of Materials:

- 1. Protect materials and equipment from damage and provide adequate and proper storage facilities during progress of the Work. Damaged materials and/or equipment shall be replaced.

J. Cleaning:

- 1. Exposed parts of Work shall be left in a neat, clean, usable condition. Finished painted surfaces shall be unblemished and metal surfaces shall be polished.
- 2. Thoroughly clean parts of apparatus and equipment. Exposed parts to be painted shall be thoroughly cleaned of cement, plaster, and other materials. Remove grease and oil spots with solvent. Such surfaces shall be wiped and corners and cracks scraped out. Exposed rough metal shall be smooth, free of sharp edges, carefully steel brushed to remove rust and other spots, and left in proper condition to receive finish painting.
- 3. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

K. WARRANTIES

- 1. Provide one year warranty on all material and labor performed as a minimum, unless noted otherwise in specific sections.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Advise the Inspector before starting the Work of this Division.
- B. Exposed conduits shall be painted to match the surfaces adjacent to installation.
- C. Salvaged materials removed from buildings shall be removed from the Project site as required by the OAR.
- D. Trenches outside of barricade limits shall be backfilled and paved within 24 hours after being inspected by the Inspector. Provide traffic plates during the time that trenches are open in traffic areas and in areas accessible to students and staff.
- E. Where existing structural walls are cored for new conduit runs, separation between cored holes shall be three inches edge to edge from new or existing holes, unless otherwise required by the Architect. All coring to be laid out and reviewed by Architect prior to drilling. Contractor to verify location of structural steel, rebar, stress cabling or similar prior to lay out.
- F. Electrical equipment shall be braced and anchored for CBC Seismic Design requirements, or as otherwise indicated on the Drawings.
- G. **LEGAL REQUIREMENTS AND STANDARDS**
 - a. Required: Comply with the latest, as applicable and effective, during the progress of Contracted Work.
 - 1. Latest Ventura County, Electrical, Fire and Building Codes and Supplemental addendums and requirements.
 - 2. California State Administrative Code, Title 24, State Building Standard.
 - 3. (CAUOSHA) California State Occupational Safety and Health Act.
 - 4. California State Fire Marshal Standards.
 - 5. Southern California Edison.
 - 6. U.L. - Underwriters Laboratories Inc.
 - 7. NEC - National Electric Code.
 - 8. ASTM - American Society of Testing and Materials.
 - 9. Current publications of the National Fire Protection Association.
 - 10. National and American Standards Association.
 - b. General compliance as applicable

1. Drawings and specification requirements shall govern where they exceed Code requirements, in case of a conflict between the plans, the codes and the specifications, the more stringent shall apply.
2. Where requirements between governing Codes and Regulations vary, the more restrictive provision shall apply.
3. Nothing contained in Contract Documents shall be construed as authority or permission to disregard or violate legal requirements.

3.2 DELIVERY STORAGE AND HANDLING

- A. Deliver products to project site with proper identification, which shall include names, model numbers, types, grades, compliance labels, and similar information needed for District identification; all products and materials shall be adequately packaged and protected to prevent damage during shipment, storage, and handling.
- B. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion.

3.3 CUTTING AND PATCHING

- A. Cutting and patching of electrical equipment, components, and materials shall include the removal and legal disposal of selected materials, components, and equipment.
- B. Do not endanger or damage installed Work through procedures and processes of cutting and patching.
- C. Repair or restore other work, or surfaces damaged as a result of the work performed under this contract.

3.4 PRELIMINARY OPERATIONS

- A. Required; Should the District require that any portion of the systems or equipment be operated prior to the final scheduled dates for completion and acceptance of the work, the Contractor shall consent. Such operation shall be under the direct supervision of, and at the expense of the Contractor, and shall not be construed as an acceptance of any of the work by the District.

3.5 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose off the Project site.
- B. Remove equipment and implements of service, and leave entire work area neat and clean, to the satisfaction of the Owner Authorized Representative.

3.6 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.7 COMPLETION

- A. Protect The work will not be reviewed for final acceptance until operating and maintenance data, manufacturer's literature, panel directories and nameplates specified herein have been approved and properly posted or installed and final cleaning of equipment and premises has been completed.
- B. When the installation is complete and all adjustments have been made, operate the systems for a period of one week, during which time demonstrate to the Engineer that the systems are completed and operating in conformance with the Specifications.

END OF SECTION

SECTION 26 05 13

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Boxes, enclosures, keys and locks.
 - 2. Receptacles and switches.
 - 3. Identifications and signs.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Division 26 – Electrical.

PART 2 PRODUCTS

2.1 BOXES, ENCLOSURES, KEYS AND LOCKS

- A. Outlet Boxes and Fittings:
 - 1. Outlet boxes installed in concealed Work shall be galvanized steel, pressed, or welded type, with knockouts.
 - 2. In exposed Work, where conduit runs change direction or size, outlet boxes and conduit fittings shall be cast metal with threaded hubs cast integral with box or fitting.
 - 3. Fittings shall be cast metal and non-corrosive. Ferrous metal fittings shall be cadmium-plated or zinc galvanized. Castings shall be true to pattern, smooth, straight, with even edges and corners, of uniform thickness of metal, and shall be free of cracks, gas holes, flaws, excessive shrinkage, and burnt-out sand.
 - 4. Covers for fittings shall be galvanized steel or non-corrosive aluminum and shall be designed for particular fitting installed.
 - 5. Light fixture outlets shall be 4-inch octagon, 4-inch square, 2 1/8-inch deep or larger, depending upon number of conductors or conduits therein. Plaster rings shall be furnished with round opening with two ears drilled $2 \frac{23}{32}$ inches center to center.

6. For local device outlets provide 4-inch square 2 1/8-inch deep, boxes for single gang, 5-inch square boxes for two-gang, and special solid gang boxes with gang plaster ring for more than two switches.
7. For horns and strobes, provide manufacturer's supplied back box as needed. For television outlets, provide 4-gang deep boxes and 4-gang plaster rings.
8. Plaster rings shall be provided on flush-mounted outlet boxes except where otherwise indicated or specified. Plaster rings shall be same depth as finished surface. Install approved ring extension to obtain depth to finish surface.
9. In existing plywood wall or drywall construction, and where flexible steel conduit is fished into walls, single-gang and 2-gang outlets for wiring devices may be sectional steel boxes with plaster ears. Boxes shall be fastened to plywood with flat-head screws in each plaster ear screw hole. Boxes fastened to gypsum board shall be Raco, Appleton, Cooper, Bowers, or equal.
10. Factory made knockout seals shall be installed to seal box knockouts, which are not intact.
11. Where flexible conduit is extended from flush outlet boxes, provide and install weatherproof universal box extension adapters.

B. Junction and Pull boxes:

1. Junction and pull boxes, in addition to those indicated, shall only be used in compliance with codes, recognized standards, and Contract Documents.
2. Interior and non-weatherproof boxes shall be constructed of blue or galvanized steel with ample laps, spot welded, and shall be rigid under torsion and deflecting forces. Boxes shall be furnished with auxiliary angle iron framing where necessary to ensure rigidity.
3. Covers shall be fastened to box with a sufficient number of machine screws to ensure continuous contact all around. Flush type boxes shall be drilled and tapped for cover screws if boxes are not installed plumb. Surfaces of pull and junction boxes and covers shall be labeled in black marker ink designating system, panelboard and circuit designation contained in box. In exposed Work, designation shall be installed on inside of pullbox or junction box cover.
4. Weatherproof NEMA 3R pull and junction boxes shall conform to foregoing for interior boxes with following modifications:
 - a. Cover of flush mounting boxes shall be furnished with a weather-tight gasket cemented to, and trimmed even with, cover all around.
 - b. Surface or semi-flush mounting pull and junction boxes shall be UL, or another Nationally Recognized Testing Laboratory (NRTL) listed as rain-tight and shall be furnished complete with threaded conduit hubs.
 - c. Exposed portions of boxes shall be galvanized and finished with one prime coat and one coat of baked-on gray enamel, unless already furnished with factory baked-on finish.

5. Junction and pull boxes shall be rigidly fastened to structure and shall not depend on conduits for support.

6. Underground Concrete Pull Boxes:
 - a. Pre-cast concrete pull boxes. Concrete pull boxes shall be traffic type, reinforced for H-20 wheel loading, pre-cast concrete. Pull boxes with inside dimensions of 2 feet by 3 feet by 3 feet deep shall consist of a base section, top ring, and cover. Base section shall be furnished with 2 knockouts measuring 10 inch by 10 inch in each 3 feet side, and one 20 inch by 20 inch knockout in each 2-foot side. Pull boxes with inside dimension 4 feet by 4 feet by 4 feet deep shall consist of a base section, midsection, topping, and cover. Base section shall be furnished with 2 knockouts measuring 8-inch by 16-inch on each of two opposite sides, and one 20-inch by 20-inch knockout on each of other two opposite sides. Pull boxes shall be furnished with a minimum of 6-inch diameter sump knockout and one inch diameter ground rod knockout. In pull boxes, furnish and install cable racks on walls. Racks shall be furnished with 3 porcelain cable holders on vertical steel mounting bars. Pull boxes shall be furnished with 3/4 inch diameter pull irons. Covers shall be traffic-type consisting of steel safety plate bolted to frame. Covers shall be marked as electrical, power, or signal as required. Pull boxes shall be as manufactured by Oldcastle Precast, Jensen Precast, Kistner, Western Precast, or equal.
 - b. Provide end bells in duct entrances. Terminate each metal conduit with insulated bushing provided with a grounding terminal.
 - c. Install pulling irons on opposite walls and below horizontal centerlines of ducts and bricked-up openings, and in bottom. Install pulling irons with each end hooked around a reinforcing bar.
 - d. Remove floor drain knockout and provide a depth of 24 inches of crushed rock below box extending a minimum of 12 inches beyond on all sides.
 - e. Permanently and effectively ground metal equipment cases, cable racks, and similar items in pull boxes to site grounding electrode system. Provide grounding conductor in compliance with CEC Article 250.
 - f. Provide 6-inch deep sand base under pull boxes.
 - g. Identify power and signal cables by tagging in manholes and pull boxes. Tie securely to cables with nylon cord.
 - h. Top of steel plate shall provide a minimum coefficient of static friction of 0.5 for either wet or dry locations, when tested for any shoe sole material. Test shall comply with ASTM D 1047 or F 489 or F 609 standards. Submit manufacturer's test results for Architect's review as part of materials and equipment submittals.


- i. The use of underground extension boxes shall be limited to not more than 1 times the original depth of pull box.
7. Underground utility boxes shall be reinforced concrete with non-setting shoulders to prevent settlement following installation. Boxes shall be furnished with cast iron cover with finger hole, size as indicated on Drawings. Utility boxes shall be as manufactured by Oldcastle, Jensen, Kistner, Western Precast, or equal.

C. Keys and Locks:

1. Provide two keys with furnished door locks, including cabinet door locks and switchboard locks, two keys for lock switches on switchboards or control panels, and two keys with interlocks or other furnished lock switches. Deliver keys to Owner.
2. Locks shall be keyed to Corbin No. 60 keys for access to operate equipment and Corbin 70 keys for service access. Special keys and locks shall only be provided where specified.

2.2 RECEPTACLES AND SWITCHES

A. Wireless Controlled Receptacles:

1. The Duplex Controller shall be the Echoflex ERNR Series Split Duplex Controller by Echoflex Solutions, Inc., or equal. (Compatible with the Occupancy sensor Echoflex MOS-21U Series Occupancy Sensor by Echoflex Solutions, Inc., or equal).
 - a) Mechanical
 - 1) The Controller shall mount in a standard single-gang wall box
 - 2) The Controller shall have learn and clear buttons for manual linking of switches and sensors
 - a) The buttons shall be accessible when the Controller is mounted, prior to mounting the faceplate.
 - 3) The Controller shall have two LED indicators to display power and linked device information
 - 4) The Controller shall have LED arrows pointing to controlled side of receptacle so that controlled side is permanently marked and easily visible in dark locations
 - 5) The Controller shall have an embossed icon  so that the controlled side is permanently marked

b) Electrical

- 1) The Controller shall support 120VAC power input
- 2) The Controller shall provide a single normally open relay contact, fully rated for 15 amps to switch power to the controlled receptacle
 - a) The Controller shall have an auxiliary output controlled from the internal relay for wiring directly to other duplex receptacles
- 3) The Controller shall use a 902 MHz EnOcean radio. Systems that use other radio frequencies shall not be acceptable
- 4) The internal radio shall have a range of at least 80 feet through walls (laterally), up to 300 feet in open space
- 5) The Controller shall be ETL listed, conform to UL 508, and certified to CAN/CSA Standard C22.2 No.14
- 6) The Controller shall comply with FCC Part 15.231 and IC RSS-210

c) Functional

- 1) The Controller shall provide switching control for an individual load plugged into the controlled receptacle

- a. The Controller shall support wireless Echoflex switches and sensors for relay control
 - 1) The Controller shall support linking of at least 20 wireless devices in any combination of Echoflex stations and sensors. Systems that do not support at least 20 stations or sensors shall not be acceptable
- b. The Controller shall provide the option of single or dual-hop wireless signal repeating to other controllers. Systems that do not provide signal repeating shall not be acceptable
- c. The Controller shall support Central Command functions for use with integrated control systems
- d. The Controller shall support commissioning and linking through software and/or mechanical means. Controllers that do not support both shall not be acceptable
- e. The Controller shall provide configuration variables that allow customization of the controllers operation with linked sensors and switches
- f. The Controller shall provide the option of reporting relay status wirelessly
- g. The Controller shall save all configuration settings and linked device details in non-volatile memory
 - 1) The Controller shall provide the option of saving user-defined configuration settings as recoverable default settings

B. Receptacles:

- 1. Duplex receptacles shall be heavy-duty specification grade, grounding type. Terminal screws shall be back and side wired with internal screw pressure plates. Mounting strap shall feature heavy-duty brass construction. Receptacle back body shall be PVC. Receptacle face shall be ivory, impact resistant nylon. Receptacles shall have triple wipe brass power contacts.

<u>NEMA #</u>	<u>Pass & Seymour Leviton</u>	<u>Hubbell</u>
(20 amps) NEMA 5-20	PS5362-I 5362-I	HBL5362-I
(15 amps) NEMA 5-15	PS5262-I 5262-I	HBL5262-I

2. Duplex receptacles on circuits supplied by panel boards with integral surge suppression shall be Pass & Seymour model number PS5262BL (blue), Hubbell DRUBTVSS15, Leviton 5262-SBU, 15 amps, 120 volts, or equal.
3. Single receptacles shall be heavy-duty specification grade, grounding type. Terminal screws shall be back and side wire with internal screw pressure plates. Mounting strap shall feature heavy-duty brass construction. Receptacle back body shall be thermoplastic. Receptacle face shall be ivory, impact resistant nylon. Receptacles shall have triple wipe brass power contacts. For circuits consisting of one single receptacle only, ampere rating of receptacle shall be same as circuit breaker or fuse.

<u>NEMA #</u>	<u>Pass & Seymour Leviton</u>	<u>Hubbell</u>
(20 amps) NEMA 5-20R	5361-I 5361-I	HBL5361-I
(15 amps) NEMA 5-15R	5261-I 5261-I	HBL5261-I

4. Provide specification grade ground-fault circuit interrupter (GFCI) type receptacles in accordance with 2010 UL standards. GFCI receptacles shall have a trip indication light. Receptacle terminal screws shall be back and side wire with internal screw pressure plates. Test and reset buttons shall match device body and shall be ivory. GFCI receptacles shall be manufactured in standard configuration for installation with stainless steel smooth plates. Exterior mounted receptacles shall be mounted inside weatherproof enclosure.

<u>NEMA #</u>	<u>Pass & Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
NEMA 5-20R	2095-I	GFR5352-IA	7899-I
NEMA 5-15R	1595-I	GFR5252-IA	8598-I

5. Provide weatherproof receptacles, except where otherwise indicated or specified, consisting of GFCI receptacles, as specified herein, and metal plates with die-cast lockable hinged lids and weatherproof mats.

C. Switches:

1. Local Switches:

- a. Provide local switches, high strength thermoplastic toggle, specification industrial grade, rated 20 amps at 120-277 volts AC only, with plaster ears, external screw pressure plate back and side wired, and standard size composition cups which fully enclose mechanism. Switches shall be approved for installation at currents up to full rating on resistive, inductive, tungsten filament lamp and fluorescent lamp loads, and for up to 80 percent of rating for motor loads. Switches shall have oversized silver alloy contacts for long life and better heat dissipation. Provide switches as single pole, double

pole, 3-way, 4-way, non-lock type. Provide non-lock type switches with ivory handles;

	<u>Pass & Seymour</u>	<u>Hubbell Leviton</u>
Single pole	PS20AC1I 1221-2I	HBL1221I
Double pole	PS20AC2I 1222-2I	HBL1222I
Three way	PS20AC3I 1223-2I	HBL1223I
Four way	PS20AC4I 1224-2I	HBL1224I

- b. Provide lock type switches, specification industrial grade, 20 amp, 120-277 volts with metal or nylon key guides with on/off indication, and operable by same key. Key shall be Owner standardized vertically oriented, tamper resistant, forked key with two each 5/16-inch long forks, 5/32-inch spacing between forks and 5/16-inch width overall.

	<u>Pass & Seymour</u>	<u>Arrow Hart</u>
Single pole w/1201LK Key	PS20AC1L w/#500 Key-2L	1221L
Double pole w/1201LK Key	PS20AC2Lw/#500 Key	1222L
Three way w/1201LK Key	PS20AC3L w/#500 Key	1223L
Four Way w/1201LK Key	PS20AC4L w/#500 Key	1224L

- c. Rotary lock switches shall incorporate a tumbler type lock to prevent unauthorized operation. Lock shall be tumbler type by Corbin, keyed to a HH41 key. Lock switch to be installed with pin tumblers facing downward. Key shall be removable in all positions. Each device shall be complete with 2 keys. Keys shall be delivered only to the Owner. Switches shall be rated at 20 amps, 120-277 volt AC. Switch plates shall be of stainless steel, engraved with on and off positions indicated.

	<u>Arrow Hart</u>
Single pole	AH1191N

Double pole AH1192N

Three way AH1193N

- d. Pilot light switches shall be rated 20 amps and shall conform to specifications for local switches. Switches shall be furnished with red, Lexan handles that are lighted by long-lasting neon lamps. Pilot light shall light when load is on. Pilot light 120 volt switches

	<u>Pass& Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
Single pole PLR	PS20AC1-RPL	HBL1221-PL	1221-
Double pole PLR	PS20AC2-RPL	HBL1222-PL	1222-
Three way PLR	PS20AC3-RPL	HBL1223-PL	1223-

Same as above except rated at 20 amps at 277 volts.

	<u>Pass & Seymour</u>	<u>Leviton</u>	<u>Hubbell</u>
Single pole PL7	PS20AC1-RPL	1221-7PR	HBL1221-

- e. Provide remote control switches for mechanically held contactors arranged for 3-wire control, toggle type, momentary contact, single pole, 3-position with center off position, rated 20 amps at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclose mechanism, and ivory handles

<u>Pass & Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
1251-I	HBL1557-I	1285-I

- f. Provide remote control switches for magnetically held contactors arranged for 3-wire control, toggle type, maintained contact, single pole, 3-position with center off position, rated 20 amps at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclosed mechanism, and ivory handles.

<u>Pass and Seymour</u>	<u>Hubbell</u>	<u>Leviton</u>
1225-I	HBL 1385	1285-I

- g. Momentary Contact locking key type switch. 20A 120/277V center off. Key shall be Owner standardized vertically oriented, tamper resistant, forked key with two each 5/16" long forks, 5/32" spacing between forks and 5/16" width overall.

Arrow Hart

AH1995L w/ AH2000 key

- h. Momentary Contact switch low voltage 1 pole 3A 24VAC 3 position center off. Key for locking switch shall be Owner standardized vertically oriented, tamper resistant, forked key with two each 5/16" long forks, 5/31" spacing between forks and 5/16" width overall.

Pass and Seymour

Toggle 1081I

Locking 1081KGRY w/#500 Key

- 2. Time Switches and Photoelectric Controls for existing construction; use section 26 09 23 for new construction.

- a. Provide time switches with a 7-day, solid-state, electronic type capable of fully automatic or manual operation and housed in a sheet steel enclosure unless built into a panel or switchboard. Contacts rated for 25 amps resistive or inductive, each pole 240 VAC; 5 amps tungsten or 277 VAC pilot duty, each pole 240 VAC. Time switches to contain a non-volatile clock and non-volatile memory with a built-in rechargeable super capacitor power carry-over system. Battery carryover is not acceptable. Provide a minimum of 15 on/off set points per week. Timing to be in one minute increments with a minimum on or off time of one minute. Time switch digital displays to indicate days of week, hours, and minutes. Display to contain a load status light to indicate when equipment is in operation. Time switches; Paragon Model EC7000 Series, Tork Model EW 101B series, Intermatic ET7000 series, or equal. Features required for application:.

- 1) Liquid crystal display panel.
- 2) Holiday scheduling: Up to 40 dates may be assigned special holiday schedules, up to one year in advance.
- 3) Automatically adjusts to and from daylight savings time and for leap year.
- 4) Contact ratings: 10 amp at 240 VAC.
- 5) Safety override switch for each circuit to either provide shut down of circuit or to override on.
- 6) Selective review: All or part of schedule shall be displayed at touch of a key.

- 7) Super Capacitor for power carry over system.
 - 8) Supply voltage: 120 V.
 - 9) 365-day advance scheduling.
- b. Photoelectric control: Shall be rated 2,000 watts, 120V with single pole, single throw, normally closed contact, enclosed in a die-cast aluminum gasketed enclosure with 1/2 inch conduit fitting, Tork series 2100, or equal.
3. Emergency Lighting Control Unit
- a. The Emergency Lighting control Unit shall provide all required functionality to allow an standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building.
 - b. The emergency lighting control unit shall allow control of emergency lighting fixture in tandem with normal lighting in an area while ensuring that emergency lighting will turn on immediately to full brightness upon loss of normal power supplying the control device. Emergency lighting operation shall be independent for each controlled area and shall not require a generalized power failure for proper operation.
 - c. The device shall have normally closed dry contacts capable of switching 10 amp emergency ballast loads at 120-277 VAC, 60 Hz, or 2 amp tungsten loads at 120 VAC, 60Hz.
 - d. The device shall have universal rated voltage inputs provided for normal power sense and normal switched power at 120-277 VAC, 60 Hz.
 - e. The device shall provide separate LEDs to indicate the presence of normal and emergency power sources. The LEDs shall indicate the unit's current operational mode (normal or emergency)
 - f. The device's normal power input terminal shall be connected to the line side of the control device such that any upstream fault causing a loss of power, including the tripping of the branch circuit breaker, will force the unit into the emergency mode and turn on the emergency lighting.
 - g. The unit shall automatically switch emergency lighting on and off as normal lighting is switched. When normal power is not available, the unit shall force and hold emergency lighting on regardless of the state of any external control device until normal power is restored.
 - h. Device shall be WattStopper ELCU-100 Emergency Lighting Control Unit, LVS #EPC-PM Series, Lighting Control Design #GR 2001 series or Equal.

4. Station Main Entrance Intercom Station:

- a. Provide Panasonic video intercom system VL-SV30BX (or equal) . locate per plans and install per manufacturer recommendations.
5. Cords and Caps:
- A. Manufacturers:
 1. Rome Cable Corporation
 2. Hubbell
 3. Or equal

Attachment Plug Construction to Conform to NEMA WD 1 match receptacle configuration to outlet provided for equipment.
 - B. Cord Construction: ANSII/NFPA 70, Type SO multiconductor flexible cord with identified equipment -grounding conductor. Suitable for use in damp locations and Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

2.3 IDENTIFICATION AND SIGNS

A. Identification Plates:

1. Provide identification plates for the following unless otherwise specified, for switchboards, unit substations, motor control centers, control panels, push-button stations, time switches, contactors, motor starters, motor switches, panelboards, and terminal cabinets.
2. Identification plates shall be of plastic stock and shall adequately describe function, voltage and phase of identified equipment. Where identification plates are detailed or described on Drawings, inscription and size of letters shall be as indicated. For lighting and power panels, identification plates shall indicate panel designation, voltage, and phase of panel. For terminal cabinets, identification plates shall indicate system contained in terminal cabinet.
3. Identification plates shall be black-and-white nameplate stock of bakelite with characters cut through black exposing white. Plates shall be furnished with beveled edges and shall be securely fastened in place with No. 4 Phillips-head, cadmium-plated steel, self-tapping screws. Characters shall be 3/16 inch high, unless otherwise indicated.

B. Markings:

1. Install identification markings to surface-mounted starters, switches, disconnect switches, contactors, and other devices controlling motors and appliances. Provide abbreviations required along with an identifying number. Markings to be provided with locking type stencils using paint of a contrasting color. Figures shall be 3/8 inch high unless otherwise indicated. Dymo Industries Inc., self-sticking plastic labels, with embossed characters made with a typewriter may be installed instead of stencils and paint; p-touch self

adhesive plastic, or Brother P-Touch self sticking laminated plastic labels may be installed.

C. Warning Signs:

1. Provide signs of standard manufacture, 18 gage steel, with porcelain enamel finish. Provide red lettering on a white background.

PART 3 EXECUTION

3.1 INSTALLATION AND SUPPORT OF BOXES

- A. Install outlet boxes flush with finished surface of wall or ceiling. Install plumb and securely fastened to structure, independent of conduit. Except where otherwise indicated, provide factory-fabricated adjustable attachment bar hangers between studs to support outlet boxes. When installation is performed in fire rated walls, maintain the wall's rating integrity by means of approved fire stop methods.
- B. Outlet boxes installed in suspended or furred ceilings with steel runner or furring channels shall be supported, except where otherwise indicated, by a Unistrut P-4000 Tessco A1200HS-10, Cooper B-Line B22s-HG, or equal channel spanning main ceiling runner channels. Each box shall be supported from its channel by a 3/8 inch 16 threaded steel rod with a Unistrut P-4008, Fastenal #48604, Cooper B-Line 78101140346 or equal nut and a Tomic No. 711-B Adapta-Stud, or equal. Rod shall be tightened to a jamb fit with channel and its nut. Box shall be locked to rod by means of a 1/2 inch locknut on stud and a 3/8 inch 16 hex nut locking stud to rod.
- C. Heights of outlets and equipment indicated on Drawings shall govern. In absence of such indications, following heights shall be maintained with heights measured to centerline unless otherwise noted:
1. Outlet boxes for fire alarm pull stations shall be mounted at 45 inches above finished floor to insure that the operating handle of the initiating device is no higher than 48 inches at finished floor. Under no circumstances shall operating handle of the device exceed 48 inches above finished floor regardless of indicated height on drawing.
 2. Wall mounted fire alarm strobe or horn/strobe devices shall be mounted such that the entire lens is not less than 80 inches above finished floor. If ceiling heights allow, wall mounted appliances shall have bottom of lens a minimum of 80 inches but not more than 96 inches to the top of lens.
 3. Install outdoor fire alarm audible devices or fire alarm sprinkler flow bells at least 10 feet but not more than 12 feet above finished floor to center. Provide STI or equal protective covers for devices when required.
 4. Voice evacuation speakers mounted indoors shall be mounted in ceiling space or if mounted on wall shall not be less than 10 feet to center above finished floor.
 5. In rooms other than places of assembly such as, but not limited to, multipurpose rooms, auditoriums, and libraries, clock outlets and speakers in

classrooms and offices shall be mounted 8 feet above finished floors. Other assembly areas such as gymnasiums shall be mounted 10 to 12 feet above finished floor. Provide STI, or equal protective covers for clocks when required.

6. Install fire alarm strobe lights 80 inches to bottom of light above finished floor.
7. Install outside bells and yard light outlets 4 feet above second floor level for 2 or more story buildings, 12 inches below top plate level for one story buildings without covered porch or arcade, and 12 inches below covered porch and arcade ceilings.
8. Install power receptacle outlets 15 inches above finished floor.
9. Install panelboards and terminal cabinets 6 feet 6 inches from finish floor to top of cabinet.
10. Install television outlets at a height corresponding to location of television monitor, or a minimum of 15 inches above finished floor.

3.2 COVER PLATES

- A. Provide a plate on each switch, plug, pilot light, data, interphone, public telephone, and television outlet, and on existing and reset outlets where so indicated or required. Plates shall be of stainless steel unless otherwise specified.
- B. Flush wiring device and signal system outlets indicated to be blank covered, shall be covered with blank stainless steel plates. Flush lighting outlets to be blanked shall be covered with Wiremold 5736 steel covers, or equal, painted to match surrounding finish. Provide stainless steel covers to blank indicated or required surface-mounted outlets.
- C. In the following cases, and at required locations. Switch and receptacle plates shall be engraved with the device(s), or fixtures being controlled, or as indicated:
 1. Three-gang and larger gang switches in locations other than classrooms.
 2. Lock switches.
 3. Pilot switches.
 4. Switches so located that operator cannot see fixtures, or items of equipment controlled while his hand is on the switch.
 5. Switches not in same room with fixtures or items of unit heaters, air curtains, fly fans, etcetera.
 6. Receptacles operating at other than 120 V shall be identified with the operating voltage.
 7. Switches operating on 277 V shall be identified with the operating voltage.

8. Where indicated on Drawings.

- D. Designations shall be as indicated on Drawings or as specified by Architect.
- E. Standard GFI cover plates shall be Pass & Seymour 4600, Raco 5028-0, or equal. GFI cover plates shall be provided with a CAM lock mechanism with two keys or a padlock hasp that does not protrude through the face of the cover and will allow the shank of locks keyed Corbin No. 60 keys.

3.3 IDENTIFICATION OF CIRCUITS AND EQUIPMENT

- A. Provide descriptive nameplates or tags permanently attached to switchboards, motor control centers, transformers, panelboards, circuit breakers, disconnect switches, starters, pushbutton control stations and other apparatus installed for operation or control of circuits, appliances, fire alarm control panel(s), fire alarm annunciator(s), power supplies, terminal cabinets, energy management control units, and Information technology system backbone and distribution equipment points.
- B. Provide nameplates of engraved laminated plastic, or etched metal. Submit Shop Drawings denoting dimensions and format to Architect before installation. Fasten to equipment with escutcheon pins, rivets, self-tapping screws, or machine screws. Self-adhering or adhesive backed nameplates are not permitted.
- C. Fasten tags to feeder wiring in conduits at every point where runs are broken or terminated, including pull wires in empty conduits. Indicate circuit, phase, and function. Tag branch circuits in panel boards and motor control centers. Tags may be manufactured of pressure-sensitive plastic or embossed self-attached stainless steel or brass ribbon.
- D. Provide circuit identification cards and cardholders in all panel boards. Cardholders shall consist of metal frame retaining a clear plastic cover permanently attached to inside of panel door. List of circuits shall be typewritten on a card. Circuit description shall include name or number of circuit, area and connected load.
- E. Junction and pull boxes shall have covers stenciled with box number when indicated on Drawings, or circuit numbers according to panel schedules. Data shall be lettered in a conspicuous manner with a color contrasting with finish.
- F. Name shall be correctly engraved, with a legend indicating function or areas, when required by codes or indicated on Drawings.

3.4 PROTECTION

- A. Protect Work of this section until Substantial Completion.

3.5 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE WIRES (600 VOLT AC)

PART 1 GENERAL

1.1 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes: Low-voltage wire, splices, terminations and installation.

1.2 SUBMITTALS

- A. Provide in accordance with Division 01.

PART 2 PRODUCTS

2.1 WIRES

- A. Wires shall be single conductor type THHN, THWN or THWN-2 insulated with polyvinyl chloride and covered with a protective sheath of nylon, rated at 600 volts. Wires may be operated at 90 degrees C. maximum continuous conductor temperature in dry locations, 90 degrees C. in wet locations for sizes 8 AWG and larger and 75 degrees C in wet locations for sizes 10 AWG and smaller, and shall be listed by UL Standard 83 for thermoplastic insulated wires, listed by Underwriter's Laboratories (UL) for installation in accordance with Article 310 of the California Electrical Code (CEC). Conductors shall be solid copper for 12 AWG and smaller conductors, and stranded copper for 10 AWG and larger conductors. Conductors shall be insulated with PVC and sheathed with nylon. Wires shall be identified by surface markings indicating manufacturer's identification, conductor size and metal, voltage rating, UL symbol, type designations and optional rating. Indentations for lettering are not permitted. Wires shall be tested in accordance with the requirements of UL standard for types THWN-2, THWN or THHN.
- B. Conductors shall be solid Class B or stranded Class C, annealed uncoated copper in accordance with UL standards, or another Nationally Recognized Testing Laboratory (NRTL).

2.2 STANDARDS

- A. THWN/THHN and THWN-2/THHN wires shall comply with the following standards:
 - 1. UL 83 for thermoplastic insulated wires.
 - 2. UL 1063 for machine tool wires and cables.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Wires shall not be installed until debris and moisture is removed from conduits, boxes, and cabinets. Wires stored at the site shall be protected from physical damage until they are installed and walls are completed.
- B. Wire-pulling compounds furnished as lubricants for installation of conductors in raceways shall be compounds approved and listed by UL, NRTL, or equal. Oil, grease, graphite, or similar substances are not permitted. Pulling of 2 AWG or larger conductors shall be performed with a cable pull machine. Any runs shorter than 50 feet are exempt. When pulling conductors, do not exceed manufacturer's recommended values.
- C. The Project Inspector will observe installation of feeder cables. Notify the Project Inspector not less than two working days in advance of the proposed time of feeder installation.
- D. At outlets for light, power, and signal equipment, provide pigtail splices with 8-inch circuit conductor leads for connection to fixtures, equipment, and devices.
- E. Pressure cable connectors, pre-insulated 3M Scotchlok, Hubbell Power, O-Z/Gedney or equal, Y, R or B spring-loaded twist-on type, may be furnished in splicing number 8 AWG or smaller wires for wiring systems, except public address and telephone systems.
- F. Joints, splices, taps, and connections to switchboard neutral, bonding or grounding conductors, conductors to ground busses, and transformer connections for wires 6 gage and larger shall be performed with high-pressure cable connectors approved for installation with copper conductors. Connectors shall be insulated with heavy wall heat shrink WCSM, or cold-applied roll-on sleeve RVS. Insulation level shall be a minimum of 600V and joints, splices, and taps shall be qualified to ANSI C 119.1, UL, NRTL, or equal listed mechanical pressure connections.
- G. Connections to any bussing and high-pressure cable connectors shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade five machine screws secured with constant pressure-type locking devices.
- H. Connection of any bonding or grounding conductors shall be securely bolted together with corrosion-resistant plated carbon steel, minimum grade five machine screws secured with constant pressure-type locking devices.
- I. Wire switchboards, panel cabinets, pull boxes, and other cabinets except public address, shall be neatly grouped and tied in bundles with nylon ties at 10-inch intervals. In switchboards, panels and terminal blocks, wires shall be fanned out to terminals. If bundles are longer than 24 inches, a maximum of nine current carrying conductors may be bundled together.
- J. Install conductor lengths with a minimum length within the wiring space. Conductors must be long enough to reach the terminal location in a manner that avoids strain on the connecting lug.
- K. Maintain the conductor required bending radius.
- L. Neutral conductors larger than 6 gage, which are not color identified throughout their entire length, shall be taped, painted white or natural gray, or taped white where they appear in switchboards, cabinet, gutters or pull boxes. Neutral conductors 6 gage and smaller shall be white color identified throughout their entire length.

- M. Fire alarm and clock wiring shall be continuous from terminal cabinets or from equipment to each device. Splices are not permitted between devices and/or terminal cabinets at junction and pull boxes. Wiring shall be terminated at terminal blocks or devices only.
- N. Wiring systems shall be free from short circuits and grounds, other than required grounds. The contractor shall be responsible for the testing of feeder and branch circuit conductor's insulation resistance. The insulation of the conductors shall be tested prior to connections to any panelboards, switchboards, variable frequency drives, lighting control systems, ballasts, and wiring devices such as but not limited to GFI receptacles, TVSS receptacles, or equipment. Insulation testing of panelboards and switchboards shall be independently performed from the insulation testing of any conductors as specified in other sections of this specification.
1. Utilize the services of an approved independent testing laboratory to perform megger time-resistance insulation testing of feeder conductors. Tests must be conducted with wires disconnected at both ends.
 - a. Provide calibration program records to assure the testing instrument to be within rated accuracy. The test equipment accuracy shall be in accord with the requirements stated by the National Institute of Standards and Technology (NIST).
 - b. Test equipment shall be provided with a label stating the date of last calibration. As a minimum the equipment shall have been calibrated within the past 12 months.
 - c. Test reports shall include the following:
 - 1) Identification of the testing organization.
 - 2) Equipment identification.
 - 3) Ambient conditions.
 - 4) Identification of the testing technician.
 - 5) Summary of project.
 - 6) Description of equipment being tested.
 - 7) Description of tests.
 - 8) Test results.
 - 9) Analysis, interpretation and recommendations.
 2. Utilize the services of an approved independent testing laboratory or a qualified contractor's employee (Technician certified in accordance with ANSI/NETA ETT-2000 Standard for Certification of Electrical Testing Personnel) to perform megger time-resistance insulation testing of branch circuit conductors. Tests must be conducted with wires disconnected at both ends.
 - a. Test equipment and report requirements stipulated under paragraph 3.01.N.1 apply to branch circuit testing.
 3. Tests shall be performed in the presence of the Project Inspector.

4. Insulation resistance shall not be less than 100 mega-ohms.

3.2 COLOR CODES

A. General Wiring:

1. Color code conductor insulation as follows:

SYSTEM VOLTAGE		
Conductor	208Y/120	480Y/277
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Natural Gray

Neutrals shall be colored-distinguished if circuits of two voltage systems are used in the same raceway.

2. For phase and neutral conductors 6 gage or larger, permanent plastic-colored tape may be furnished to mark conductor end instead of coded insulation. Tape shall cover not less than 2 inches of conductor insulation within enclosure.

B. Signal Systems: Wires for signal systems shall be color-coded and installed under observation of the Project Inspector. Except where otherwise specified, color-coding shall be as follows:

1. Fire Alarm Systems:

- a. Notification Devices (Signal Loop Circuits)
Strobes: Red = Positive, Black = Negative
Horns: Red = Positive, Black = Negative
- b. Initiating Devices (Alarm Loop Circuits):
Pull Stations: Yellow and Blue
Smoke Detectors (Circuit): Orange and Brown
Thermal Detectors (Circuit): Orange and Brown
Air Duct Smoke Det. (Circuit): Purple and Gray
- c. Initiating Device (Power Circuit): Red = Positive, Black = Negative.
- d. Interlocks: Red = Positive, Black = Negative
- e. AC Power: Black and White

All underground wiring to be XHHW insulation rated for wet location.

2. Program Clock Circuits:

- a. Clocks: Run Black (Label - CRUN)
Reset Red (Label - CRST)
Common = White (Label - - CC)

- b. Program Bells: Pink 1st Period (Label - PB1P)
Pink 2nd Period (Label - PB2P)
Pink 3rd Period (Label - PB3P)
Pink 4th Period (Label - PB4P)
Pink = 5th Period (Label - PB5P)
Pink 6th Period (Label - PB6P)
Common = White (Label - PBC)
- c. Night Lights: Brown = N.L. On (Label - NLON)
Brown = N.L. Off (Label - NLOFF)
Common White (Label - NLC)
- d. Heat: Purple Heat On (Label - HON)
Purple Heat Off (Label - HOFF)
Common White (Label - HC)
- e. Toilet Flush: Yellow Flush On (Label - TFON)
Common White (Label - TFC)

3. Additional requirements:

- a. All existing outside bells to be identified and labeled on and at each terminal block.
- b. All existing classroom buzzers to be identified and labeled on and at each terminal block.
- c. All existing relays located at the master clock to be identified and labeled as to what it controls. Each relay shall be labeled by the use of a white label and black lettering.
- d. All wires shall be identified and labeled by the use of white shrink wrap, with black lettering on each end of each wire.
- e. All wires shall be placed neatly and tie wrapped into each terminal cabinet, and each terminal block shall be marked as to what circuits it has on it (i.e. Fire Alarm, Clock, program bells, etc.)

3.3 FEEDER IDENTIFICATION

- A. Feeder wires and cables shall be identified at each point the conduit run is broken by a cabinet, box, gutter, etc. Where terminal ends are available, identification shall be by means of heat shrink wire markers, which provide terminal strain relief. Markers shall be by Tyco Electronics, Panduit, Brady Perma-Sleeve, or equal. Identification in other areas shall be by means of wrap-around tape markers from Tyco Electronics, Panduit, Brady Perma-Code or equal. Markers shall include feeder designation, size, and description.

3.4 TAPE AND SPLICE KITS

- A. Splices, joints, and connectors joining conductors in dry and wet locations shall be covered with insulation equivalent to that provided on conductors. Free ends of conductors connected to energized sources shall be taped. Voids in irregular connectors shall be filled with insulating compound before taping. Thermoplastic insulating tape approved by UL, NRTL, or equal for installation as sole insulation of splices shall be furnished and shall be installed according to manufacturer's printed specifications.

3.5 TAGGING

- A. General: Install identification markers on ungrounded conductors of all circuits, in switchboards, panel boards, pull, junction and outlet boxes, lighting fixtures, switches, receptacles and other terminating enclosures. Grounded circuit conductors shall have identification markers in switchboards, panel boards, and all enclosures where more than one circuit grounded circuit conductor is installed. Identification shall include switchboard, panel board, or other source and circuit number. Tags shall be 3M Co. "Scotchcode" " write-on tape or shall be premarked with self-adhesive wraparound type EZ Code, Brady.
- B. Tagging: Conductors shall be lagged in each junction box, pull box, wireway or auxiliary gutter and at each device, motor outlet, panel board, switchboard or other conductor termination. Tag shall show feeder number, size. Phase and origin

3.6 MISCELLANEOUS (AS APPLICABLE)

- A. Make all branch circuit and fixture joints for #10 AWG and smaller wire with UL approved connectors, listed for 600 volts. Provide Minnesota Mining and Manufacturing Co. insulated "Scotchlocks," Ideal Co. "Wing-Nut", or T & B Burndy Co. "Piggy" connectors.
- B. Make all branch circuit joints of #8 AWG and larger with screw pressure lugs, and insulate with electrical tape to 150% of the insulating value of the conductor insulation.
- C. Tape all connections made with non-insulated type connectors with half-lapped, rubber-type tape, to 1-1/2 times the thickness of the conductor insulation, then cover with Scotch #33 tape.
- D. Each circuit must correspond to the branch circuit number indicated on the panel schedule shown on the drawings except where departures are approved by the Engineer.
- E. Neatly group or tape together wiring within equipment enclosures.
- F. Where conductors in conduit pass through exterior walls, a sealing compound of moisture-resistant material shall be applied in the ends of the conduits to seal around the conductors.
- G. Megger tests shall be taken on all feeder conductors and on all conductors for motors over 15 HP. Tests shall be made in presence of the District's representative and prior to connection of equipment. Written reports of results shall be submitted to the Engineer. Conductors testing below manufacturers standard shall be replaced at no expense to the owner.

3.7 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.8 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Provide and install grounding system as indicated or required.
- B. Related Requirements:
 - 1. Refer to related sections for their system grounding requirements.
 - 2. Section 26 05 00: Common Work Results for Electrical.

1.2 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. IEEE 142 Green Book.
 - 2. Underwriter's Laboratories (UL).
 - 3. California Electrical Code.
 - 4. Building Industry Consultant Services International (BICSI) (Signal).
 - 5. EIA/TIA (Signal and power).
 - 6. Nationally Recognized Testing Laboratory (NRTL) or equal.
 - 7. Motorola R56 Standards.

1.3 SYSTEM DESCRIPTION

- A. Metallic objects on the Project site that enclose electrical conductors, or that are likely to be energized by electrical currents, shall be effectively grounded.
- B. Metal equipment parts, such as enclosures, raceways, and equipment grounding conductors, and earth grounding electrodes shall be solidly joined together into a continuous electrically conductive system.
- C. Metallic systems shall be effectively bonded to the main grounding electrode system.
- D. A separately derived AC source shall be grounded to the equipment grounding conductor, and to separate "made" electrode of building grounding electrode system.
- E. Electrical continuity to ground metal raceways and enclosures, isolated from equipment ground by installation of non-metallic conduit or fittings, shall be provided by a green insulated grounding conductor of required size within each raceway connected to isolated metallic raceways, or enclosures at each end. Each flexible conduit shall be provided with a green insulated grounding conductor of required size.

- F. Cold water, UFER ground or other utility piping systems, shall not be utilized as grounding electrodes due to the installation of insulating couplings and non-metallic pipe in such installations. In addition to bonding to cold water pipe provide at least one of the following made grounding electrodes:
1. A dedicated “made” electrode, fabricated of at least 20 feet of galvanized 1/2 inch diameter rebar encased by at least two inches of concrete, and placed next to the bottom of a concrete foundation, or footing in direct contact with earth. A welded extended portion shall surface at the location of the common grounding electrode bus bar and be extended by a 3/0 CAD welded bare copper cable, or be CAD welded directly to the bus. The CAD weld shall be at least four inches above finished floor in a dry location. The main grounding electrode and associated grounding conductors shall be in an enclosure and in conduit.
 2. Grounding electrodes as specified hereafter in this section.
 3. Concrete enclosed electrode, fabricated of at least 20 feet of No. 2 AWG, minimum size, bare copper conductor, encased by at least two inches of concrete, located within or near bottom of a concrete foundation, or footing, which is in direct contact with earth. Footing rebar shall be connected to copper wire with approved connectors. An external electrode, as specified hereafter or as required by the CEC, shall be installed and connected to foundation or footing rebar.
- G. Non-current carrying metal parts of high-voltage equipment enclosures, signal and power conduits, switchboard and panelboard enclosures, motor frames, equipment cabinets, and metal frames of buildings shall be permanently and effectively grounded. Provide a CEC sized grounding conductor in every raceway.
- H. Metallic or semi-conducting shields and lead sheaths of cables operating at high voltage, shall be permanently and effectively grounded at each splice and termination.
- I. Neutral of service conductors shall be grounded as follows:
1. Neutral shall be grounded at only one point within the Project site for that particular service. Preferable location of grounding point shall be at the service switchboard, or main switch.
 2. Equipment and conduit grounding conductors shall be bonded to that grounding point.
 3. If other buildings or structures on the Project site are served from a switchboard or panelboard in another building, power supply is classified as a feeder and not as a service.
 4. Equipment grounding conductor is installed from switchboard to each individual building. At building, grounding conductor is bonded with power equipment enclosures, metal frames of building, etc., to “made” electrode for that building.
 5. Feeder neutrals shall be bonded at service entrance point only, neutrals of separately derived systems shall be bonded at the source only.
- J. If there is a distribution transformer at a building the secondary neutral conductor shall be grounded to “made” electrode serving the building.
- K. Within every building, the main switchboard or panelboard, shall be bonded to the cold water line. Metallic piping systems such as gas, fire sprinkler, or other systems shall be bonded to the cold water line.

1.4 SUBMITTALS

- A. Provide in accordance with Division 01.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Furnished yard boxes shall be precast concrete and shall be approximately 14 inches wide by 19 inches long by 12 inches deep or larger, if necessary to obtain required clearances. Boxes shall be furnished with bolt-down, checkered, cast iron covers and cast iron frames cast into boxes. Yard boxes shall be Jensen Precast, Oldcastle Precast, Western Precast, Kistner, or equal.
- B. "Made" electrodes shall be copper-clad steel ground rods, minimum 3/4 inch diameter by ten feet long.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Grounding electrodes shall be installed in the nearest suitable planting area, where not otherwise indicated on Drawings, and each electrode shall terminate within a concrete yard box installed flush with finish grade. In planting areas, finish elevation of concrete yard boxes shall be two inches above planting surfaces.
- B. If concrete enclosed electrode is provided, grounding wire shall be terminated to a suitable copper plate with grounding lugs and must be enclosed in a raceway or box..
- C. Grounding rods shall be driven to a depth of not less than eight feet. Permanent ground enhancement material, (GEM) as manufactured by Erico Electrical Products, Loresco Powerset, Tessco Ultrafil or equal, shall be installed at each ground rod to improve grounding effectiveness. Install in accordance with manufacture's installation instructions.
- D. Grounding electrodes shall provide a resistance to ground of not more than 25 ohms.
- E. When installing grounding rods, if resistance to ground exceeds 25 ohms, two or more rods connected in parallel, or coupled together shall be provided to meet grounding resistance requirements.
- F. Ground rods shall be separated from one another by not less than ten feet.
- G. Parallel grounding rods shall be connected together with recognized fittings and grounding conductors in galvanized rigid steel conduit, buried not less than 12 inches below finish grade.

3.2 TESTING

- A. Provide the services of an approved independent testing laboratory to test grounding resistance of "made" electrodes, ground rods, bonding of building steel, water pipes, gas pipes and other utility piping. Tests shall be performed as follows:
 - 1. Visually and mechanically examine ground system connections for completeness and adequacy.

2. Perform fall of potential tests on each ground rod or ground electrode where suitable locations are available per IEEE Standard No. 81, Section 8.2.1.2. Where suitable locations are not available, measurements will be referenced to a known dead earth or reference ground.
 3. Perform the two point method test per IEEE No. 81, Section 8.2.1.1 to determine ground resistance between ground rod and building steel, and utility piping - such as water, gas and panelboard grounds. Metal railings at building entrances and at handicapped ramps shall also be tested.
 4. Test shall be performed in the presence of the Inspector.
- B. Submit 3 copies of test results to the Architect. Test results shall be submitted on an official form from the independent testing laboratory recording Project location, test engineer, test conditions, test equipment data, ground system layout or diagram, and final test results.

3.3 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.4 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 05 33

RACEWAYS, BOXES, FITTINGS, AND SUPPORTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Raceways and wire ways.
 - 2. Conduit installation.
 - 3. Underground requirements.
- B. Related Requirements:
 - 1. Section 26 05 00: Common Work Results for Electrical.
 - 2. Section 26 05 13: Basic Electrical Materials and Methods.
- C. Applicable Standards and Codes.
 - 1. EIA/TIA 569 Standards.
 - 2. National American Standards Institute (ANSI).
 - 3. National Electrical Manufacturer's Association (NEMA).
 - 4. Nationally Recognized Testing Laboratory (NRTL).
 - 5. California Electrical Code (CEC).
 - 6. Uniform Building Code (UBC).
 - 7. Underwriters Laboratory (UL).

1.2 SUBMITTALS

- A. Materials List: Provide in accordance with Division 01.

PART 2 PRODUCTS

2.1 RACEWAYS

- A. Conduit Materials:
 - 1. Metallic conduit, and tubing shall be manufactured under the supervision of an UL, or another NRTL factory inspection and label service program. Each ten-foot length of conduit and tubing shall bear the UL or another NRTL label and manufacturer's name.
 - 2. Rigid metallic conduit shall be rigid steel, heavy wall, mild steel, zinc-coated, with an inside and outside protective coating manufactured in accordance with ANSI C 80.1. The Couplings, elbows, bends, conduits, bushings and other fittings shall be the same materials and finish as the rigid metallic conduit.

Fittings, connectors, and couplings shall be threaded type, manufactured in accordance with ANSI C 80.1 and UL 6.

3. Electrical metallic tubing shall be steel tubing, zinc-coated with a protective enamel coating inside, manufactured in accordance with NEMA C 80.3. Fittings, couplings, and connectors shall be gland compression type, set screw couplings and connectors not permitted. All parts shall be manufactured in accordance with NEMA C80.3 and UL 6A Electrical metallic tubing is designated hereinafter as EMT. Steel and rain tight fittings shall be approved and listed for the intended application.
 4. Flexible steel conduit shall be of flexible interlocking strip construction with continuous zinc coating on strips, manufactured in accordance with UL 1.
 - a. Connectors and couplings shall be required fittings of the type, which threads into convolutions of flexible conduit.
 5. Liquid-tight flexible metal conduit shall be galvanized heavy wall, flexible locked steel strip construction, UV rated, with smooth moisture and oil-proof, abrasion-resistant, extruded plastic jacket. Connectors shall be as required for installation with liquid-tight flexible conduit and shall be installed to provide a liquid-tight connection.
 6. Non-metallic conduit shall be rigid PVC electrical conduit extruded to schedule 40 dimensions of Type II. Grade 1 high impact, polyvinyl chloride, sweeps, couplings, reducers and terminating fittings shall be listed under the UL, or another NRTL, and shall bear the manufacturer's listed marking.
 7. Multi-cell raceway shall be four inch PVC, Type 40, UL or another NRTL listed for underground use with optical fiber and signal system cables. Raceway shall be furnished with 3-1/2 inch factory installed inner ducts with required internal spacers, and required couplers, sweeps, and end bells. Multicell raceway shall be Carlon Multigard, or District approved equal.
 8. Metal Clad (MC) cable system is not allowed.
- B. Sleeves for Conduits: Sleeves shall be adjustable type by Carlon, U.S. Plastic, PEP Plastic or equal.
- C. Where conduit enters a building through a concrete foundation below grade, or ground water level, or where it is necessary to seal around a conduit where it passes through a concrete floor or wall, provide O-Z/Gedney Type FSK Thru Wall and Floor Seal, equivalent Cooper Crouse Hinds Thru-Wall, Legrand Thru-Wall, or equal.
- D. Expansion Joints-Seismic Separations between building(s) and other locations as indicated on drawings:
1. Provide Thomas & Betts XJG-TB, O-Z/Gedney. type AX with bonding strap and clamps, Cooper XJGD or equal. At exterior locations, provide Thomas & Betts XJG-TB, O-Z/Gedney type EX, Cooper XJGD, or equal. Provide O-Z/Gedney type AXDX, or equal combination deflection/expansion fittings at all seismic separations. Provide manufacture's internal and external bonding jumpers at all locations. Liquid-tight metal conduit or flexible metal conduit shall not be approved at expansion joints, separations between buildings or seismic separations.

2. Provide expansion fittings at intervals not exceeding 100 feet in conduits exposed to direct sunlight. Fittings may be installed in the conduit run or where conduit attaches to junction or pull boxes. OZ/Gedney type AX, TX or EXE series, or equivalent by Thomas and Betts, Crouse-Hinds or approved equal.

E. Conduit Seal Fittings:

1. Provide conduit seal fittings where indicated on the Drawings. Conduit seals shall be of rigid galvanized steel. Seals in horizontal conduit installations shall be Thomas & Betts EYS, Appleton Type ESU, Crouse Hinds Type EYS, or equal. Seals in vertical conduit installations shall be Thomas & Betts EYD, Appleton Type SF, Crouse Hinds Type EYD, or equal, with continuous drain. When installing conduit seals make provision for percent fill space reduction in accordance with CEC.
2. Install sealing compound after wire has been installed. Ensure drain is not blocked in vertical seals when installing compound. Where conduit seals are installed in hazardous area applications, there shall be no conduit coupling, fitting, etc., between seal and boundary of hazardous area.

F. Surface Steel Raceway:

1. The surface steel raceway system for branch circuit wiring, data network, voice, video, and other low voltage wiring shall be as manufactured by the Wiremold Company, Hubbell, or Mono-Systems, Inc. or equal. The raceway system may be supplied pre-wired in accordance with all sections of these specifications and requirements herein, and shall be UL or another NRTL listed. Computer data installation shall be as required by other sections of this Division.
 - a. If furnished pre-wired, the system must be listed in accordance with UL or another NRTL for "Multiple Outlet Assemblies" and so labeled on interior of the assembly. The pre-wired installation must contain no extra wire splices in the raceway as compared to a contractor assembled installation assembled from components. The pre-wired steel raceway shall be Hi-Pot tested at the factory to prevent any potential bare wire or shot circuit defects.
2. The raceway base, cover, and device bracket shall be manufactured of steel and finished in ivory, gray enamel or custom colors suitable for field painting to match adjacent finishes.
3. The raceway shall be a two-piece design with a metal base and snap-on metal cover, except for the Wiremold V700 system, Hubbell HBL750 series and Mono-Systems Inc. S145-700 series that shall be a one-piece design. The base and cover sections shall be a minimum of 0.040 inch wall thickness. The base section shall be available in ten-foot lengths. A hand-operated cutting tool shall be available for the base and cover to ensure clean, square cuts. Wiremold V500, Hubbell V500, and Mono Systems inc. SM500 series are not permitted.
4. A full complement of fittings shall be furnished, including but not limited to, flat internal and external elbows, tees, entrance fittings, wire clips, cover clips, couplings, support clips, C-hangers and end caps. The fitting color shall match the raceway color. Fittings shall be supplied with a base where

indicated and/or required. A take-off fitting shall be furnished as required to adapt to existing flush wall boxes.

5. Device brackets shall be furnished for mounting single or two-gang devices within the raceway. Devices shall be provided with the ability of mounting flush or in conjunction with standard steel, stainless steel, or manufacturer's metal faceplates.
6. The raceway shall be furnished with a complete line of connectivity outlets and modular inserts for unshielded twisted pair including category 5, fiber-optic, coaxial, and other cabling types with face plates and bezels to facilitate installation. Computer data installation shall be as required by other sections of this Division, and Division 27.
7. Raceway shall be furnished with corner elbows and tee fittings to maintain a cable bend radius which meets the requirements of fiber-optic and copper cables under EIA/TIA 569 for communications pathways.

G. Factory Pre-Wired Surface Metal Raceway:

1. Furnish and install pre-wired surface metal raceways as indicated on Drawings and as specified.
2. Metal Raceway shall be galvanized steel Wiremold V4000, Hubbell 4000 series, or Mono-Systems Inc. SMS-4000 series complete with raceway base, cover, fittings, receptacles and mounting plates required for a complete assembly. Raceway shall have two wiring compartments with integral dividing barrier for isolating the wiring compartments.
3. Pre-wired assembly shall be UL, or another NRTL listed as a multi-outlet assembly and surface raceway as labeled on interior of assembly.
4. Wiring devices and other components shall be factory installed, electrically wired and covers labeled as indicated on drawings. Each receptacle shall be identified with panelboard and circuit number from which it was fed. Grounding shall be maintained by means of factory installed grounding conductors.
5. Where shown on Drawings, Raceway covers shall have provisions for mounting computer data outlets.
6. Complete assembly is to consist of required fittings such as elbows, slide couplings for joining raceway sections, blank end caps and flat tees.
7. Prewired assembly must contain no wire splices.
8. Receptacles and wiring shall be as indicated on drawings and as specified.
9. Where raceway is used for power and computer data outlets, installation of data outlets shall be as required by other sections of this specification.
10. Prior and during installation, verify and comply with manufacturer's installation instructions.
11. Entire assembly shall be tested for shorts, opens, ground faults, and wire insulation at factory and certified. Raceways shall be electrically continuous and bonded in accordance with California Electrical Code.

12. Submit shop drawings for approval showing the complete layout of all components of each raceway, raceway lengths, each component description, location and circuit identification.
 13. All wiring devices shall be removable without requiring disassembly of wireway.
 14. Standard non OEM wiring devices shall be used as specified in District's specifications.
- H. Wireways shall be 16 gage galvanized steel enclosed hinge/screw wiring troughs, surface metal raceway, wireway, and auxiliary gutter designed to enclose electrical wiring. Wireway fittings shall be furnished with removable covers and sides to permit complete installation of conductors throughout the entire wireway run. Cover shall be furnished with keyhole slots to accept captive screws locking the cover securely closed. Wireways shall be UL or another NRTL listed, and shall be Square D Type LDB NEMA-1 enclosure for interior applications, or Type RDB NEMA-3R enclosure for exterior applications, or equal by Cooper B-line, Hoffman, Wire Guard, or Circle AW.
- I. Penetration in Fire-Rated Structures: Provide 3M, or equal, sealant and fire barriers for installing fire-rated seals around penetrations through floors, walls, and elevator hoistways. Fire stop system must be UL, or another NRTL listed, and classified for through-penetration applications of metallic conduits and busways.
- J. Pull Wires: Install 1/8 inch polypropylene cords in empty or spare conduits.

PART 3 EXECUTION

3.1 CONDUIT INSTALLATION

A. General Requirements:

1. Provide complete and continuous systems of rigid metallic conduit, outlet boxes, junction boxes, fittings and cabinets for systems of electrical wiring including lighting, power, and signal systems, except as otherwise specified.
2. EMT may be installed in interior concealed applications and in areas approved by owner. EMT shall not be installed in concrete, directly buried underground, outdoors, in boiler rooms, elevator pits, or where subject to damage.
3. Within buildings, flexible steel conduit may be installed instead of rigid steel conduit where permitted by code. Flexible steel conduit shall be installed:
 - a. For continuous lengths not exceeding more than 50 feet between pull points (pull boxes, outlet boxes, etcetera).
 - b. With no maximum total raceway length located within a building interior when the flex is located in concealed locations.
4. Flexible Steel conduit shall not exceed 1-1/2 inches in size.
5. Liquid-tight flexible steel conduit shall only be installed, except where otherwise specified, for final connection of motor terminal boxes, shop equipment, cafeteria equipment, HVAC equipment and other equipment, or for frequent interchange, and shall be of sufficient length, not exceeding 36

inches, to permit full travel or adjustment of motor on its base. Liquid-tight flexible conduit shall not be used for equipment not requiring adjustment or frequent interchange.

6. Connectors for flexible metal conduit shall be made of steel, and of the types which threads into convolutions of conduit. Connectors for watertight flexible metal conduit shall be as required for installation and shall be installed to provide a watertight connection.
7. Exposed conduit shall be installed vertically and horizontally following the general configuration of the equipment, using cast threaded hub conduit fittings where required and shall be clamped to equipment with suitable iron brackets and one hole pipe strap.
8. If connection is from a flush wall-mounted junction box, install an approved extension box.
9. Underground feeder distribution conduits for systems may be non-metallic conduit instead of rigid conduit except where otherwise specified or indicated.
10. Conduit shall be concealed unless otherwise indicated. Conduits exposed to view, except those in attic spaces and under buildings, shall be installed parallel or at right angles to structural members, walls, or lines of building. Conduits shall be installed to clear access openings.
11. Bends or offsets will not be permitted unless absolutely necessary. Radius of each conduit bend or offset shall be as required by ordinance. Bends and offsets shall be performed with standard industry tools and equipment or may be factory fabricated bends or elbows complying with requirements for radius of bend specified. Heating of metallic conduit to facilitate bending is not permitted. Public telephone conduit bends and offsets shall be provided with a radius which is not less than ten times trade size of conduit unless otherwise permitted. Refer to underground installation, specified in this section, for radius of bends and offsets required for underground installations.
12. Running threads are not permitted. Provide conduit unions where union joints are necessary. Conduit shall be maintained at least six inches from covering of hot water and steam pipes and 18 inches from flues and breechings. Open ends of conduits shall be sealed with permitted conduit seals during construction of buildings and during installation of underground systems.
13. Expansion Joints/Seismic Separations/Separations between buildings/Locations Indicated: Provide Thomas & Betts XJG-TB, O-Z Electrical Mfg. Co. Inc. Type AX with bonding strap and clamps, Crouse Hinds XJGD, or equal. At exterior locations, provide Thomas & Betts XJG-TB, O-Z Electrical Mfg. Co. Inc. Type EX, Crouse Hinds XJGD, or equal. Provide Crouse Hinds, Thomas & Betts, or O-Z Electrical Mfg. Co. Type AXDX, or equal Combination Deflection/Expansion Fittings at all seismic separations. Provide manufactures internal and external Bonding Jumpers at all locations. Liquid-tight flexible conduit shall not be approved at expansion joints or seismic separations.
14. Where conduits are terminated in groups at panelboards, switchboards, and signal cabinets, etc., provide templates or spacers to fasten conduits in proper

position and to preserve alignment. Conduits terminating at signal cabinets shall only enter cabinets in the following locations:

- a. Conduits entering top, side, and bottom of cabinets shall be aligned in a single row, centered two inches from rear of cabinet.
 - b. Conduits entering back of cabinet shall be aligned in a single row centered two inches from top of cabinet.
 - c. Conduits shall not be spaced closer than three inches on centers.
15. Conduits above metal lath ceilings shall be rigidly suspended with pipe hangers or pipe racks or shall be secured to superstructure with factory fabricated pipe straps. Conduits in metal lath or steel stud partitions shall be tied to furring channels or studs. In ceiling spaces and in partitions, tie wires shall be spaced not more than 5 feet apart, shall fasten conduit tight against channels and studs at point of tie and shall not support any of conduit weight. Tie wire shall be 16 gage galvanized double annealed steel.
 16. Where auxiliary supports, saddles, brackets, etc., are required to meet special conditions, they shall be fastened rigid and secure before conduit is attached.
 17. Conduit in ceiling spaces, stud walls, and under floors, shall be supported with factory fabricated pipe straps or shall be suspended with pipe hangers or pipe racks. Pipe straps shall be attached to and shall fasten conduit tight at point of support against ceiling and floor joists, rafters, and wall studs, or two-inch x four-inch headers fitted between joists or wall studs.
 18. Conduits installed on exposed steel trusses and rafters shall be fastened with factory fabricated conduit straps or clamps, which shall fasten conduit tight against supporting member at point of support.
 19. Conduits installed under buildings shall be strapped with factory fabricated conduit straps to underside of concrete floor or joists, or wood floor joists, or shall be suspended with pipe hangers or pipe racks. Conduits under building are not permitted to be placed directly on grade; they shall be suspended from building or shall be buried below surface or ground. 1-1/4 inch and larger conduits under buildings shall be installed with conduit hangers or racks.
 20. Pipe hangers for individual conduits shall be factory fabricated. Steel rods shall be 3/8 inch for two-inch conduit hangers and smaller and shall be 1/2 inch for 2 1/2-inch conduit hangers and larger.
 21. Pipe racks for groups of parallel conduits and for supporting total weights not exceeding 500 pounds shall be trapeze type and shall consist of a cross channel, Steel City Kindorf B-900, Unistrut P-1000, equivalent Cooper B-Line or equal, suspended with a 3/8 inch minimum diameter steel rod at each end. Rods shall be fastened with nuts, top and bottom to cross-channel and with square washers on top of channel. Conduits shall be clamped to top for cross-channel with conduit clamps, Steel City Kindorf C-105 or Unistrut P-1111 through P-1124, equivalent Cooper B-Line, or equal. Conduits shall not be stacked one on top of another, but a maximum of two tiers may be on same rack providing an additional cross-channel is installed. Where a pipe rack is to be longer than 24 inches, or if the supported weight exceeds 500 pounds, submit Shop Drawings of installation to the Architect for review.

22. Conduits suspended on rods more than two feet long shall be rigidly braced to prevent horizontal motion or swaying. Installation shall meet zone 4 seismic requirements.
23. Factory fabricated pipe straps shall be one or two-hole formed galvanized clamps, heavy-duty type, except where otherwise specified.
24. Hangers, straps, rods, or pipe supports under concrete shall be attached to inserts set at time concrete is placed, or with approved concrete anchors. Under wood, install bolts, lag bolts, or lag screws; under steel joists or trusses, install beam clamps. Contractor shall submit size of anchors, bolts, screws, and installation method to Architect for approval prior to start of any work.
25. Conduits shall be supported at intervals required by code, but not to exceed ten feet. One inch and smaller exposed conduits shall be fastened with one-hole malleable iron straps. Perforated straps and plumber's tape is not permitted for the support of conduits.
26. Conduits stubbed up through a roof or an arcade shall be flashed with a waterproof flashing. Refer to Division 07 for additional requirements.
27. Bushings and locknuts for rigid steel conduit shall be steel threaded insulating type. Setscrew bushings are not permitted.
28. Flex conduits shall be cut square and not at an angle.
29. Routing of conduits may be changed providing length of any conduit run is not increased more than ten percent of the length indicated on Drawings.

B. Underground Requirements:

1. Conduits and multicell raceways installed underground shall be entirely encased in three inch thick concrete on all sides , except where otherwise specified. Provide required spacers to prevent any deflection when concrete is placed and to preserve position and alignment. Conduits and raceways shall be tied to spacers. Anchors shall be installed to prevent floating of conduits and raceways during placing of concrete. Provide red colored concrete to encase conduits of systems operating above 600 volts.
2. Underground conduits and raceways shall be buried to a depth of not less than 24 inches below finished grade to top of the concrete envelope, unless otherwise specified.
3. Assemble sections of conduit with required fittings. Cut ends of conduit shall be reamed to remove rough edges. Joints in conduits shall be provided liquid-tight. Bends at risers shall be completely below surface where possible.
4. Conduits and raceways in a common trench shall be separated by at least three inches of concrete. Electrical power and/or lighting conduit runs installed in a common trench with conduits containing signal system wiring such as public address, telephone, intrusion detection, fire alarm, television, computer networking, and clock systems shall maintain a separation of a minimum of six inches from these types of signal system conduits and raceways. Electrical power, lighting and signal conduits and raceways installed in a common trench with other utility lines such as gas, water, sewer and storm lines shall maintain 12 inches separation from these types of utility lines.

5. The Inspector will observe underground installations before and during concrete placement. A mandrel shall be drawn through each run of conduit in presence of the Inspector before and after placing concrete. Mandrel shall be six inches in length minimum, and have a diameter that is within 1/4 inches of diameter of conduit to be tested.
6. Non-metallic conduit installations shall comply with following additional requirements. Joints in PVC conduit shall be sealed by means of required solvent-weld cement supplied by conduit manufacturer. Non-metallic conduit bends and deflections shall comply with requirements of applicable electrical code, except that minimum radius of any bend or offset for conduits sized from 1/2 inch to 1 1/2-inch inclusive shall not be less than 24 inches. Bends at risers and risers shall be PVC-coated rigid steel conduit. Radius of curve of bends or offsets in non-metallic conduit for public telephone system shall be not less than ten times trade size of conduit, unless otherwise specifically permitted.
7. Furnish and install a six-inch wide, polyethylene, red underground barrier type 12 inches above full length of concrete reading, "CAUTION ELECTRIC LINE BURIED BELOW".
8. Underground conduit systems provided for utility companies shall be furnished to meet the requirements of the utility companies requiring service.
9. Protect inside of conduit and raceway from dirt and rubbish during construction by capping openings.
10. Add bell-end bushings for conduit stub-up including underground entries to pull boxes, and manholes. Under floor standing switchboards and motor control centers provide a four-inch galvanized nipple with ground bushing.
11. Underground conduit for systems operating above 600 volts shall be a minimum size of four inches.
12. At portable classroom all stub ups shall be installed with a coupling flush to finish grade.
13. Underground conduits and raceways shall be swabbed prior to wire pull.

C. General Installation Requirements for Computer Network System Conduits:

1. Location of outlet boxes and equipment on Drawings is approximate, unless dimensions are indicated. Drawings shall not be scaled to determine position and routing of wireways, drops, and outlet boxes. Location of outlet boxes and equipment shall conform to architectural features of the building and other Work already in place and must be ascertained in the field before start of Work.
2. The maximum pulling tensions of the specified cables shall not be exceeded and proper radius of cable bends shall be maintained.
3. For computer network wiring, conduit types shall be limited to rigid metal conduit, electrical metallic tubing, schedule 40 PVC, multi-cell raceways, and flexible metallic conduit for lengths less than six feet.
4. Interior section of conduit run shall be not longer than 100 feet and shall not contain more than two bends of 90 degrees between pull points or pull boxes.

5. The inside radius of a conduit bend shall be at least six times the internal diameter of the conduit. When the conduit size is greater than two inches, the inside radius shall be at least ten times the internal diameter of the conduit. For fiber-optic cable, the inside radius of a conduit bend shall be at least ten times the internal diameter of the conduit.
6. Conduit shall be sized in accordance with Table 4.4-1 of EIA/ TIA 569 standard.
7. Splicing or terminating cables in pull boxes is not permitted.
8. For indoor application, a pull box shall be provided in conduit run where:
 - a. The length is over 100 feet.
 - b. There are more than two bends of 90 degrees.
 - c. There is a reverse bend in the run.
9. Boxes shall be provided in a straight section of conduit and shall not be installed in lieu of a bend. The corresponding conduit ends are to be aligned with each other. Conduit fittings shall not be installed in place of pull boxes.
10. Where a pull box is provided with raceways, pull box shall comply with the following:
 - a. For straight pull-through, provide a length of at least eight times the trade-size diameter of the largest raceway.
 - b. For angle and U-pulls:
 - 1) Provide a distance between each raceway entry inside the box and the opposite wall of the box of at least six times the trade-size diameter of the largest raceway, this distance being increased by the sum of the trade-size diameters of the other raceways on the same wall of the box.
 - 2) Provide a distance between the nearest edges of each raceway entry enclosing the same conductor of at least:
 - a) Six times the trade-size diameter of the raceway; or
 - b) Six times the trade-size diameter of the larger raceway if they are of different size.
 - c) For a raceway entering the wall of a pull box opposite to a removable cover, provide a distance from the wall to the cover of not less than the trade-size diameter of the largest raceway plus six times the diameter of the largest conductor.
11. Drawings generally indicate Work to be installed, but do not indicate all bends, transitions of special fittings required to clear beams, girders or other Work already in place. Investigate conditions where conduits and wireways are to be installed, and furnish and install required fittings.

- D. Slabs on Grade:
1. Unless specifically reviewed by the Architect and DSA, conduits 1 ¼-inches and larger are not permitted to be installed in structural concrete slabs. Where conduits are permitted, and are installed in concrete slabs on grade, slabs shall be thickened at bottom where conduits occur to provide three inches of concrete between conduit and earth. Required excavation shall be part of the Work of this section.
 2. If concrete slab is five inches or more in thickness with a moisture barrier plastic sheet between earth and slab, one inch and smaller conduits shall be installed in the slab with a minimum of one inch concrete between earth and conduit.
- E. Concrete Walls, Beams, and Floors: Provide sleeves where conduits pierce concrete walls, beams, and floors, except floor slabs on grade. Sleeves shall provide 1/2 inch clearance around conduits. Sleeves shall not extend beyond exposed surfaces of concrete and shall be securely fastened to forms. Where conduits pass through walls below grade, seal with required sealant and backer materials between conduit and sleeve to provide a watertight joint. Sealant shall be as indicated in Section 07 92 00: Joint Sealants.

3.2 STUBS

- A. Panelboard: Install two one inch conduits from each flush mounted panelboard to access under floor space and to access above ceiling space where these conditions occur. Cap conduits with standard galvanized pipe caps.
- B. Floor: At points where floor stubs are indicated in open floor areas, for connections to machines and equipment, conduits shall be terminated with couplings, tops flush with finished floor. Stubs shall extend above couplings the indicated distance. Where capped stubs are designated, couplings shall be closed with cast iron plugs with screw drive slots.
- C. Underground:
1. Underground conduit stubs shall be terminated at locations indicated, and shall extend five feet beyond building foundations, steps, arcades, concrete walks and paving. Rigid metallic conduit stubs and non-metallic conduit stubs shall be capped by installing a coupling flush in end wall of concrete encasement and plugging with a permitted plug. Project record drawings shall indicate location of ends of underground conduit stubs fully dimensioned and triangulated with reference to buildings or permanent landmarks. These dimensions, including depth below finished grade, shall be marked on project record drawings in presence of the Inspector before backfilling trench. Where extending existing concrete encased stubs, clean, chip and wire brush end of existing concrete and brush on a heavy coat of neat cement paste or epoxy bonding agent.

2. Over ends of individual underground conduit stubs or groups of conduit stubs, install four-inch by 18-inch deep PVC filled with concrete, flush with finished grade in asphaltic concrete or lawns, and two inches above finished grade in planting areas. Cast a three-inch by three-inch brass plate engraved "ELECT" flush in top of concrete. Secure plate to concrete with brass dowels or as indicated on drawings.

3.3 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.4 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 08 00

ELECTRICAL SYSTEMS COMMISSIONING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Section Includes:

1. General requirements for Commissioning (Cx) of lighting systems components, lighting controls and HVAC systems line voltage interconnection components, including installation, start-up, testing and documentation according to construction documents and Commissioning Plan (CxP).
2. Standard procedures for the execution of commissioning work shall be in conformance with Division 1, Section 01 91 13 General Commissioning Requirements. Coordinate work with the Commissioning Services Provider (CxSP).

1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements.
- B. Section 01 91 13: General Commissioning Requirements.
- C. Section 01 79 00: Maintenance and Operations Staff Demonstration and Training.
- D. Section 23 80 00: Heating, Ventilation, and Air Conditioning Equipment.
- E. Section 23 09 23: Environmental Control and Energy Management Systems.
- F. Section 23 08 13: Environmental Controls and Energy Management System Commissioning.
- G. Section 26 05 00: Common Work Results for Electrical.
- H. Section 26 05 13: Basic Electrical Materials and Methods.
- I. Section 26 05 26: Grounding and Bonding.
- J. Section 26 05 19: Low Voltage Wires (600 Volt AC).
- K. Section 26 05 86: Motors and Drives.
- L. Section 26 50 10: Solid State (LED) Lighting.
- M. Section 26 09 23: Lighting Control Systems.

1.3 REFERENCES

- A. Applicable codes, standards, and references: inspections and tests shall be in accordance with the following applicable codes and standards:
 1. National Electrical Testing Association – NETA.
 2. National Electrical manufacturer's Association – NEMA.
 3. American Society for Testing and Materials – ASTM.
 4. Institute of Electrical and Electronic Engineers – IEEE.
 5. American National Standards Institute – ANSI.
 6. National Electrical Safety Code – NESC.

7. California Building Code – CBC.
8. California Electrical Code – CEC.
9. California Green Building Standards Code (CalGreen).
10. Conglomerate for High Performance Schools (CHPS).
11. Insulated Power Cables Engineers Association – IPCEA.
12. Occupational Safety and Health Administration – OSHA.
13. National Institute of Standards and Technology – NIST.
14. National Fire Protection Association – NFPA.
15. California Electrical Code.
16. ANSI/NFPA 70B – Electrical Equipment Maintenance.
17. NFPA 70E – Electrical Safety Requirements for Employee Work Places.
18. ANSI/NFPA 101– Life Safety Code.

1.4 SUBMITTALS

- A. Submittals shall include the following:
 1. Submit required Cx submittals in accordance with Division 1 Specification Sections.
 2. Copy of the Architect’s reviewed and accepted submittals to the CxSP via the OAR.
 3. List of team members who will represent the CONTRACTOR in the Pre-functional Equipment Checks and Functional Performance Testing, at least two weeks prior to the start of Pre-functional Equipment Checks.
 4. Detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, checklist documentation and field checklist forms to be used by factory or field technicians, and a copy of full details of OWNER-contracted tests, full factory testing reports, if any, and Warranty information, including responsibilities of OWNER to keep Warranty in force, clearly defined.
 5. Detailed manufacturer’s recommended procedures and schedules for Pre-functional Equipment Checks, supplemented by CONTRACTOR’s specific procedures, and Pre-functional Tests, at least four weeks prior to the start of Pre-functional Performance Tests.
 6. After facility’s commission is complete, submit completed Pre-functional Equipment Checklists and Functional Performance Test checklists organized by system and by subsystem. Bind information in a single package. The results of failed tests shall be included along with a description of the corrective actions taken.

1.5 MEETINGS, SEQUENCING AND SCHEDULING

- A. Meetings: Attend (Cx) meetings as required under Section 01 91 13 and the Cx Plan.
- B. Sequencing and Scheduling: The work described in this Section shall begin only after work required in related Division 26 Sections has been successfully completed, and tests, inspection reports and Operation and Maintenance manuals required in Division 26 Sections have been submitted and approved. The start-up and Pre-functional Equipment Checklists shall be completed and submitted to the OWNER’s Authorized Representative (OAR) prior to the functional performance tests. Refer to the project’s Cx Plan for more details.

1. Coordinate electrical work with the work of other trades prior to scheduling of any Cx procedures.
2. Coordinate the completion of electrical testing, inspection, and calibration prior to start of Cx activities.
3. Cx activities shall be scheduled in accordance with project's Cx plan.

1.6 QUALITY CONTROL

- A. Comply with OWNER's Quality Control Specifications, Sections 01 45 16 – 01 45 19, as applicable.
- B. Incorporate manufacturer's recommended Cx procedures for the systems and equipment to be commissioned under this Section.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

- A. Equipment to be utilized in the commissioning process shall meet the following requirements:
 1. Provide test equipment as necessary for the equipment and systems to be commissioned.
 2. Provide testing equipment and accessories that are free of defects and certified for use.
 3. Provide testing equipment with current calibration labels per NIST Standards.
 4. Testing equipment shall be UL Listed.

PART 3 EXECUTION

3.1 COMMISSIONING PROCESS REQUIREMENTS

- A. Work to be performed prior to commissioning:
 1. Complete all phases of the work so the system(s) can be started, tested, adjusted, balanced, and otherwise commissioned.
 2. Start-up services required to bring each system into full operational state and ready for functional performance testing:
 - a. Completion of authorized manufacturer representative's start-up procedures and recommendations.
 1. Provide Manufacture's start-up completed forms.
 - b. Completion of pre-functional checklists.
 - c. Copy of required manufacturer and field testing.
 - d. Motor rotation check.
 - e. Control sequences of operation.
 - f. Full and partial load performance.
 3. If modifications or corrections to the installed systems are required to bring the system(s) to acceptance levels due to CONTRACTOR's incorrect installation or defective materials, such modifications or corrections shall be made at no additional cost to the OWNER.

4. Functional tests shall not start until each system is complete and the above items have been documented and submitted to the Engineer of Record, Cx Services Provider and OWNER for review.
- B. Pre-commissioning Responsibilities: Inspection, calibration and testing of the equipment and devices necessary to commission the following systems:
1. Electrical Lighting Systems.
 2. Lighting Controls.
 3. HVAC line voltage electrical components.
 4. Line voltage interface of Environmental Controls and Energy Management System with other systems.
- C. Commissioning Process Requirements: Refer to Section 01 91 13 General Commissioning Requirements, related sections and Cx Plan for information on meetings, start-up plans, Pre-Functional and Functional Performance Testing (FPT), operations and maintenance data, and other Commissioning activities.

3.2 PREPARATION

- A. Provide certified electricians and/or qualified personnel as required with adequate tools and equipment necessary to perform Cx activities.
- B. Provide all equipment required for the commissioning of equipment and systems indicated in article 3.01.B.
- C. Provide certified testing agency personnel or report(s) as required in the Cx Plan.

3.3 TESTING

- A. Testing documentation shall include the following minimum information:
1. Test number.
 2. Equipment used for the test, with manufacturer and model number and date of last calibration.
 3. Date and time of the test.
 4. Indication of whether the record is the first commissioning test, or a retest following correction of a previously identified issue.
 5. Identification of the system, subsystem, assembly, or equipment.
 6. Conditions under which the test was conducted, including (as applicable) ambient conditions, set points, override conditions, and status and operating conditions that impact the results of the test.
 7. Systems and assemblies test results, performance and compliance with contract requirements.
 8. Issue number and description of corrected issue that prompted retesting.
 9. Name and signature(s) of witnesses and the person(s) who performed the test(s).
- B. Test lighting and controls systems to verify performance, operation, functionality, light levels, energy usage, and compliance with construction documents.
1. Start up, test and document results under the observation of the CxSP.
 2. Execute the Functional Performance Test (FPT) under the observation of the CxSP.

3. Provide completed and signed FPTs to CxSP for inclusion in the commissioning report.
4. Functions and Testing Conditions:
 - a. Occupancy sensors and timer controls for lighting:
 - 1) Verify that specified functions and features are set up, debugged and fully operable at time of test.
 - 2) Verify that occupant override feature functions as intended in the contract documents.
 - 3) Verify that sensors response times/durations are set properly.
 - 4) Test the sequence of operation for features and modes and confirm that adjustable times match the design specifications and contract documents.
 - 5) Verify that sensors are located per manufacturer's recommendations.
 - b. Electric lighting dimming, photocells and controls:
 - 1) Test the dimming controls during daytime when conditions are such that controls should be dimming electric lighting.
 - 2) Verify that amperage changes in light fixtures are proportional to external light changes. Verify that dimmed light levels uniformity at the specified work plane remain within specified limits.
 - 3) Verify that delays and ramp times are set and functioning so that the speed of change of light fixture output is slow enough to not bother occupants, and in compliance with the specifications.
 - 4) Verify that dimming does not cause lower than specified light levels in adjacent "non-dimmed" spaces.
 - 5) Verify that the controls and sensors cannot be easily overridden or disabled by occupants.
 - 6) Verify that dimming systems in places of assembly are interfaced with the Central Fire Alarm system.
 - 7) Verify that dimmed lighting in these areas shall come back to full bright during a fire alarm or emergency condition.
 - c. Illumination Levels, Night Conditions:
 - 1) Verify that lighting throughout the building is operating automatically.
 - 2) Test with doors closed (to simulate actual occupancy) and after finishes are complete.
 - d. Illumination Levels, Day Conditions:
 - 1) Verify that lighting levels comply with average maintained foot-candle levels shown on plans.
 - 2) Verify that lighting throughout the building is operating automatically.
 - 2) Test with doors closed (to simulate actual occupancy), after finishes are complete, and room is furnished.
 - 3) Test at different times during the day, or under OWNER-approved simulated conditions, to ensure proper system

response and to determine that lighting levels are within specified requirements.

- 4) In classrooms and educational spaces test the system for the different pre-determined settings. Quiet time, AV mode, all on/off, up/down dimming, and standard operations.
 - e. Lighting Power Density: Verify building lighting power density. Perform the test with interior lighting turned on and any manual or automatic controls temporarily overridden. Provide statement of compliance with 100% design energy report. Measurements shall be taken at least one minute after lights are turned on.
 - f. Emergency Lighting System: Verify that the system operates automatically under any condition, without human intervention, and that it resets back to normal operations after the power failure or emergency condition is over or cleared.
5. Acceptance Criteria:
- a. Lighting Controls: For the conditions, sequences and modes tested; dimming, occupancy, photocell, and timing controls, integral components and related equipment shall respond to changing conditions and parameters defined in the Contract Documents.
 - b. Illumination Levels: Average light levels in the tested space at the work plane elevation shall be in the range of plus or minus 10% of the specified light level range for the space.
 - c. Lighting Power Density: Average instantaneous lighting power density shall be within plus or minus ten percent of that indicated in the Construction Documents.
 - d. Power factors on lighting circuits shall be greater or equal to 0.95, or as required by lighting fixture specifications.
 - e. Electrical system total harmonic distortion shall be smaller than 20%.
 - f. Electrical equipment AIC ratings shall be as indicated in construction drawings.
 - g. Feeders % voltage drop. Flag feeders with voltage drop greater than 3%.
6. Sampling Strategy for Identical Units:
- a. Lighting Controls: Test all automatic interior lighting controls.
 - b. Illumination Levels: Test all spaces, zones and rooms to verify as proper light levels.
- C. HVAC Electrical Component Testing
1. Document HVAC Division 23 electrical components using the startup procedure submitted by CONTRACTOR and accepted by the CxSP.
 2. Complete and submit Start-up, Pre-functional, and Functional Checklists.
 3. Verify the following information prior to HVAC system equipment startup.
 - a. Voltage.
 - b. Phase.
 - c. Motor Size.
 - d. Lock Rotor Amperage.
 - e. Full Load Amperage.

- g. Minimum and Maximum Circuit Ampacity.
 - h. Feeder protection or branch circuit protection, breaker or fuse size as applicable.
4. Coordinate and check corresponding unit electrical protection.

3.4 ADJUSTING

- A. Incorrect installations, including improper adjustments may result in additional work being required for Cx acceptance.
 - 1. Perform work required to correct installations not meeting contract requirements at no additional cost to the OWNER.
- B. Corrective work shall be completed in a timely manner to permit completion of the Cx process.
 - 1. Refer to the Cx Plan for retesting requirements necessary to achieve required system performance.
 - 2. If the systems' Cx deadline, as defined in the Cx Plan, goes beyond the scheduled completion of commissioning without resolution of the problem, the OWNER reserves the right to obtain supplementary services or equipment to resolve the problem.
 - a. The cost of additional and/or supplementary services inquired by OWNER as a result of CONTRACTOR's lack of performance, or inability to resolve identified issues will be solely the responsibility of the CONTRACTOR.

3.5 TRAINING

- A. Provide training and documentation as required in construction documents.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Low-voltage lighting control system.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 26 05 00 – Common Work Results for Electrical.
 - 3. Section 26 05 13 – Basic Electrical Materials and Methods.
 - 4. Section 26 05 19 – Low-Voltage Wires (600 Volt AC).
 - 5. Section 26 05 33 – Raceways, Boxes, Fittings, and Supports.
 - 6. Section 26 08 00 – Electrical Systems Commissioning.
 - 7. Section 26 50 00 – Lighting.
 - 8. Section 26 50 10 – Solid State (LED) Lighting.

1.2 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. Submit a complete one-line diagram of the proposed system configuration for Architect/Engineer's review. The riser diagram shall identify but not be limited to wiring, equipment, components, interconnection with other systems, and location and type of raceways.
- C. Manufacturer's Data: Submit catalog cuts and description of each system component.
- D. Provide wiring diagrams and installation details for lighting control equipment.
- E. Provide a complete sequence of operation and system interface requirements with fire alarm, and other applicable systems as depicted in construction documents.
- F. Shop Drawings: Submit a complete set of detailed Shop Drawings for the entire lighting control system; the shop drawings shall include but not be limited to relay panels with designations and dimensions, day light sensors locations based on manufacturer's recommendations, and system components with manufacturer's part numbers.
- G. Installation Instructions: Submit manufacturer's written installation instructions, wiring diagrams. Instructions shall include recommendations for handling of equipment and parts, and protection and storage requirements.

- H. Software flow diagram of and complete sequence of operation.
- I. Software licenses and electronic keys, and list of assigned passwords.
- J. Supplemental local or factory training schedule for post warranty support.
- K. A complete list of recommended spare parts with pricing for the OWNER's use in keeping the environmental control system downtime to a minimum.

1.3 QUALITY ASSURANCE

- A. Components shall be listed and labeled by Underwriter's Laboratories (UL), or another Nationally Recognized Testing Laboratory (NRTL).
- B. Lighting control system and peripheral devices with IP addresses shall be UL listed in compliance with UL-2900 – Cyber Security Network Connected Systems.
- C. Lighting Control Systems shall comply with the state of California Building and Electrical Codes, and Title 24 energy requirements in effect at time of submittal for building permit.
- D. Conduct a coordination meeting with the lighting control contractor, electrical contractor, EOR, Manufacturer Representative, Commissioning Agent, and the OAR to validate the location of lighting control system components, including daylight, vacancy, motion sensors. Sensors shall be located based on manufacturer's recommendations.
- E. Systems components shall be Title 24 compliant and listed as California Energy Commission approved products.

1.4 WARRANTY

- A. Manufacturer shall provide a three-year material warranty.
- B. Installer shall provide a two-year installation warranty.

1.5 TRAINING

- A. Provide a competent instructor who is factory trained and has comprehensive knowledge of system components and operations to provide full instructions to designated personnel in the system operation, maintenance, and programming. Training shall be specifically oriented to installed equipment and systems.
- B. Training shall include system overview, time schedules, override commands, emergency operation, and programming and report generation for school based non-technical personnel.
- C. Provide an eight hours OWNER's school-based personnel and Maintenance and Operations technical employees training session; this training session shall cover and provide the following:
 - 1. As-built drawings of System layouts and point to point connection diagrams.
 - 2. System components cut sheets.
 - 3. Operations and maintenance data.

4. Programmer and maintenance training: database entry; trend logs application programs, diagnostic routines, reporting, failure recovery and calibration, and expose the trainees to system's features, components, system architecture, operations, programming, report generation, communications, reading and interpreting alarms, and any other pertinent information required for the operations and maintenance of the system.
 5. Training sessions shall accommodate a minimum of 20 persons and be facilitated at CONTRACTOR's training facility, which should be no more than 50 miles from the Project Site.
 6. Obtain OWNER's approval for training locations exceeding 50 miles. In such cases, the CONTRACTOR shall be responsible for transportation expenses.
 7. CONTRACTOR shall provide training computers for all attendees. Computers shall be ready for live training sessions.
 8. Instructor(s) shall give the trainees the opportunity to practice on simulated and actual (installed) systems.
- D. The training session shall have an itemized agenda covering all aspects of the training to be covered in the sessions. CONTRACTOR shall obtain agendas approval from OWNER and Commissioning Agent.

1.6 SYSTEM REQUIREMENTS

- A. The lighting controls shall be a centralized system furnished with digital room controllers, capable of working as a network system that communicates via common data line (s).
- B. The system shall be furnished with transformers, control electronics, hardware, resident software and complete programming, occupancy sensors, constant light controllers, exterior light sensors, photocells, digital and analog switches, dimmer switches, conduit and wiring for a complete and functional installation.
1. Software shall be resident within the lighting control system.
 2. System shall provide local access to programming functions at the master Lighting Control Panel (LCP) and remote access to programming functions via computers or other intelligent communication devices running an industry standard internet browser.
 3. System software shall provide real time status of all components and ancillary devices.
 4. For on-site access, the lighting control system shall have a built-in touchscreen allowing authorized access to localized control and programming
- C. Areas controlled by a motion sensor; such as rooms with one luminaire and emergency fixtures designed to operate 24 hours a day, seven days a week shall be programmed accordingly.
- D. The system shall have a server built into the master LCP. The server shall effectively work/operate through HTML pages from any authorized workstation.
1. WEB front end shall be accessible over an OWNER provided Ethernet 10/100 Mbps to the local area network.

2. Protocol shall be TCP/IP and allow either http (hypertext transfer protocol) or https (hypertext transfer protocol secured) connections.
- E. Desktop computers are not part of this section and will be provided by others. Non-networked, non-digital, non-server capable systems are not acceptable.
 - F. Lighting control system shall be able to be monitored and take commands from a remote Personal Computer (PC); should the remote PC go off-line system programming uploaded to the lighting control system shall continue to operate as intended. Systems requiring an on-line PC or server for normal operation are not acceptable
 - G. Devices shall be factory pre-addressed but be able to be field addressable also. Systems requiring field addressing only are not acceptable.
 - H. Programs, schedules, time of day, etcetera, shall be held in non-volatile memory at power failure. At restoration of power, lighting control system shall implement programs required by current time and date.
 - I. System shall be capable of flashing lighting OFF/ON for any relay or lighting zone prior to the lights beings turned OFF. The warning interval time between the flash and the final lights off signal shall be definable for each zone. Occupant shall be able to override any scheduled OFF sweep using local lighting zone override switches within the zone or occupied space. Occupant override time shall be pre-programmed not to exceed two hours, or current California Title 24 requirements.
 - J. The system shall be capable of implementing ON, OFF, Raise (dimming), and Lower (dimming), and preset commands, group or zone by means of devices connected to programmable inputs in the lighting control system.
 - K. Programming and scheduling shall be done at the master LCP and/or remotely via the Internet. Remote connections shall function in real time control and real time feedback.
 - L. System may consist of centralized relay panels, room controllers, digital switches, analog switches, photocells, motion sensors, lumen control devices, dimmer switches, and various digital interfaces. All system components, including remote and centralized room controllers, digital switches, etc. shall operate and be integrated as a network.
 1. Remote Room Controllers (RRC) shall control lighting fixtures in that area or space.
 2. The RRC shall provide power to ancillary and control devices, such as occupancy sensors, and take input from controlling devices, such as daylight and occupancy/vacancy sensors.
 3. RRP's shall be capable of taking inputs from OWNER specification line voltage type switches.
 - M. RRC, switches, photocells and occupancy sensors, and ancillary devices and components shall be integrated per lighting control manufacturer's instructions.
 - N. Location of devices and relay panels or relay controllers installed above ceilings shall be identified with a printed label attached to ceiling elements. Locate label directly below equipment location.

1.7 LIGHTING CONTROL OVERVIEW-BY AREA CONTROLLED

A. Classrooms:

1. Classrooms shall be controlled by a combination of vacancy sensors, daylight controllers and dimmers switches.
 - a. The vacancy sensor is to automatically switch lights OFF when the room is not occupied for 15 minutes.
 - b. Daylight controls shall automatically adjust light intensity according to the natural light level in the room to maintain a uniform level of lighting in the range of 30-50 foot-candles.
 - c. The daylight sensors shall be enabled and disabled by the vacancy sensors to ensure daylight-controlled lights never automatically turn ON when room is unoccupied. The lighting control system shall allow an authorized person to disable the daylight sensors and dimming controls.
 - d. Wall switches, and dimmers are to manually switch lights ON and OFF. Switches shall comply with the operational requirements of the current T24, and include location of device, accessibility and override capability.
 - e. Quiet time switch is to temporarily bypass the occupancy sensors for a pre-programmed period of one hour, or as indicated on drawings.

B. Corridors and Open Areas:

1. Corridors and other common areas are to be controlled by a combination of programmable low voltage keyed switches and time schedules supplied by the networked lighting control system.
 - a. Low voltage keyed switches are operable 24 hours a day and are to manually switch lights ON and OFF.
 - b. The central timer is to automatically sweep lights OFF after hours and provide scheduling capability where and when occupancy sensors are not used.
 - c. Interior corridors require occupancy sensors.

C. Custodial, Unsupervised and Equipment Rooms:

1. Provide occupancy sensors with automatic on-off capability in addition to manual switches, and programming features indicated on plans. These sensors shall turn off the lights in the room via 15 minutes pre-set programmable interval after the room has been vacated.

D. Exterior Security Lights:

1. Program exterior wall packs and security lights to be controlled via exterior light sensors, and time switches as indicated on drawings.
 - a. Program lights to ON state when natural lighting is below 5 foot-candles
 - b. Program lights to OFF when natural light level is greater than 5 foot-candles.

E. Exterior, Non-Security Lights:

1. Exterior non-security lighting in parking lots, corridors and pathways, and decorative lights shall be controlled via exterior light sensor working in conjunction with programmable controlled time schedules via the lighting control system.
 - a. Program lights to ON state when natural lighting is below 5 foot-candles, and when scheduled time is set to ON.
 - b. Program lights to OFF state when natural light level is greater than 5 foot-candles, and when scheduled time is set to OFF.

F. Restrooms:

1. Student Restroom Lighting and Exhaust Fans (Fans interlocked with lights):
 - a. Restroom lights shall be controlled from the lighting control panel via assigned relays.
 - b. Provide by-pass lock type, vandal resistance key operated switch adjacent to the door, and ceiling mounted occupancy sensors for on/off controls.
 - c. The sensor shall turn off the lights via a programmable pre-set 15 minutes interval, after the room has been vacated.
2. Staff Restrooms Lights and Exhaust Fans (Fans interlocked with lights):
 - a. Restrooms lights and fan shall be controlled from the lighting control panel via assigned relays.
 - b. Provide ceiling mounted occupancy sensors, and by-pass toggle switches for system override adjacent to the door.
 - c. The sensor shall turn off the lights via a programmable pre-set 15 minutes interval, after the room has been vacated.

G. Emergency Lighting:

1. Provide emergency lighting controls circuitry to achieve override or bypass of manually operated switches, lighting control systems, dimmers and occupancy sensors during power failures.
2. Each area of luminaries or groups of luminaries shall be equipped with and be controlled by a UL924 listed emergency lighting control unit to allow the detection of localized power failures.

PART 2 PRODUCTS

2.1 CENTRAL LIGHTING CONTROL PANELS

- A. Central Lighting Control Panels (CLCP) shall be located in electrical closets.
- B. Panels shall be surface or flush mounted type as indicated on Drawings, with a hinged door assembly. Doors shall be furnished with flush type locks, spring latching, Corbin locks for

metal doors, keyed to Corbin No. 60 keys. Panels shall include the following components or features:

1. Shall be preprogrammed and preassembled with control equipment and relays as indicated on the lighting plans.
2. Shall be equipped with suitable dividers separating Class 1 and Class 2 compartments, 120v and 277v compartments as well as "normal and emergency" compartments.
3. Lighting control relays as indicated on Drawings. Provide 10 percent spare relays for centralized relay panels up to the maximum capacity of panel.
4. Shall be equipped with a neatly typewritten schedule with number and name of rooms or areas served by the relay circuits. Room numbers and names used shall be determined at the Project site and may not be those indicated on Drawings. Schedule shall indicate panel designation and voltage and shall be mounted in a frame under transparent plastic 1/32-inch-thick on inside of panel cabinet.
5. Each panel shall be rated for 120 or 277 VAC.
6. Shall be preassembled, preprogrammed and include relays capable of switching 20 amps lighting loads for 120 or 277 VAC.
7. Central lighting control panels, remote lighting control panels, relays, low voltage switches, interior light sensors, exterior light sensors, and associated control electronics shall be furnished by Lighting Control and Design (LC & D), Douglas Lighting Controls, or equal.
8. Approved products: Douglas Dialog Series, LC & D #GR-2400 series, or equal.

2.2 REMOTE ROOM CONTROLLERS

- A. Remote Room Controllers (RRC) shall be mounted in the ceiling space as indicated on plans.
 1. Each RRC shall be connected to the network lighting control system using manufacturer's recommended wiring method and configuration.
 2. Provide a printed label "RLCP" to the T-bar grid below the RRC".
 3. Approved products: LC&D GR-2404 Series or Douglas WRC-4244.
- B. Each RRC shall contain the following hardware features:
 1. Digital dataline switch inputs.
 2. 12 VDC and 24 VDC inputs for occupancy sensors requiring DC voltage for analog occupancy sensors, or Digital dataline type inputs for occupancy and light sensors.
- C. Switches shall be capable of switching individual relays, local groups of relays within the panel or global groups of relays system wide. Each switch shall be configured to be ON, OFF, RAISE, LOWER, or Toggle.

- D. The RRC shall digital dataline occupancy sensors. The sensors shall be configured for OFF only or ON/OFF switching scenarios.
- E. Photo sensor shall be linked with occupancy sensing so that when light levels are high enough, the occupancy/vacancy sensor will not switch the photo-controlled relays ON.

2.3 RELAYS

- A. Relays shall be warranted for a minimum of three-years.
- B. Relays shall be individually added or replaced. Lighting control systems incapable of replacing individual relays are not acceptable.
- C. Each lighting control relay shall be capable of controlling incandescent, fluorescent, LED sources, and HID lighting loads. Relays not rated for all types of lighting loads are not acceptable.
- D. Approved Products:
 - 1. Single Pole: Douglas WR-6161, LC&D SL-277-NC, or equal.
 - 2. Double Pole: Douglas WR-6172, LC&D SL-480-NC, or equal.

2.4 LOW VOLTAGE SWITCHES

- A. Low voltage switches shall be wired in compliance with manufactures requirements. Digital switches shall be part of the lighting control system network.
 - 1. Provide stainless steel switch plates, unless noted otherwise in construction documents.
 - 2. Approved Products: LC&D Chelsea series, Douglas WSW-3500 series, or OWNER approved equal.
- B. Physical removal of any single switch shall have no effect on the communication between relay panels in the rest of the lighting control network. Lighting control systems requiring the continuous connection of all low voltage switches are not acceptable.
- C. Keyed switches shall be digital.
 - 1. Approved products: Douglas WSK-35XX Series, LC&D KS Series, or equal.
 - 2. Provide stainless steel switch plates, unless noted otherwise in construction documents.
- D. Classrooms witches controlling luminaires in classrooms shall be digital and be wired to programmable inputs in the lighting control system network.
 - 1. Each switch shall be programmed to control ON only, OFF only or ON and OFF, dimming, audio/visual and quiet time one, some, or all relays in the entire network.
 - 2. Whiteboard luminaires shall be controlled independently with On, Off, and dimming capabilities.

- E. High abuse areas (common areas, gymnasiums, etcetera) shall be controlled using a vandal resistant, touch sensitive high abuse switch and available with up to three buttons in a single gang. Multi gang versions shall also be available.
 - 1. Touch pads shall be stainless steel and capable of handling both high abuse and power wash cleaning crews' activities.
 - 2. Switches shall be digital or analog as indicted on plans.
 - 3. High abuse switch touch buttons shall control a single relay or group(s) of relays of the lighting control system.
 - 4. Touch buttons shall be controllable via programmed commands to enable or disable, ON, OFF, Toggle or Maintain operation functions. Programming shall be done locally or remotely.
 - 5. Touch pad(s) shall be identified as to function by an engraved label.
- F. Switches must be capable of handling electrostatic discharges of at least 30,000 volts (1cm spark) without any interruption or failure in operation.

2.5 INTERIOR DAYLIGHT SENSORS

- A. Interior daylight sensors shall cause light fixtures to brighten or dim to maintain pre-determined and uniform light levels.
- B. The sensors shall permit any relay to switch at a unique light level and shall attempt to maintain a constant light level by switching individual relays ON or OFF as the ambient light level changes.
- C. Controllers offering single set point controls are not acceptable.
- D. Each interior daylight sensor shall continuously monitor the true light level and shall broadcast this level to lighting control network. Controllers requiring readings at the sensor head itself are not acceptable.
- E. Each interior daylight sensor shall be fully adjustable via the lighting control software. Controllers requiring adjustments at the sensor head are not acceptable.
- F. Provide daylight sensors in all rooms with windows, skylights, or daylight filtration. Refer to lighting plans to determine which switch legs are controlled by the daylight controller.
- G. Approved Products: LC&D iPC Series, Douglas WPS-3711, Douglas WPP-INT, or equal.

2.6 EXTERIOR LIGHT SENSORS

- A. One exterior light sensor shall permit different relays to switch at different light levels. Sensors offering less than 14 remotely settable trip points are note acceptable.
- B. Exterior light sensor shall continuously monitor light levels and shall broadcast this level over the lighting control network. Exterior light sensor shall be fully adjustable via the networked lighting control system.

- C. Sensors and controllers requiring adjustments at the sensor head are not acceptable.
- D. Sensors shall be UL or NRTL listed for exterior application.
- E. Approved products: Douglas WPS-3741B, LC&D PCO, or equal.

2.7 DIMMING CONTROLLER

- A. Remote relay panels shall be capable of outputting 0V – 10V dimming signal for each relay provided in the remote room controller. LED Dimming drivers shall be controlled by industry standard 0V-10V control input.
- B. LED Drivers using proprietary control protocols shall not be acceptable.
- C. To maximize daylight harvesting and minimize disruption to occupants, each dimming output shall provide adjustment for baseline, start point, mid point, end point, trim fade up rate, fade down rate, time delay and enable/disable masking.
- D. Photocells settings must be remotely accessible.
- E. Systems that provide ON, OFF with Time Delay only and systems that do not provide remote accessibility are not acceptable.
- F. Mount photocells in locations indicated on plans and according to manufacturer's recommendations for daylight system type, open or closed loop. Trip points shall be able to be programmed and altered remotely via programming functions at the master Lighting Control Panel (LCP) and remote access to programming functions via computers or other intelligent communication devices.
- G. Photocells requiring manual trip point adjustment, or systems that provide local adjustment only are not acceptable.
- H. Photocells used for interior lighting control shall have multiple settings such as start-point, mid-point, off-point, fade-up rate, fade-down etc.
- I. Approved Products: Douglas WPS-3711, Douglas WPP-INT, LC&D iPC series, or equal.

2.8 OCCUPANCY SENSORS

- A. Occupancy Sensors:
 - 1. Ceiling-Mounted Dual Technology Sensors:
 - a. Sensors shall be dual technology infrared-ultrasonic capable of detecting presence in floor area to be controlled, by detecting Doppler shifts in transmitted ultrasound and infrared technology.
 - 1. ADI-Voice technology may be used in addition to the required infrared-ultrasonic features.
 - b. Detection shall be maintained when a person moves only within a maximum distance of 12 inches, in either a horizontal or vertical manner, at approximate speed of 12 inches per second. Lights shall not go off when a person is reading or writing while seated at a desk.

- c. Each sensor shall be furnished with a convenient shunt provision, which will enable a person to by-pass sensor in event of failure.
- d. Sensitivity shall not change more than ten percent in temperature range of 0 degrees F. to 120 degrees F., and in humidity range of ten percent to 80 percent. Sensitivity adjustment shall be provided for each technology.
- e. Time delay range shall be adjustable from 15 seconds to 15 minutes.
- f. Sensors power supply shall be provided by power pack, consisting of a transformer and contact closure relay in one package. Power output of transformer shall be capable of operating a minimum of two sensors.
- g. Approved products: Watt Stopper No. DT-200, similar as manufactured by Leviton, Sensor Switch, Unenco, or equal.

B. Dual Technology Passive Infrared Wall Switch Sensors with Daylight Controls:

- 1. Sensors shall be capable of detecting presence in floor area to be controlled, by detecting changes in infrared-ultrasonic energy. Small movements shall be detected such as when a person is writing while seated at a desk.
- 2. Passive infrared sensor shall utilize a dual-element sensor and a multi-element fresnel lens.
- 3. Sensor shall be furnished with a daylight filter which ensures that sensor is insensitive to short-wavelength infrared waves, such as those emitted by the sun.
- 4. Sensors shall be furnished with convenient bypass provisions, which enable lighting to be turned on in case of failure.
- 5. Time delay range shall be adjustable from 15 seconds to 15 minutes.
- 6. Sensitivity adjustment shall range from 0 (off) to ten (maximum).
- 7. Adjustments and mounting hardware shall be concealed under a removable cover to prevent tampering with adjustments and hardware.
- 8. Each sensor shall cover up to 800 square feet, with a field-of-view of 180 degrees.
- 9. Sensor shall be a completely self-contained control system.
- 10. Power shall be provided via an internal transformer.
- 11. Switching mechanism shall be a latching dry contact relay.
- 12. Sensor shall be capable of switching from 30 to 1000 Watts, LED, incandescent or fluorescent light sources.
- 13. Sensor shall be furnished with a daylight feature, adjustable from ten to 400 foot-candles, that maintains lighting off when a desired foot-candle level is present.
- 14. Sensors shall be dual voltage, 120 volt and 277 Volt.
- 15. Approved products: Watt Stopper No. WI 200, I 300, similar as manufactured by Leviton Sensor Switch, Unenco, or equal.

2.9 LIGHT LEVEL CONTROLERS (EXISTING FACILITIES)

- A. Controller shall be capable of detecting changes in lighting levels; it shall utilize an internal photoconductive cell to measure light levels through 50 percent diffused lens.
- B. Controller shall be capable of controlling any type of lighting. It shall be a self-contained 24 VDC device that controls lighting through use of power switch packs.
- C. Controller shall be capable of turning lighting on and off between ten and 200 foot-candles.
- D. Controller shall be furnished with an adjustable dead-band feature to prevent lighting from cycling when lighting goes on and off, and from minor changes due to cloud cover.
- E. Controller shall be furnished with an adjustable time delay range of five seconds to five minutes.
- F. Controller shall be furnished with an LED lamp indicating status of sensor. LED shall have different colors for on and off status.
- G. Adjustments and mounting hardware shall be concealed under a removable cover to prevent tampering with adjustments and hardware.
- H. Each controller shall be equipped with a by-pass mechanism, which will enable lighting to be turned on during failure conditions.
- I. Approved manufacturers: Watt Stopper No. LS-100 XA, or similar products by Leviton, Sensor Switch, Unenco or equal.

2.10 UNIT INVERTERS

- A. Unit Inverters shall be rapid start type consisting of emergency power packs designed to be installed in channels of new lighting fixtures.
- C. Power pack construction shall be of durable polycarbonate housing.
- D. Units shall be furnished with test switches and pilot lights.
- E. Units shall automatically power designated lamp(s) for 90 minutes of emergency service upon failure of utility power.
- F. Upon return of utility power, battery shall automatically recharge.
- G. Batteries shall be field-replaceable, sealed, rechargeable, spill-proof, maintenance-free nickel cadmium.
- H. High efficiency inverter/charger design shall include low-voltage disconnect to prevent deep discharge of battery and dual voltage designed for connection to either 120 or 277 volts. Chargers shall recharge fully discharged batteries to provide 90 minutes operation within 24 hours. Power pack shall not operate if shut off manually.
- I. An unconditional five-year warranty is required.
- J. Approved products: Dual-Lite UFO-5 Series, Bodine, Iota I series, Beghelli Luce, or equal.

2.11 INTERFACE TO BUILDING MANAGEMENT SYSTEM

- A. When interface to the Building Management System is required, The lighting control system shall provide a BACnet/IP interface module that communicates with the BMS via a BACnet/IP network. (a collection of one or more IP sub networks (IP domains) that are assigned a single BACnet network number). Verify if interface to BMS is required.
- B. BACnet/IP interface module shall provide the capability for the BMS to:
 - 1. Communicate directly with each relay in the lighting control system network and each group used within the lighting control system.
 - 2. Monitor the status and status changes of each relay and each group.
- C. Install wiring and confirm operation of the lighting control BACnet/IP interface module per the lighting control manufacturer's instructions. Installing, wiring, and interfacing of BMS components to the lighting control system.

PART 3 EXECUTION

3.1 GENERAL

- A. Lighting control system shall not be used for any other purpose other than its intended use and application.
- B. Provide required interconnections with other systems such as emergency power sources, fire alarm systems, and building management system as required or indicated on drawings.
- C. Installation shall meet or exceed standard practice of workmanship and quality.
- D. Drawings are diagrammatic in nature and indicate work to be provided, but do not provide means and methods, bends, transitions, or special fittings required to clear beams, girders or other work already in place. Investigate conditions where conduits are to be installed and furnished and install required fittings.

3.2 INSTALLATION AND SET-UP

- A. Verify that conduit for line voltage wires enters panel in line voltage areas and conduit for low-voltage control wires enters panel on low-voltage areas. Refer to manufacturer's drawings for location of line and low-voltage areas.
- B. Provide for digital type switches and make all connections according to lighting control manufacturer's requirements.
- C. Central Lighting Control Panels and Remote Room Controllers shall be connected via a data line (Douglas uses a non-polarized two No. 18 and LC&D uses Cat5 four twisted pair cable, with RJ45 end connectors). Connect entire lighting control system per manufacturer's requirements. Do not exceed manufacturer's total data line length requirement.
- D. Panels shall be located so that they are readily accessible and not exposed to physical damage.

- E. Panel locations shall be furnished with enough working space around panels to comply with the California Electrical Code.
- F. Panels shall be securely fastened to the mounting surface by at least four points.
- G. Unused openings in the cabinet shall be effectively closed.
- H. Cabinets shall be grounded in accordance with Article 250 of the California Electrical Code, and manufacturer's recommendations.
- I. Lugs shall be suitable and listed for installation with the conductor being connected.
- J. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.
- K. Maintain the required bending radius of conductors inside cabinets.
- L. Clean cabinets of foreign material such as cement, plaster and paint.
- M. Distribute and arrange conductors neatly in the wiring gutters.
- N. Follow the manufacturer's torque values to tighten lugs.
- O. Before energizing the panelboard, the following steps shall be taken:
 - 1. Retighten connections to the manufacturer's torque specifications. Verify that required connections have been furnished.
 - 2. Remove shipping blocks from component devices and the panel interior.
 - 3. Remove debris from panelboard interior.
- P. Follow manufacturers' instructions for installation.

3.3 OPERATING/SERVICE MANUALS

- A. Service and Operation Manuals:
 - 1. Submit operation and service manuals. Complete manuals shall be bound in flexible binders and data shall be typewritten or drafted.
 - 2. Record drawings: Provide (3) printed and one electronic copy on flush media of as built documents in latest version of ACAD of the entire system; including, floor plans with equipment, and devices layouts and wiring, interconnections with other systems, conduit and cable runs, programmed configurations, sequence of operations, system labeling codes, system passwords, and other pertinent information.
 - 3. Manuals shall include instructions necessary for proper operation and servicing of system and shall include complete wiring circuit diagrams of system, wiring destination schedules for circuits and replacement part numbers. Manuals shall include as-built cable Project site plot plans and floor plans indicating cables, both underground and in each building with conduit, and as-built coding used on cables. Programming forms of systems shall be submitted with complete information.

3.4 PROTECTION

- A. Protect all work, equipment and components of the lighting control system until Substantial Completion.

3.5 TESTING

- A. Set-up, commissioning and testing of the lighting control system, and OWNER instruction shall include:
 1. Confirmation of system programming.
 2. Confirmation of operation of individual relays, switches, occupancy sensors and daylight sensors.
 3. Operation of system's features under normal and emergency operations.
 4. Before energizing check and demonstrate in the presence of the Project Inspector that cables and wire connections are free from short circuits, ground faults, and that there is continuity, and necessary insulation.
 5. Confirm system operations and functionality.
 6. Check system interface response to other systems such as fire alarm and emergency power system conditions.

3.6 SPARE PARTS

- A. Provide a minimum of five percent spare parts of each type of relay, sensors, switches, and peripheral devices.

3.7 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 24 16
PANELBOARDS AND SIGNAL TERMINAL CABINETS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Lighting and power distribution facilities, including panelboards.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 26 05 00: Common Work Results for Electrical.
 - 3. Section 26 05 13: Basic Electrical Materials and Methods.
 - 4. Section 26 26 00: Power Distribution Units.
 - 5. Section 26 50 00: Lighting.
 - 6. Division 27: Communications.
 - 7. Division 28: Electronic Safety and Security.

1.2 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. Shop Drawings: Include a front elevation indicating cabinet dimensions, make, location and capacity of equipment, size of gutters, type of mounting, finish, and catalog number of locks. General layout of internal devices, wiring drawings with wire numbers and device connections, vendor cut sheets of devices in enclosure and bill of materials listing description, manufacturer, part number, and quantity of items shall be included.
- C. Installation Instructions: Submit manufacturer's written installation instructions.

1.3 DESIGN REQUIREMENTS

- A. Panelboards:
 - 1. Panelboards shall be wall-mounted, enclosed safety type with 120/240 volt, three-wire solid neutral 277/480 volt, four-wire or 120/208 volt, four-wire solid neutral mains as indicated on Drawings or specified. First panelboard of each building shall be provided with main or sub-feeder circuit breakers where so indicated.
 - 2. Single pole branches shall be molded case, thermal magnetic circuit breakers with inverse time delay, trip free, quick-make, quick-break mechanism and silver alloy contacts. Circuit breakers shall be fully rated, with ampere rating marked on handle and shall indicate on/off and tripped positions. Ground fault interrupters shall be incorporated into circuit breakers where indicated. They shall be listed by UL, or other NRTL as ground fault devices. Provide appropriate lug kit of sufficient size to accommodate the feeders.

3. Two- and three-pole branches shall be enclosed, and shall be thermal magnetic circuit breakers with inverse time delay, tamper-proof, ambient compensated, single handle, internal common trip, and quick-make, quick-break mechanism with silver alloy contacts. Circuit breakers shall be fully rated or as otherwise indicated on the Drawings.
 4. Main and subfeeder circuit breakers shall be enclosed, thermal magnetic type with inverse time delay, single handle common trip, quick-make, quick-break mechanism, corrosion-resistant bearings and silver alloy contacts. Ampere frame size and trip rating shall be as indicated on Drawings. Breakers over 225 amperes shall be furnished with interchangeable trip units. Handles of main and subfeeder circuit breakers shall be provided cabinet door. Voltage rating shall be as indicated on Drawings.
 5. Circuit breakers shall be fully rated and of one-piece, bolt-on type and shall meet short-circuit interrupting capacity requirements indicated on Drawings. Series rated circuit breaker combinations are not acceptable.
 6. Internal connections shall be fabricated with plated copper bus bars and the busses shall extend for full length of space available for branch circuit breakers. Feeder cable connectors shall be installed at point of feeder entrance. Terminals shall be furnished with copper conductors. Panelboards fed by conductors having over-current protection greater than 200 amperes shall be protected on supply side by over-current devices having a rating not greater than that of panelboards. Copper bussing shall be fully rated. Heat rated bussing is not acceptable.
 7. Except where otherwise indicated, circuit breakers shall be in two vertical rows connected to bus bars in a distributed phase arrangement. Two-pole branches shall be balanced on busses. Single pole branches shall be numbered adjacent to its circuit breaker, with odd numbers on left and even numbers on right.
 8. Specified circuit breaker spaces shall be furnished with hardware required for future installation of circuit breakers.
 9. Provide locking devices for individual circuit breakers. Padlocking devices shall be secured to circuit breakers and by panel dead front plates.
- B. Surge Suppressors: Where indicated on Drawings, provide transient voltage surge suppressors as an integral part of panelboards. Panelboards shall be complete with 200 percent rated copper neutral bus, ground bus and isolated ground bus in addition to requirements of this section. Surge suppressors shall be as follows:
1. Surge Capacity:
 - a. Line-to-neutral for wye systems: 80 KA.
 - b. Line-to-ground: 80 KA.
 - c. Neutral-to-ground: 80 KA, three-phase wye.
 - d. Line-to-neutral plus line-to-ground: 160 KA.
 2. UL 1449 2nd Edition Suppressed Voltage Rating for 208/120 Wye System:
 - a. Line-to-neutral: 400 volts.

- b. Line-to-ground: 400 volts.
 - c. Neutral-to-ground: 400 volts.
 - d. Maximum continuous over-voltage: 150 volts.
3. EMI/RFI High-Frequency Noise Power Filter (Characteristics):
- a. 100 KHz at 44 dB.
 - b. 100 MHz at 44 dB.
 - c. 10 MHz at 44 dB.
 - d. 100 MHz at 44 dB.
4. MOVs shall be thermally protected for low current faults and shall be fused with surge-rated fuses. The surge-rated surge current passes and clears the circuit safely if the surge capacity is exceeded. Enhanced diagnostics shall continuously monitor the unit's status and shall include LEDs to signal a reduction in surge capacity or the loss of a suppression circuit. An audible alarm, with test and silence features, shall be furnished in diagnostic package.
5. Each phase or the entire unit shall be replaceable and have bolted-on, tin-plated copper connections. Unit to have UL witnessed fault current rating of 65,000 symmetrical amperes.
6. Surge suppression units shall comply with the following:
- a. UL certified.
 - b. UL 1283.
 - c. UL 1449.
 - d. IEEE C 62.45.
 - e. IEEE C 62.41.
 - f. Nationally Recognized Testing Laboratory (NRTL) or equal.

C. Panelboard Cabinets:

- 1. Panelboard cabinets shall be code gage galvanized steel or blue steel; fronts, doors, and trims shall be code gage furniture steel. Cabinets shall be furnished with at least six-inch high gutters at top and bottom where feeder cable size exceeds four gage or where feeder cable passes through cabinet vertically. Cabinets shall be furnished with top and bottom gutters sized as required by inspection department having jurisdiction, but never less than six inches where more than one feeder enters top or bottom of cabinets. Side gutters shall not be less than four inches wide. Width of cabinets shall be 20 inches, unless otherwise indicated on Drawings.
- 2. Doors shall be cut true, shall accurately fit opening and finish smooth across joints. Rabbets shall be inside. Hinges shall be entirely concealed except for barrels and pins.

Hinge flanges shall be welded to door and trim. Doors shall be equipped with flush type, spring-latching, Corbin locks for metal doors, keyed to Corbin No. 60 keys.

3. Where contactors, time switches, and control devices are specified or indicated to be installed within panelboard cabinets, a separate compartment and door shall be provided at top of cabinet for such devices. Door shall be sized as required to permit removal of contactor and other devices intact. Gutters shall be provided at sides and top of compartment. Doors shall be equipped with flush type, spring-latching, Corbin locks for metal doors keyed to Corbin No. 60 keys.
 4. Provide and install panelboard manufacturer's permanent circuit number kit option.
 5. Panelboards with control devices in compartment shall arrive at the Project site completely assembled with control devices installed and wired.
 6. Outdoor cabinets shall be NEMA Type 3R. Construction shall be formed from code gage galvanized steel with ANSI No. 61 gray enamel finish. Provide heavy-duty, three point latching, vault type door handles with padlocking provisions. Provide stainless steel or galvanized butt hinges on doors. Padlocks shall be furnished, keyed to Corbin No. 60 keys.
 7. Self-tapping screws and bolts not permitted.
- D. Panelboard Schedule: Provide a neatly typewritten schedule with number or name of room or area, or load served by each panelboard circuit. Room numbers or names shall be determined at the Project site and shall not necessarily be those indicated on the Drawings. Schedule shall also indicate panel designation, voltage and phase, building and distribution panel or switchboard from which it is fed. Schedule shall be installed in a frame under transparent plastic 1/32 inch thick on inside of each panelboard cabinet door.
- E. Panelboard nameplate: Provide a nameplate identifying panelboard. Plates shall be black and white plastic nameplate stock, with character cut through black exposing white and shall bare designation of service. Name plate shall be mechanically fastened to switchboard.
- F. Provide additional labeling on dead-front of panelboard. Label shall be a P-Touch or equal with a minimum width of 3/8 inch with black letters on white background. Label shall re-identify panelboard and also identify name and location of power source feeding this panel. Location information shall include building name if located in different building and name or room location. If power source is installed in same room, label should indicate source name and "In this Room"
- G. Panelboard Standards: Panelboards shall be UL, or other NRTL listed and labeled. Panelboards shall meet latest revisions of following standards:
1. California Electric Code, Article 384.
 2. UL 67, Panelboards.
 3. UL 50, Cabinets and Boxes.
 4. UL 943, GFCI.
 5. UL 489, Molded Case Circuit Breakers.
 6. NEMA PB1.

7. Federal Specifications W-P- 115C and WC-375B.
- H. Signal Terminal Cabinets:
1. Signal terminal cabinets shall conform to the Specifications for panelboard cabinets, except as modified herein.
 2. Terminal cabinets shall be flush type, with two-inch trim or surface mounted type, as indicated on Drawings. Terminal cabinets shall be furnished with sections and barriers to separate each system. Sections over 24 inches in width shall be provided with double doors and locks. Terminal cabinets, or sections of terminals housing separate systems, shall measure 12 inches long by 18 inches high by 5 $\frac{3}{4}$ -inch deep, unless otherwise indicated on Drawings. Trims for sectional cabinets shall be of one-piece construction.
 3. Terminal cabinets shall be furnished with $\frac{3}{4}$ inch thick plywood. Plywood shall be fastened in place with machine screws or factory installed mounting screws.
 4. Flush-mounted terminal cabinets shall be finished as specified for flush-mounted panelboard cabinets. Surface and semi-flush mounted terminal cabinets shall be finished as specified for surface-mounted panelboard cabinets.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Panelboards shall be manufactured by Siemens, W.A. Benjamin, General Electric, Cutler Hammer, Square D or equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Panelboards shall be located so they are readily accessible and not exposed to physical damage.
- B. Panelboards installed outdoors shall be specifically listed for wet locations and shall be weatherproof in NEMA Type 3R cabinets.
- C. Panelboard locations shall provide sufficient working space around panels to comply with the California Electrical Code.
- D. Panelboards shall be securely fastened to structure and mounted on surface by at least four points.
- E. Unused openings in cabinets shall be effectively closed as required by the manufacturer.
- F. Cabinets shall be grounded as specified in Article 250 of the California Electrical Code.
- G. Conduits shall be installed so as to prevent moisture or water from entering and accumulating within the enclosure.

- H. Lugs shall be suitable and listed for installation with the conductor being connected.
- I. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs.
- J. Maintain the required bending radius of conductors inside the cabinet.
- K. Clean the cabinet of foreign material such as cement, plaster, and paint.
- L. Distribute and arrange conductors neatly in the wiring gutters.
- M. Use the manufacturer's torque values to tighten lugs.
- N. Before energizing panelboards, the following steps shall be taken:
 - 1. Retighten connections to the manufacturer's torque specifications. Verify that required connections have been provided.
 - 2. Remove shipping blocks from component devices and panelboard interiors.
 - 3. Manually exercise circuit breakers to verify they operate freely.
 - 4. Remove debris from panelboard interior.
- O. Follow manufacturer's instructions for installation.
- P. Do not install in highly corrosive environments, unless rated for the application.

3.2 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.3 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 50 10
SOLID STATE (LED) LIGHTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: LED Luminaires, LED modules, drivers, wiring, and lighting controls.
- B. Related Requirements:
 - 1. Division 01 - General Requirements.
 - 2. Section 26 05 00: Common Work Results for Electrical.
 - 3. Section 26 05 13: Basic Electrical Materials and Methods.
 - 4. Section 26 05 26: Grounding and Bonding.
 - 5. Section 26 05 19: Low-Voltage Wires (<600 Volt AC).
 - 6. Section 26 09 23: Lighting Controls Systems.

1.2 REFERENCES

- A. American National Standards Institute/American National Standard Lighting Group ANSI/ANSLG – C78.377-2008 Specifications for the Chromaticity of Solid State Lighting Products.
- B. American National Standards Institute/American National Standard Lighting Group ANSI/ANSLG – C82.77-2002 Harmonics Emission Limits.
- C. Federal Communication Commission (FCC) 47 CFR Part 15 – Radio Frequency Devices.
- D. Illuminating Engineering Society of North America (IESNA) LM-79-, LM-80-15, and TM-21.
- E. National Electrical Manufacturers Association (NEMA) SSL-1-2010 Electronic Drivers for LED Devices, Arrays, or Systems.
- F. SSL-3-2010 Solid State Lighting High Power LED Binning for General Illumination.
- G. SSL-4-2012 Solid State Lighting Retrofit Lamps.
- H. National Fire Protection Association (NFPA) NEC-70-2011
- I. Underwriters Laboratories (UL) 8750-Light Emitting Diode (LED) Equipment for Use in Lighting Products.
- J. Underwriters Laboratories (UL) 1598C- Light Emitting Diode (LED) Retrofit Luminaire Conversion Kits.

1.3 SUBMITTALS

- A. List of Materials: Submit a complete list of proposed materials.
- B. Shop Drawings: Provide detailed and dimensioned Shop Drawings indicating kind, weight and thickness of materials, method of fitting and fastening parts together, location and number of sockets, size of lamps, and complete details of method of fitting suspension and fastening luminaires in place. Provide wiring diagrams for lighting control equipment. Drawings shall contain sufficient information to assemble and install equipment at the Project site without further instructions.
- C. Prior to start of construction; provide photometric calculations with graphic of lighting foot-candle levels at work plane, ceiling and walls. Calculations shall comply with IESNA recommendations.
- D. Installation Instructions: Submit manufacturer's written installation instructions for luminaires and accessories.

1.4 SUBSTITUTIONS

- A. Luminaires that deviate from these requirements shall not be accepted without written approval from OWNER'S Design Standards Section and Maintenance and Operations Technical Unit. When deviating or substituting luminaires, the following information shall be submitted:
 - 1. Substitution request form substantiating reasons and benefits to OWNER.
 - 2. OWNER'S approval shall be obtained for any equipment or materials substitutions.
 - 3. Submit a completed OWNER's LED luminaires evaluation form with supporting documentation for any and all fixtures' performance claims. The form can be found at the following electronic address:
http://www.laschools.org/documents/file?file_id=310976408
- B. Substitutions: Submittals must comply with contract general provisions.

1.5 QUALITY ASSURANCE

- A. Design of lighting luminaires, accessories, supports, and method of luminaire installation shall comply with requirements for earthquake-resistant construction of the State of California.
- B. Provide suspension points at no more than two feet from luminaire ends. Spacing between supports shall not exceed eight feet.
- C. Components and luminaires shall be listed and approved for the intended application by Underwriter's Laboratories (UL), or other Nationally Recognized Testing Laboratory (NRTL), and in compliance with applicable industry standards and codes, including those mentioned under article 1.02 – References.

1.6 WARRANTY

- A. Provide the following warranties:
 - 1. One year labor warranty.

2. Material warranty:
 - a. LED modules: five years minimum.
 - b. Drivers: five years minimum.
 - c. Lighting Pole (Standards): five year minimum.
- B. Warranty period shall begin at substantial completion or at project acceptance for beneficial occupancy, whichever occurs first.
- C. CONTRACTOR shall warranty Luminaires, including drivers, LED modules and ancillary components via a single warranty source. Multiple warranty sources is not acceptable.

PART 2 PRODUCTS

2.1 MATERIAL AND FABRICATION

- A. Luminaires of same type shall be of one manufacturer.
- B. Manufacturer and model number references are indicated as a standard of performance and quality; other manufacturers' models may be submitted for review, provided the product meets or exceeds the product's specified requirements and substantially complies with OWNER'S LED Luminaires Evaluation Requirements Form.
- C. Conductors that pass over edges or through metal opening(s) shall be secured from contacting the edges, and be protected from cutting and abrasion. This requirement shall be met through one of the following:
 1. Rolling the edge of the metal not less than 120 degrees.
 2. A bushing or grommet of a material other than rubber at least 1.2 mm (0.047") thick.
 3. Glass sleeving at least 0.025 mm (0.010") thick.
- D. Lighting luminaires shall meet the following requirements:
 1. Industry standards as indicated under Article 1.02.
 2. Luminaire shall be from a manufacturer who has been in the business of manufacturing LED lighting luminaires for interior and exterior applications for a minimum of 5 years.
 3. Luminaires shall comply with the California Health and Safety Code requirements for products containing substances identified in the California Lighting Efficiency and Toxics Reduction Act, or be in compliance with the European Restriction of Hazardous Substances (RoHS), whichever is more stringent.
 4. Luminaires shall be baked-on enamel or powder-coated, unless otherwise specified in this section.
 5. The luminaire(s) lens, including end caps shall be 0.187 nominal thickness.
 6. Drivers shall be easily accessible without the use of special tools.

7. Wiring cavity shall be field accessible for service or repairs.
8. Luminaires shall be capable of being operated by standard motion/ vacancy sensors, daylight sensors, and dimmers.
9. Luminaires shall be provided with a manufacturer's stencil or permanent legible sticker that states manufacturer business information and date of delivery.
10. Temperature rating; -20 degrees Celsius minimum starting temperature. Luminaire accessories including LEDs and drivers shall be able to withstand temperatures in excess of 110 Fahrenheit degrees.
11. Color Rendering Index (CRI):
 - 1) Interior Applications: +82 CRI.
 - 2) Exterior Applications: +70 CRI
12. Power factor: Greater than 0.9 at 120V and 277V.
13. Total Harmonic Distortion: Less than 20% at 120V and 277V.
14. Color Correlated Temperature: 4000K minimum \pm 275K degrees.
15. LEDs and drivers life expectancy: 50,000 minimum projected hours at 6,000 hours testing for both LEDs and drivers.
16. Luminaires in contact with insulation materials shall be IC rated.

2.2 DRIVERS and LED MODULES

A. Drivers:

1. Approved Drivers Manufacturers:
 - a. Osram – Optotronic.
 - b. Philips – Advance and Xitanium.
 - c. Universal Lighting Technologies – Everline.
 - d. General Electric – Lightech.
 - e. Thomas Research Products
 - f. Kenall – Low Profile LED Driver
 - g. EldoLED
 - h. Equal. Only if approved by OWNER's M&O Technical Services and Design Standards units through a deviation request.
2. Driver Type and Characteristics:
 - a. Comply with the state of California Health and Safety Code requirements for products containing substances identified in the California Lighting Efficiency

and Toxics Reduction Act, or be RoHS compliant, whichever is more stringent.

- b. Dimming for 0-10 volt DC control circuits. Drivers shall be specifically compatible with the lighting control system being provided.
- c. Comply with applicable state, federal, and industry standards listed under References article.
- d. Wattage as stated in Luminaire's LM-79 test report.
- e. Driver performance requirements:

DRIVERS PERFORMANCE CHARACTERISTICS		
No.	Characteristic	Minimum Requirements
1	Input Voltage range	120V, 277V
2	Input Overvoltage	320 VAC for 48 hours, 350 VAC for 2 hours.
3	Frequency	50/60 Hz Nominal
4	Power factor	+0.95 Minimum
5	Inrush Current	Less than 30 amps @ 120V Less than 70A @ 277V
6	Input Current Range	54A @ 120V, 23A @ 277V
7	Output Current	1670 mA Maximum
8	Maximum Power	65 Watts
9	Total Harmonic Distortion	Less than 20%
10	Leakage Current	Less than 500 mA
11	Output Protection	Short and Open Circuit Protection
12	Maximum Case Temperature	90 ⁰ C
13	Minimum Starting Temperature	-20 ⁰ C
14	Storage Temperature	No less than 70 ⁰ C
15	Humidity	Rated for dry and damp locations
16	Cooling	Convection
17	Sound Rating	Class A
18	Life Expectancy	>50,000 hours at +50 ⁰ C
19	Dimming, Motion Sensors and Daylight Sensors Controllability	0-10V

B. LEDs:

1. Approved Manufacturers:

- a. General Electric.
- b. Philips.
- c. NICHIA
- d. Samsung LED Co.
- e. CREE
- f. Equal. With OWNER's approval.

2. LEDs Characteristics:

- a. Color Correlated Temperature (CCT):
 - 1) Chromaticity target Duv and tolerance 0.001 plus/minus 0.006.
 - 2) Nominal CCT for 4000K, target CCT 3985K \pm 275K.
 - 3) CCT measurements in compliance with ANSI C78.377-2008.
- b. Lumen Maintenance: Greater than 90% at 50^o C degrees.
- c. LEDs must be from same manufacturer and batch.
- d. TM-21 and LM-80 reported hours of no less than 50,000 with a minimum of 6000 hours testing.
- e. LM-79 reported CCT and CRI in compliance with articles 2.01.D.11 and 14.

2.3 LUMINAIRES

- A. Refer to lighting fixture schedule on plans for all fixtures to be used for this project.

2.4 EXIT ILLUMINATION

A. :

- 1. Ceiling or wall-mounted, vandal-resistant type, LED EXIT, consisting of:
 - a. LED board, green exit lettering and directional arrows as indicated on drawings.
 - b. Face plate and polycarbonate shield.
 - c. Number of faces, voltage, and emergency power source shall conform to design requirements indicated on drawings.
 - d. Area of refuge listing is required when luminaires are used in such locations.
 - e. Utilize a flag mount luminary with additional support from the ceiling or wall for canopy or pendant mounted exit signs. This option shall be exercised only if a wall is not available.

- f. Approved Products: Per Plans, or OWNER approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Attachment of all light fixtures to structure shall be per DSA approved drawings. Install a lighting luminaire for each lighting outlet indicated and label with day of installation.
- B. Luminaire voltage shall be as indicated on Drawings.
- C. Install recessed and surface-mounted luminaires, with plaster frames compatible with ceiling and wall systems employed; secure luminaires mechanically to frames.
- D. Align rows of suspended and surface-mounted luminaires to form straight lines at uniform elevations.
- E. Recessed luminaires shall fit snugly against ceilings to prevent light leakage.
- F. Luminaire installations shall comply with CBC Seismic requirements
- G. Emergency light luminaires shall be labeled "Emergency Luminaire" with one inch high letters produced with a P-touch or similar labeling system.

3.2 TESTING

- A. Check and adjust luminaires for required illumination.
- B. Replace defective LED strips and drivers.
- C. Test and adjust lighting control equipment for proper operation.

3.3 SPARE PARTS

- A. Furnish ten percent spare LED strips with a minimum of one spare strip of each type.
- B. Furnish ten percent spare motion detectors of each type with a minimum of one spare detector of each type.
- C. Furnish ten percent spare drivers of each type with a minimum one spare driver of each type.

3.4 HAZARDOUS WASTE DISPOSAL

- A. Hazardous waste disposals shall be handled and disposed of by an approved, licensed contractor.
- B. Products with PCBs are not acceptable. Hazardous waste shall be placed in appropriate containers provided by hazardous waste contractor labeled clearly with:
 - 1. Project Name
 - 2. Quantity of materials

3. Date materials became waste

- C. Store, remove, transport and dispose of hazardous materials in accordance with state and federal regulations.
- D. Provide Owner with copy of manifest and certificate of destruction.

3.5 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.6 CLEANUP

- A. Remove rubbish, debris, and waste materials from all areas of work each day.
- B. Clean luminaire surfaces of dirt, cement, plaster and debris. Furnish cleansers compatible with material surfaces being cleaned.

END OF SECTION

DESCRIPTION

The Arrowlinear fixture is a linear asymmetric system of lighting designed for wall washing and signage type applications. The fixture has three CCT options, multiple lengths and configurations, extruded aluminum housings, die cast end caps and mounting arms, and diffuse acrylic lens. It is a simple and effective linear asymmetric lighting solution. Versatile mounting hardware enables fixture to be mounted in multiple orientations to accommodate a wide variety of installations including base mount, ceiling mount, wall mount, ceiling mount, wall mount and cantilever mount.

SPECIFICATION FEATURES

Construction

Housing is corrosion-resistant. Aluminum extrusion with die-cast aluminum end caps. End caps are secured by concealed stainless steel fasteners. Housing, end caps, and lens are sealed with single, closed cell silicone gaskets. Stainless steel hardware is standard. Reflector is constructed from 22 gauge cold rolled steel and pre-painted reflective white. A slightly diffused acrylic lens is standard, constructed of impact-resistant, U.V. stabilized virgin acrylic to prevent discoloration.

Electrical

LED fixtures use >0.9 power factor

UL 1310 Class 2 AC to DC driver with built-in dimming as standard. Integral LED light engines are easily replaceable in the field. Offered in 80+ CRI for 3000K, 3500K, 4000K CCT.

Mounting

Fixtures can be installed as base mount, ceiling mount, wall mount and cantilever mount. Fixture includes Slide-N-Mount™ adjustable, lockable, mounting arms constructed from Type 383 die-cast aluminum. Support structure by others.

Finish

Fixture housing is powder coated for superior protection against fade

and wear.

Aiming

Fixture includes the PointGrab2™ lockable aiming system, providing minimum 180 degree vertical adjustment of the fixture housing in 5 degree increments. The aiming feature locks securely in place by means of a stainless steel locking mechanism.

Compliance

UL / cUL listed for use in damp locations.

Warranty

Standard 5 year limited warranty on all parts.



ARROWLINEAR

LED

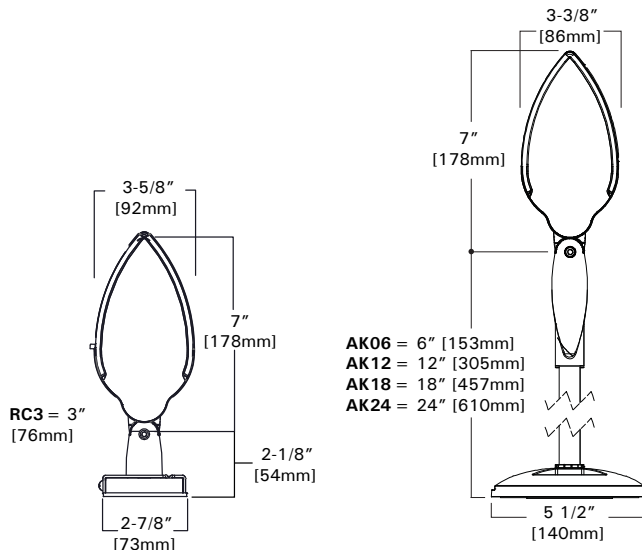
BASE MOUNT
CEILING MOUNT
WALL MOUNT
CANTILEVER MOUNT

Asymmetric Indirect

Individual Linear
Continuous Linear

CERTIFICATION DATA
UL/cUL Damp Location Listing
LM79 Compliant

ENERGY DATA
>0.9 Power Factor
120V – 277V 50/60 Hz
25°C Ambient Temperature



ORDERING INFORMATION

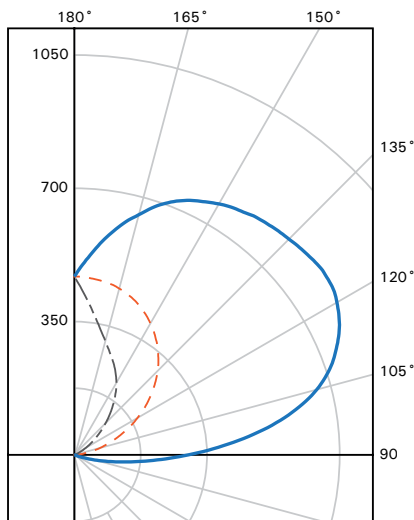
SAMPLE NUMBER: A04-SI-A-1-LED-30K-D-120-W-AK06-LMC

Series ^{1,2,3,4,5,6,7}	Size	Lens	Light Level	Lamp	Color Temperature
A02 = Arrowlinear 2' Unit A04 = Arrowlinear 4' Unit A06 = Arrowlinear 6' Unit A08 = Arrowlinear 8' Unit A12 = Arrowlinear 12' Unit AC__ = Arrowlinear Continuous Row (Specify in feet)	Indoor SI = Extra Small - Indoor	A = Acrylic	1 = See Energy & Performance Data Chart on page 2	LED = LED	30K = 3000K 35K = 3500K 40K = 4000K

Wiring ⁸	Voltage	Finish	Mounting ^{1,9}	Options ¹⁰
D = Dimming	120 = 120V 277 = 277V UNV = Universal	B = Black Z = Bronze S = Silver W = White C = Custom	RC3 = Rectangular Canopy, 3" Arm / Integral (Not offered on the Cantilever mount) ⁹ AK06 = 6" Adjustable Knuckle / Integral AK12 = 12" Adjustable Knuckle / Integral AK18 = 18" Adjustable Knuckle / Integral AK24 = 24" Adjustable Knuckle / Integral	LMC = Large AK Mounting Canopies (to match non-power feed canopy to power feed canopy. See page 2 for details.)

See page 4 for Technical Notes.

PHOTOMETRICS



FILE NAME: A02-SI-A-2-LED-35K-1C-120-S-AK6-24
LAMP: 3500K
LUMENS: 1990
INPUT WATTS: 20.5 W
EFFICACY: 97.1 LPW
TEST REPORT: ITL87330-GONIOPHOTOMETRY

Information based on 2 ft. section

ZONAL LUMEN SUMMARY		
Zone	Lumens	% Fixture
0- 30	0	0
0- 40	0	0
0- 60	0	0
0- 90	62	3.1
90-120	639	32.1
90-130	952	47.8
90-150	1537	77.2
90-180	1928	96.9
0-180	1990	100

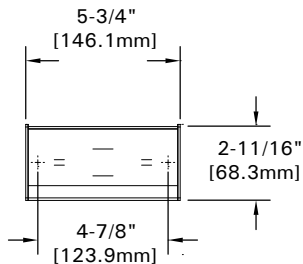
ENERGY & PERFORMANCE DATA

Individual Length	Lumens	Wattage	Length
2ft	1990	20.5	27-3/8" (695mm)
4ft	3980	40.5	51" (1295mm)
6ft	5970	60.6	77-7/16" (1967mm)
8ft	7960	82.2	101-1/16" (2567mm)
12ft	11940	121.1	151-3/16" (3839mm)

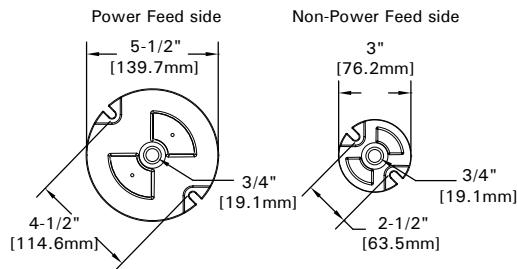
Color Temperature Conversion Factor (per ft)		
CCT	Lumens/ ft	Multiplier
3000K	923	0.927
3500K	995	1.000
4000K	1043	1.048

MOUNTING

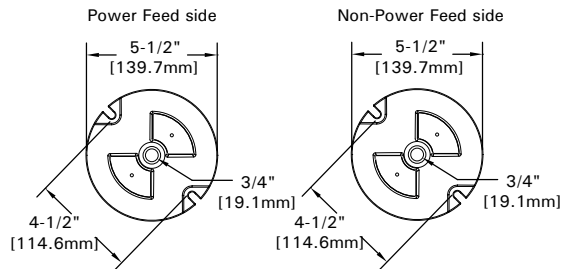
RC3 Mount - Standard rectangular wall mount plate



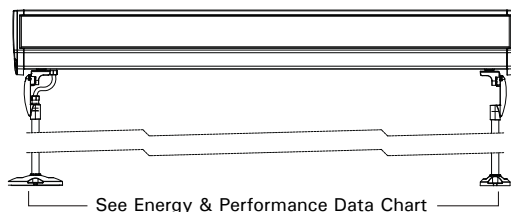
AK Mount - Standard circular wall mount plate



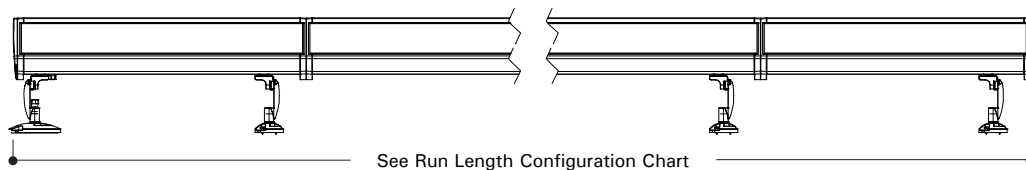
LMC Mount - Standard circular wall mount plate



Individual Linear (Axx)



Continuous Linear (AC_)



See page 4 for Technical Notes.

RUN LENGTH CONFIGURATION CHART

CONTINUOUS LINEAR RUN (AC _)				INDIVIDUAL LINEAR (Axx)			
Length (Nominal)	Actual Length	Fixture		Series	Length (Nominal)	Actual Length	Fixture
16	16.77	8' 8'		A02	2	2.28	2'
20	20.94	12' 4' 4'		A04	4	4.25	4'
24	23.1	8' 8' 6		A06	6	6.45	6'
26	25.12	12' 12'		A08	8	8.42	8'
30	29.29	12' 12' 4'		A12	12	12.60	12
32	31.5	12' 12' 6					
34	33.47	12' 12' 8'					
38	37.6	12' 12' 12'					
40	39.8	12' 12' 6 4' 4'					
42	41.8	12' 12' 8' 8'					
46	45.9	12' 12' 8' 8' 4'					
48	48.2	12' 12' 8' 8' 6					
50	50.16	12' 12' 12' 12'					
52	52.3	12' 12' 12' 8' 6					
54	54.34	12' 12' 12' 8' 8'					
56	56.54	12' 12' 12' 12' 6					
58	58.5	12' 12' 12' 12' 8'					
60	60.7	12' 12' 12' 12' 6 4'					
62	62.6	12' 12' 12' 12' 12'					
64	64.8	12' 12' 12' 12' 8' 6					
66	66.8	12' 12' 12' 12' 8' 8'					
68	67.1	12' 12' 12' 12' 6 6 4'					
72	71.0	12' 12' 12' 12' 8' 8' 4'					
76	75.2	12' 12' 12' 12' 12' 12'					
78	77.4	12' 12' 12' 12' 12' 8' 6					
80	79.3	12' 12' 12' 12' 12' 8' 8'					
82	81.5	12' 12' 12' 12' 12' 12' 6					
84	83.5	12' 12' 12' 12' 12' 12' 8'					
86	85.7	12' 12' 12' 12' 12' 12' 8' 8' 6					
88	87.7	12' 12' 12' 12' 12' 12' 12'					
90	89.9	12' 12' 12' 12' 12' 12' 12' 8' 6					
92	91.9	12' 12' 12' 12' 12' 12' 12' 8' 8'					
94	94.1	12' 12' 12' 12' 12' 12' 12' 12' 6					
96	96.0	12' 12' 12' 12' 12' 12' 12' 12' 8' 8' 4'					
98	98.2	12' 12' 12' 12' 12' 12' 12' 12' 12' 6 4'					
100	100.2	12' 12' 12' 12' 12' 12' 12' 12' 12' 12'					

Continuous Configuration Notes

1. Consult factory for alternate row configurations.
2. Continuous runs are supplied as components which can be field configured to fit specific installation requirements.

See page 4 for additional Technical Notes.

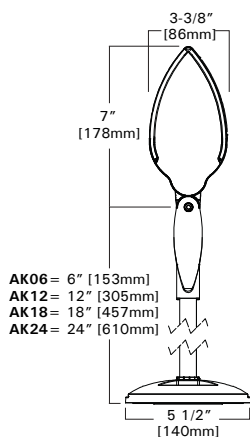


Eaton
18001 East Colfax Avenue
Aurora, CO 80011
P: 303-393-1522
www.eaton.com/iO

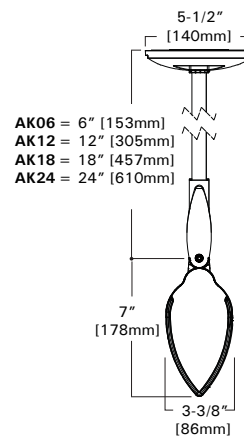
Specifications and dimensions subject to change without notice.
See additional information on the following pages.

MOUNTING OPTIONS

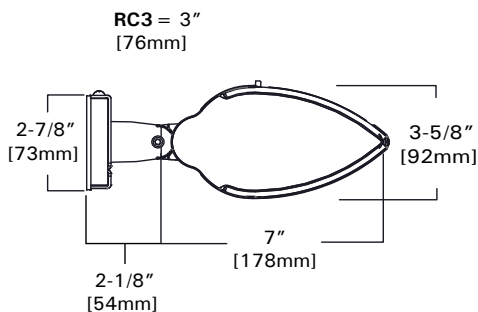
Base Mount



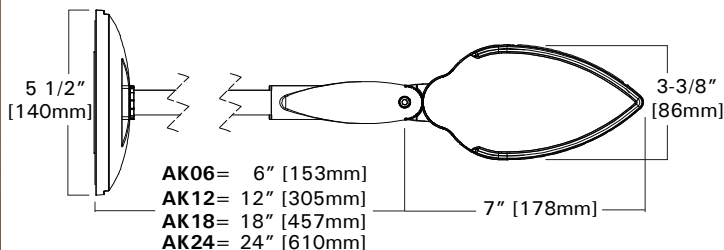
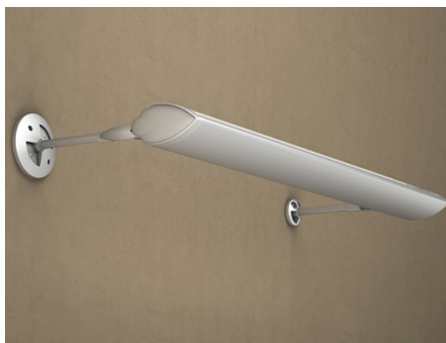
Ceiling Mount



Wall



Wall / Cantilever



TECHNICAL NOTES

- All options may not be available with all models.
- 12'-0" fixtures require three mounting points
- Slide 'N Mount adjustable lockable arms, are standard.
- For RC3 mount: Use 2"x 4" horizontal j-box (by others) required for mounting.
- Separate power feed required at maximum 80'-0" intervals (120V), or 100'-0" intervals (277V).
- For run lengths less than 16 feet, please order individual fixtures.
- Run lengths only available in even increments. Not all run lengths are available. See Run Length Configuration Chart on page 3 for details. Alternate configuration maybe available upon request.
- Dimming is standard on all Arrowlineair fixtures. Individual fixtures require 2 power feeds for standard dimming.
- For RC3 mount: Use 2"x 4" horizontal j-box (by others) required for mounting.
- LMC Canopy standard on both arms for individual fixtures so option not available.

GEOPAK Series 1

SIZE 1 - TRP1/QSP1/RDI1

proposed fixture.



FEATURES

- GeoPak Series consists of three compact Geometric wall-pack shapes in four popular finishes
- "Normally On" emergency luminaire for architectural applications
- 12 high-power LEDs create 3115 lumens in AC and 658 lumens in emergency mode
- Environmentally friendly, long-life Lithium Iron Phosphate battery
- Standard Temperature Range: 0°C to 40°C, Optional Heater: -30°C to 40°C
- Zero uplight distributions
- Wet Location Listed to UL924



*3000K and warmer CCTs only

RELATED PRODUCTS

- ⌘ [RDI2 GeoPak](#) ⌘ [TRP2 GeoPak](#) ⌘ [QSP2 GeoPak](#)

SPECIFICATIONS

CONSTRUCTION

- Housing is made from die-cast aluminum with a hinged back-plate for ease of installation and maintenance
- The LED bezel and trim-plate are made of stainless steel
- Five powder coat standard finishes, plus custom color options
- Wet Location Listed to UL924 and UL1598 Standard

OPTICS

- 12 high power LEDs delivering up to 3,000 lumens
- Up to 118 lumens per watt
- Type II, III and IV distributions for a wide variety of applications
- Zero uplight (UO), dark sky, neighbor friendly

INSTALLATION

- Universal plate for mounting to standard 3 1/2" and 4" square electrical boxes. All connections are made from connections at the rear of the unit
- Optional back-box accessory available for surface conduit application. See BB-Geo accessories

ELECTRICAL

- 120-277 operation, 50/60Hz
- 0-10V dimming driver standard
- 10kA surge protector
- Photocell and occupancy sensor options available for complete on/off and dimming control
- Integral Battery Backup provides emergency lighting for the required 90 minute path of egress
- Includes a long-life Lithium Iron Phosphate battery with optional battery heater for cold temperature application
- Utilizes 4 LEDs in emergency mode with 657 lumens. Each of the 4 LEDs in emergency are designed to function independently in the unlikely event of a single LED malfunction
- Spectron® self-testing/self-diagnostic electronics are included standard
- Independent dedicated driver and LED array for battery/emergency mode operation

CERTIFICATIONS

- DesignLights Consortium® (DLC) qualified. Please refer to the DLC website for specific product qualifications at www.designlights.org
- Drivers IP66 and RoHS compliant
- UL 1598 listed for use in wet locations

WARRANTY

- 5 year limited warranty
- See [HLI Standard Warranty](#) for additional information

KEY DATA	
Lumen Range	1471-2942
Wattage Range	13.9-28.2
Efficacy Range (LPW)	95-118
Fixture Projected Life (Hours)	L70>345K
Weights lbs. (kg)	10.5-11.5 (4.8-5.2)

GEOPAK SERIES 1

SIZE 1 - TRP1/QSP1/RD11

ORDERING GUIDE

Example: TRP2-24L30-3K7-2-UNV-DBT

CATALOG #

ORDERING INFORMATION

Series	# LEDs	Wattage	CCT/CRI	Distribution	Voltage
TRP1 Trapezoid	12L 12 LEDs	15 15 watts	3K7 3000K, 70 CRI	2 TYPE II	UNV 120-277V
RD11 Radius		20 20 watts	4K7 4000K, 70 CRI	3 TYPE III	1 120V
QSP1 Qtr-sphere		30 30 watts	5K7 5000K, 70 CRI	4 TYPE IV	2 208V
					3 240V
					4 277V

Color	
BLT	Black Matte Textured
BLS	Black Gloss Smooth
DBT	Dark Bronze Matte Textured
DBS	Dark Brone Gloss Smooth
GTT	Graphite Matte Textured
LGS	Light Grey Gloss Smooth
PSS	Platinum Silver Smooth
WHT	White Matte Textured
WHS	White Gloss Smooth
VGTT	Verde Green Textured
Color Option	
CC	Custom Color

Control Options Network	
PC	Button Photocontrol
SCP^{2,3}	Programmable occupancy sensor, factory default is 10% light output
Spec SCP/SCO & SWPM Mount Height	
-8F	Up to 8ft mount height
-20F	Up to 20ft mount height

Options	
F⁴	Fusing (only available with STD fixture configuration, 120-277V only)
E¹	Battery pack (0°C)
EH¹	Battery pack (-30°C) with heater

Notes:

- 1 Voltage specific (120 or 277V only)
- 2 Must order minimum of one remote control to program dimming settings, 0-10V fully adjustable dimming with automatic daylight calibration and different time delay settings, 120-277V only
- 3 PCU option not applicable, included in sensor
- 4 Must specify input voltage (120, 208, 240 or 277)

ACCESSORIES (ORDERED SEPARATELY)

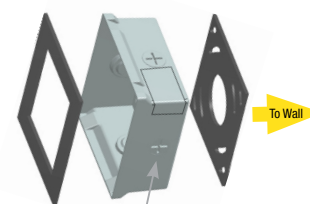
Catalog Number	Description
<input type="checkbox"/> SCP-REMOTE*	Remote control for SCP option. Order at least one per
<input type="checkbox"/> BB-GEO-XX	Black box with 4-1/2" threaded conduit holes, specify finish by replacing "XX" with finish selection, eg. Dark Bronze "DB"

Notes:

* Must order minimum of one remote control to program dimming settings, 0-10V fully adjustable dimming with automatic daylight calibration and different time delay settings.



BB-GEO-XX – Mounted to luminaire



BB-GEO-XX

GEOPAK SERIES 1

SIZE 1 - TRP1/QSP1/RD11

PERFORMANCE DATA

Description	Drive Current	System Watts	Dist. Type	5K (5000K NOMINAL 70 CRI)					4K (4000K NOMINAL 70 CRI)					3K (3000K NOMINAL 80 CRI)				
				Lumens	LPW	B	U	G	Lumens	LPW	B	U	G	Lumens	LPW	B	U	G
12	350mA	13.9	2	1635	118	1	1	1	1577	113	1	1	1	1497	108	1	1	1
			3	1613	116	1	0	1	1556	112	1	0	1	1477	106	1	0	1
			4	1607	116	0	0	1	1550	111	0	0	1	1471	106	0	0	1
	500mA	19.9	2	2268	114	1	1	1	2176	109	1	1	1	2077	104	1	1	1
			3	2245	113	1	0	1	2140	108	1	0	1	2049	103	1	0	1
			4	2229	112	0	0	1	2150	108	0	0	1	2041	103	0	0	1
	700mA	28.2	2	2942	104	1	1	1	2885	102	1	1	2	2721	96	1	1	1
			3	2912	103	1	0	1	2836	101	1	0	1	2685	95	1	0	1
			4	2892	103	1	0	1	2789	99	1	0	1	2674	95	1	0	1

ELECTRICAL DATA

INPUT POWER CONSUMPTION

Drive Current (mA)	Input Voltage (V)	System Power (W)	Current (Amps)
350mA	120	13.9	0.12
	277		0.05
500mA	120	19.9	0.17
	277		0.07
700mA	120	28.2	0.24
	277		0.10

Battery backup units consume additional power during charging (maximum 32.2 watts for E, 50.7 watts for EH)

INPUT POWER CONSUMPTION

Ambient Temperature	OPERATING HOURS					
	0	25,000	50,000	TM-21-11* L96 60,000	100,000	L70 (Hours)
25°C / 77°F	1.00	0.98	0.97	0.95	0.91	>345,000
40°C / 104°F	1.00	0.96	0.95	0.82	0.87	>268,000

LUMINAIRE AMBIENT TEMPERATURE FACTOR (LATF)

Ambient Temperature	Lumen Multiplier	
0° C	32° F	1.02
10° C	50° F	1.01
20° C	68° F	1.00
25° C	77° F	1.00
30° C	86° F	1.00
40° C	104° F	0.99
50° C	122° F	0.98

Use these factors to determine relative lumen output for average ambient temperatures from 0-40°C (32-104°F).

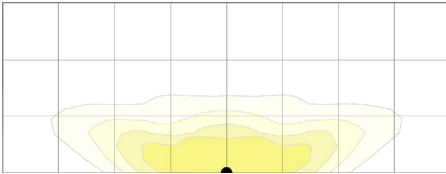
GEOPAK SERIES 1

SIZE 1 - TRP1/QSP1/RD1

PHOTOMETRY

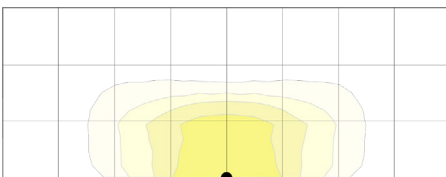
The following diagrams represent the general distribution options offered for this product. For detailed information on specific product configurations, see [website photometric test reports](#).

Type II



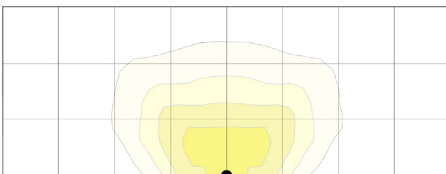
Mounting Height: 10'

Type III



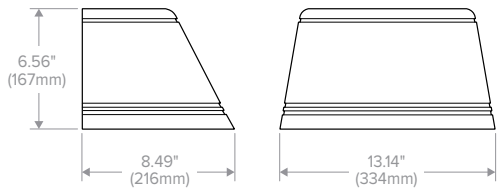
Mounting Height: 10'

Type IV (Forward throw)

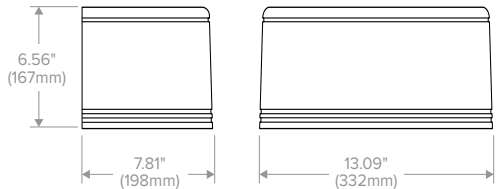


Mounting Height: 10'

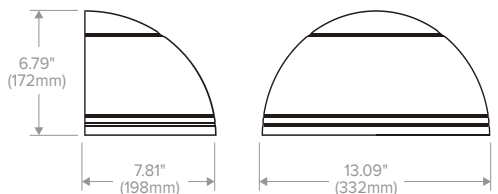
DIMENSIONS



Trapezoid (TRP1)



Round (RD1)



Quartersphere (QSP1)

GEOPAK SERIES 1

SIZE 1 - TRP1/QSP1/RD11

ADDITIONAL INFORMATION

GEOPAK - BATTERY BACK UP

Functional Circuitry: Transient surge protection device on AC input. Upon failure of the normal utility power, an LED driver is automatically activated to power the emergency LEDs. Upon resumption of normal utility power, the LED driver is turned off, and the battery is recharged through a micro-controller based 3-stage charger. The battery is a maintenance-free Lithium Iron Phosphate (LiFePo) type. A low voltage battery disconnect (LVD) feature protects the battery from severe damage during prolonged power failures. Manual testing is available at any time using the push-to-test button. The optional heater features a heating wrap and thermostat to maintain optimal battery temperature during charge or discharge. The GeoPak includes the following features:

- Battery re-charge within 24 hours
- AC Lock-out circuit
- Self-diagnostics monitors LED status, LED driver circuit, battery capacity and charger function and displays any fault detection by means of a flashing code.

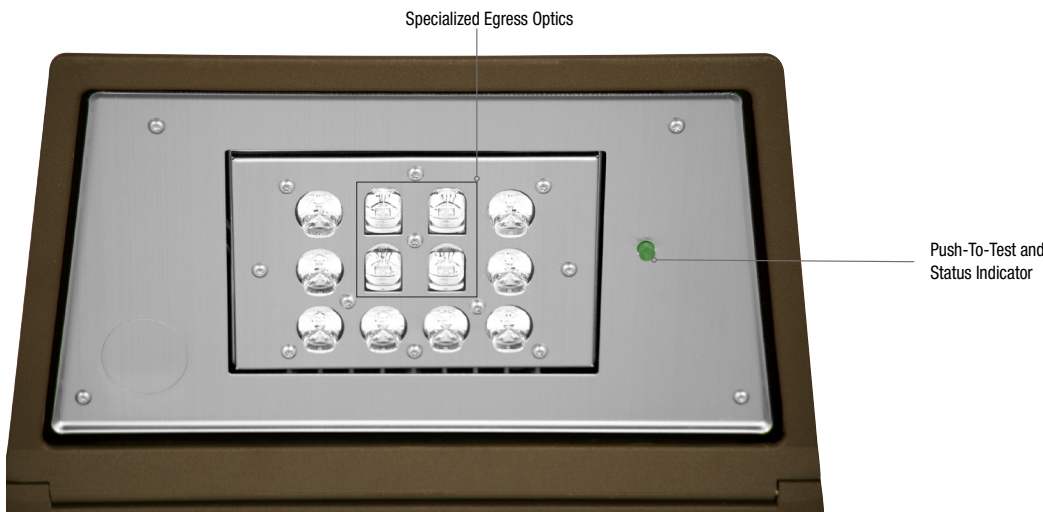
- Self-Test feature runs a 1 minute test once a month and an alternating 30 or 60 minute test once every 6 months. Multi-color LED indicator provides visible fault detection and charging status.
- User initiated 1, or 90-minute system test feature
- 15 minute re-transfer delay
- Automatic unit transfer in brown-out conditions (below 80% of nominal AC input voltage).
- Battery backup units consume 6 watts when charging a dead battery and 2 watts during maintenance charging. EH (units with a heater) consume up to an additional 8 watts when charging if the battery temp is lower than 10°C

EMERGENCY PHOTOMETRIC PERFORMANCE (1 FC AVERAGE .1 FC MINIMUM)

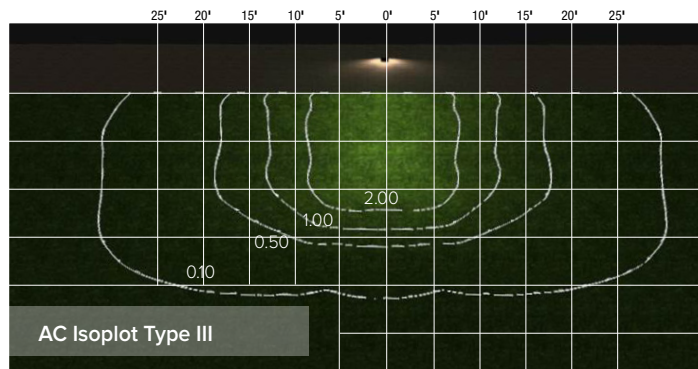
28' multi-unit spacing at 10' MH with 0/30/10 reflectances on a 6' path

26' x 10' single unit coverage at 10' MH with 0/30/10 reflectances

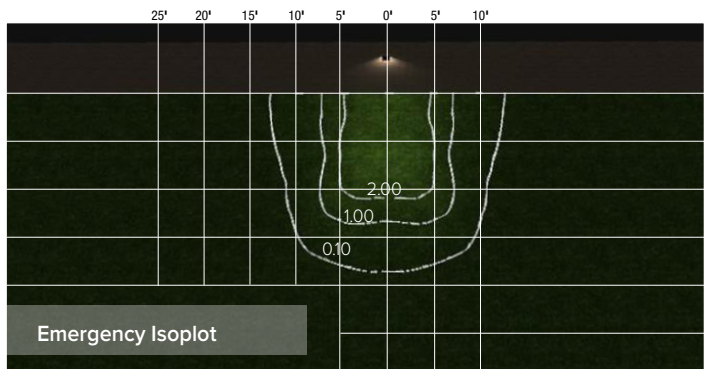
6' x 19' forward throw coverage at 10' MH with 0/30/10 reflectances



Normal Mode



Emergency Mode



Provides Life Safety Code average illuminance of 1.0 fc. Assumes open space with no obstructions. Diagrams for illustration purposes only, please consult factory for application layout.

USE OF TRADEMARKS AND TRADE NAMES

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DESCRIPTION

The UX series Exit is a UL 924 code compliant solution for harsh industrial and outdoor environments. It has both a NEMA4X and an IP66 rating, is approved for temperatures from -30 C to 50 C as well as a class 1, division 2 hazardous location option. The housing is die cast aluminum with a vandal proof shield. The LED source is field configurable for red or green output. The self powered version comes standard with a nickel cadmium battery and self-diagnostics.

Catalog #		Type	
Project			
Comments		Date	
Prepared by			

SPECIFICATION FEATURES

Electrical

- Voltage Input 120/240/277 VAC
- Low-Voltage Disconnect
- Brownout Circuit
- Overload/Short Circuit Protection
- Test Switch/Power Indicator Light
- Photocell Test Switch (requires accessory laser for activation)
- Fully Recharged in 24 Hours
- Self-diagnostics standard on self-powered versions

Housing Construction

- Die cast aluminum housing
- Die cast canopy included (for mounting convenience only - no electrical components in canopy)
- Universal pattern knockouts on rear of single face housing for direct mounting to junction box
- Exit can be universally mounted ceiling, wall or end
- Painted finish
- NFPA 101 compliant knockout chevrons allow quick conversion to directional signs

- UV stable clear, polycarbonate, vandal resistant shield with Torx® head tamperproof screws, stainless steel
- Knockouts provided for 1/2" conduit entry

Lamp Data

- LED lamp provides uniform light output
- Red and green lettering
- Field Configurable

Code Compliance

- UL 924, Outdoor Wet Location Listed (suitable for wet and damp locations)
- UL50, NEMA 4X
- UL844, Hazardous Locations (Class I, Division 2, Groups A, B, C, D)
- HAZ LOCATION CODE T6 with HAZ Connection
- Life Safety NFPA 101
- NEC/OSHA
- Most State and Local Codes

- Suitable for Floor Proximity Installation, UL Listed, ADA (American Disabilities Act)
- NSF, National Sanitation Foundation/Splash Zone (for Food Processing)
- IP66, Ingress Protection from IEC (International Electrical Commission)
- Cleanrooms Class 10,000
- Meets New York City Exit construction code

Warranty

- Exit: 5-year
- Battery: 7-Year Pro-rata

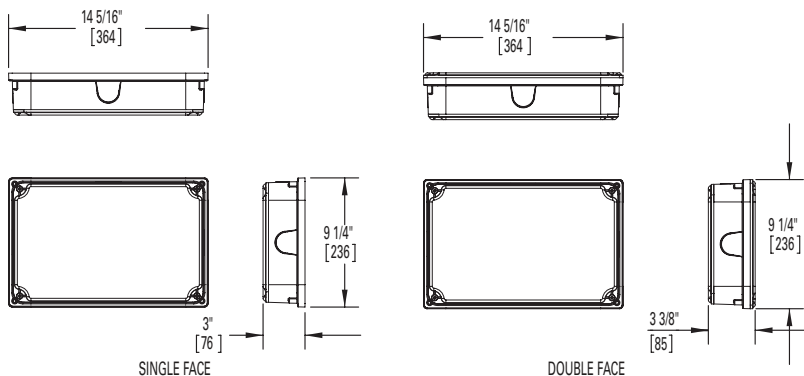
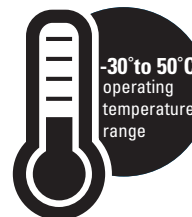
Temperature Performance Data

- UX7: -30°C to 50°C
- UX6: -40°C to 50°C



UX SERIES

- UL924 WET LOCATION
- ULTIMATE EXIT
- NEMA 4X
- CLASS 1, DIV 2
- HAZARDOUS LOCATION
- PENDANT AND UNIVERSAL
- SURFACE MOUNT
- SELF POWERED
- LED LAMPS
- VANDAL PROOF
- SELF-DIAGNOSTIC
- NYC APPROVED
- EXIT LIGHTING



CATALOG LOGIC

Series	Faces	Housing Color	Hazardous Location	Accessory
UX6 = AC only	1 = single	_ = Silver	_ = not Hazardous location	2C capability, UX2C-KIT can be purchased as a separate accessory
	2 = double	WH = White BK = Black	HAZ = Hazardous Location	
Series	Faces	Housing Color	SD	Hazardous Location
UX7 = battery	1 = single	_ = Silver	SD = standard	_ = not Hazardous location
	2 = double	WH = White BK = Black		HAZ = Hazardous Location

ENERGY DATA

Fixture	Input Voltage	Input Current	Input Power	Power Factor
UX6	120 V / 60 Hz	0.09 Amps	1.1 watts	0.11
	277 V / 60 Hz	0.09 Amps	1.3 watts	0.06
UX7	120 V / 60 Hz	0.1 Amps	1.4 watts	0.12
	277 V / 60 Hz	0.1 Amps	1.6 watts	0.06

TECHNICAL DATA

Lamps

The UX Family with energy saving LED lamps offers extremely long life with very low input wattage. LED lamps are available in either red or green. LED lamps have a long life, eliminating the need for any lamp maintenance under normal conditions.

Housing

Die cast aluminum with painted finish. NFPA 101 compliant knockout chevrons for easy conversion to directional sign. Universal pattern knockouts are in the back of the single face housing for direct mounting to junction box. Conduit entry knockouts provided. UV stable, polycarbonate shield for protection. Gasketing provides water-tight, dust-tight housing is UL Wet Locations, NEMA4X, IP66, and Class 1, DIV 2 enclosure.

Electronics

Dual voltage input 120/277 VAC is standard. Nickel Cadmium battery is standard on self-powered exits. All battery and electrical components are enclosed within the exit housing, preserving the low profile appearance even on self-powered exits.

Photocell Test Switch

Allows verification of proper operation of the transfer circuit and emergency lamps with a laser pointer (laser is sold as an accessory). The emergency lamps will test for 30 seconds when activated.

Self-Diagnostics

The Eagle Eye self-diagnostic software will automatically perform all tests required by UL924, and NFPA 101 and will systematically calibrate itself in the field; thus reducing installation labor and eliminating manual calibration errors. The system indicates the status of the emergency light at all times using the LED indicator. A 90 minute battery test will occur once every twelve months. A 30 second battery power simulation test will occur every 30 days. The solid state microprocessor based system has the ability to accurately detect and warn of system failures, plus it incorporates all of the standard electronic features that sets Sure-Lites apart from its competition.

Solid-State Charger

Supplied with a 120/277 VAC, voltage regulated solid-state charger, the battery is recharged immediately upon restoration of AC current after a power failure. The charge circuit reacts to the condition of the battery in order to maintain peak battery capacity and maximize battery life. Solidstate construction recharges the battery following a power failure in accordance with UL 924.

Solid-State Transfer

The UX Series Exit incorporates solid-state switching which eliminates corroded and pitted contacts or mechanical failures associated with relays. The switching circuit is designed to detect a loss of AC voltage and automatically energizes the lamps using DC power. Upon restoration of AC power, the DC power will be disconnected and the charger will automatically recharge the battery.

Low-Voltage Disconnect

When the battery's terminal voltage falls, the low-voltage circuitry disconnects the lighting load. The disconnect remains in effect until normal utility power is restored, preventing deep battery discharge.

2C Capability (UX6 versions only)

The AC only versions of the UX series can be function in 2C mode with the addition of the UX2C-KIT which is purchased separately.

Overload and Short Circuit Protection

The solid-state overload monitoring device in the DC circuit disconnects the lamp load from the battery should excessive wattage demands be made and automatically resets when the overload or short circuit is removed. This overload current protective feature eliminates the need for fuses or circuit breakers for the DC load.

Brownout Circuit

The brownout circuit on Sure-Lites exits monitors the flow of AC current to the exit and activates the emergency lighting system when a predetermined reduction of AC power occurs. This dip in voltage will cause most ballasted fixtures to extinguish causing loss of normal lighting even though a total power failure has not occurred.

Test Switch/Power Indicator Light

A test switch permits the activation of the emergency circuit for a complete operational systems check. The Power Indicator Light provides visual assurance that the AC power is on.

Sealed Nickel Cadmium Battery

Sure-Lites sealed nickel cadmium batteries are maintenance-free and offer high discharge rates and stable performance over a wide range of temperatures.

Warranty

This Sure-Lites UX Exit is backed by a firm five (5) year warranty against defects in material and workmanship. Maintenance-free, long-life, sealed nickel cadmium batteries carry a seven year pro-rata warranty.

SELF DIAGNOSTIC TESTING OPERATIONS

The Sure-Lites Self Diagnostics is continuously monitoring your emergency fixture, and will signal any failure through the 3 color indicator LED.

Initial Operation:

When the unit is first powered up, it will go into a 24 hour fast charge, indicated by the indicator LED pulsing green. Once the unit has fully charged, it will perform a self calibration, after which the LED will change to steady green, indicating the unit is fully charged and float charging the battery to maintain readiness.

Automatic Testing:

The unit will perform a battery capacity, lamp/LED, and charge circuit test every 30 days for 30 seconds. During this time, the indicator LED will change to a steady yellow. It will perform a full battery capacity (90 minute) test once per year. During this time, the indicator LED will change to a blinking yellow.

Manual Testing:

- 10 Second "Installation" test – Press and release the test button once during fast charge (blinking green) to initiate a 10 second quick test. The sign will switch to emergency mode for 10 seconds allowing the installer to verify proper installation of the unit, and the LED indicator will turn solid yellow.
- 30 Second Test - Press and release the test button once during float charge (steady green). The indicator LED will turn steady yellow to indicate the unit is performing a 30 second test of the batteries and lamps/LEDs.
- 90 Minute Test - Press and release the test button a second time during a 30 second test (steady yellow) to change to a 90 minute test. During this test, the LED indicator will change to blinking yellow, and the circuit will perform a full battery capacity, charge circuit, and LED test.
- Canceling Test – Press and release the test button during the 90 minute test (flashing yellow) to return the fixture to its original state (fast charge or float charge)

Laser Test:

The SEL SD products are equipped with a Laser Test function, that allows the unit to be manually tested without the need to physically press the test button. Shining a laser pointer in the hole marked "LASER TEST" on the bottom of the unit has the same effect as a press and release of the test button.

Clearing Failure Codes:

- A battery failure (LED two blink red) can be cleared by replacing the battery. Disconnecting the battery and AC power, or performing a full 90 minute discharge, will reset the error code, however, it will return if the battery is faulty
- Charge Circuit (LED three blink red) and lamp/LED failure (LED four blink red) will clear when the unit successfully passes a manual or automatic 30 second test.

NATIONAL ELECTRICAL CODE (NEC)

The National Electrical Code (NEC) defines a hazardous location as "a location where fire hazards or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust or ignitable fibers or filings.

The Code further separates these hazardous locations into three classes:

- Class I – locations containing gases and vapors
- Class II – locations containing dust
- Class III – locations containing fibers and filings.

Each of these classes is broken into divisions. These divisions are separated into groups according to characteristics. The UX-HAZ Exit Sign Series is rated for Class 1, Division 2, Groups A, B, C, D only.

The following chart summarizes these classifications:

Class	Division	Group
I Gas	2 Potential Exists – May be present in atmosphere	A Acetylene B Flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.45 mm or a minimum igniting current ratio (MIC ratio) less than or equal to 0.40. (Example material is hydrogen) C Flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.45 mm and less than or equal to 0.75 mm, or a minimum igniting current ratio (MIC ratio) greater than 0.40 and less than or equal to 0.80. (Example material is ethylene) D Flammable gas, flammable liquid-produced vapor, or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than 0.75 mm or a minimum igniting current ratio (MIC ratio) greater than 0.80. (Example material is propane)


SELF DIAGNOSTIC TESTING OPERATIONS

Indicators:

- LED Off - No power to unit, emergency mode.
- LED Steady Green - Unit is fully charged and is float charging the battery to maintain readiness.
- LED Green Pulse - Unit is in a 24 hour fast charge of the battery.
- LED Two Blink Red - Battery has failed a capacity test, or the battery is disconnected. See "Clearing Failure Codes" above.
- LED Three Blink Red - Battery charge circuit has failed. See "Clearing Failure Codes" above.
- LED Four Blink Red - Lamps have burned out, or on an EXIT/Combo, 50% or more of the LEDs have failed. See "Clearing Failure Codes" above.
- LED Steady Yellow - 30 second test or 10 second quick test (Fast Charge only).
- LED Blinking Yellow - 90 minute test.

Maintenance:

None required. Replace the batteries as needed according to ambient conditions. However, we recommend that the equipment be tested regularly in accordance with local codes.



<ul style="list-style-type: none"> ○ OFF - EMERGENCY MODE / POWER OFF ● STEADY BLINK GREEN - FAST CHARGE ● STEADY GREEN - FULL / FLOAT CHARGE ● STEADY YELLOW - QUICK TEST 	<ul style="list-style-type: none"> ● STEADY BLINK YELLOW - 90 MINUTE TEST ● 2 BLINK RED - BATTERY FAILURE ● 3 BLINK RED - CHARGE CIRCUIT FAILURE ● 4 BLINK RED - LAMP/ LED FAILURE
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SECTION 28 31 00

FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire alarm system shall consist of fire alarm control panel or networked nodes, of the same make and CSFM (California State Fire Marshall) listed for the application.
2. Labor, equipment, materials, connections, testing, and performance of operations in the installation of fire alarm system.

B. Related Requirements:

1. Division 01 General Requirements.
2. Section 23 09 00: HVAC Instrumentation and Controls.
3. Section 23 80 00: Heating, Ventilating, and Air Conditioning Equipment.
4. Section 26 05 00: Common Work Results for Electrical.
5. Section 26 05 13: Basic Electrical Materials and Methods.
6. Section 26 05 19: Low-Voltage Wire (600 Volt AC).
7. Section 26 05 26: Grounding and Bonding.
8. Section 26 05 33: Raceways, Boxes, Fittings, and Supports.

1.2 SYSTEM REQUIREMENTS

A. Fire detection system shall continually supervise and monitor the following initiating, signaling, and monitoring circuits:

1. Manual fire-pull stations.
2. Smoke and heat detectors, duct detectors, including those installed under other sections.
3. Fire sprinkler flow and tamper switches. In existing installations also include PIV tamper switches.
4. Alarm signaling circuits including alarm bells, horns and visual alarm units.
5. Annunciators.
6. Power supplies and batteries.
7. Interconnection with Central and Autonomous Public Address systems, telephone network system, Clock System-Classroom or Program schedule change, HVAC system where applicable.

- B. System controls shall be UL listed for power limited applications in accordance with California Electrical Code.
- C. The fire alarm devices and equipment shall be listed for installation for the fire alarm control panel to which they are being connected.
- D. Complete installation shall conform to the version of NFPA 72, California Fire Code, California Building Code (CBC), and California Electrical Code (CEC) as approved by DSA on stamped drawings.
- E. System labels and devices programming addresses shall be based on final signage and building labeling submittals. For existing facilities contractor shall obtain from Owner Authorized Representative a copy of the current site layout and building labeling designations.

1.3 CERTIFICATION

- A. Certification: Installation of fire alarm system shall not begin until Shop Drawings, including State Fire Marshal listing numbers of fire alarm components, are submitted and reviewed by the Architect. Written certification by fire alarm equipment distributor or manufacturer shall be submitted to the Architect stating that system and its component parts are as approved and listed by the State Fire Marshal, and that the design conforms to requirements set forth in CBC.

1.4 PERFORMANCE

- A. System shall be fully programmable, configurable, and expandable in the field without special tools or PROM programmers and shall not require replacement of memory ICs. Installer shall provide a CD of system installed software, site specific system programming and information and tools required to re-program or modify the system.

1.5 SYSTEM FUNCTIONAL OPERATION

- A. When a fire alarm condition is detected by one of the system alarm initiating devices, the following functions shall occur:
 1. System alarm LED shall flash.
 2. Local sounding device in panel shall be activated.
 3. The LCD display shall indicate type of device, custom label location label and point status alarm condition.
 4. Appropriate change of status message shall be transmitted to remote annunciator(s).
 5. Automatic programs assigned to alarm point shall be executed and associated indicating devices and relays activated.
 6. In the event of a fire alarm control panel activation, manual and automatic electronic tone or electromechanical bell class passing signals shall be disabled.
 7. In the event of a fire alarm condition the Central and Autonomous Public Address System shall be overridden.
 8. UDACT (Universal Digital Alarm Communicator Transmitter) shall activate.
 9. Provide necessary hardware and labor for a complete and tested interfacing of the fire alarm system with the lighting controls systems in Auditoriums, Multi-

Purpose rooms, and Gymnasiums; lighting in these areas shall be brought to full brightness in the event of a fire alarm.

- B. Trouble and Supervisory Conditions.
 - 1. When any trouble condition is detected the following functions shall occur:
 - a. System trouble LED shall flash.
 - b. Local sounding device in panel shall be activated.
 - c. The LCD display shall indicate the type of trouble and custom label location associated with the trouble condition and its location. Unacknowledged alarm messages shall have priority over trouble messages. If such an alarm is displayed, then trouble messages shall not be displayed.
 - d. Appropriate message shall be transmitted to remote annunciators.
 - e. UDACT shall activate.
- C. When any supervisory condition occurs such as a sprinkler valve tamper, the following function shall occur:
 - 1. System supervisory LED shall flash.
 - 2. Local sounding device in panel shall be activated.
 - 3. Appropriate message shall be transmitted to remote annunciators.
 - 4. UDACT shall activate.
- D. Activation of control panel ACKNOWLEDGE switch in response to a single new alarm, trouble or supervisory condition shall silence panel sounding device and change system alarm, trouble, or supervisory LED from flashing to steady-ON. If additional new alarm, trouble, or supervisory conditions exist in the system; activation of this switch shall advance display to next alarm, trouble, or supervisory condition that exists, and shall not silence local audible device or change LED to steady until new conditions have been so acknowledged. New alarm conditions shall always be displayed before new trouble conditions. Occurrence of a new alarm, trouble, or supervisory condition shall cause panel to resound, and sequences as described above, shall repeat.
- E. Activation of the signal silence switch shall cause appropriate notification (indicating appliances and relays to return to normal condition. Selection of notification appliance circuits and relays silenced by this switch shall be fully programmable.
- F. Activation of system reset switch shall cause electronically latched initiating devices or zones, as well as associated output devices and circuits, to return to normal condition after sixty seconds of alarm. If alarm conditions exist in system after system reset switch activation, system shall then re-sound alarm conditions as indicated hereafter.
- G. Activation of lamp test switch shall turn on LED indicators, LCD display, and local sounding device in panel, and then return to previous condition.
- H. Fire alarm indicating appliances may be silenced or extinguished, after one minute, by operating signal silence switch at the FACP or by use of key supervised alarm silence switch at remote annunciators. A subsequent zone alarm shall reactivate signals. Audible indicating appliances shall be automatically silenced after no less than five nor more than ten minutes of operation. Visual indicating appliances shall be extinguished at system

reset, or automatically after no less than five nor more than ten minutes of operation. Fire sprinkler flow alarm bells shall not silence until the contacts in the fire sprinkler flow switch return to the normal non-alarm state. Appropriate signage must be installed on or next to the sprinkler alarm bell.

- I. System's circuits including but not limited to initiation, indicating, and equipment interfacing shall be monitored for open or short circuit and ground fault conditions, these conditions shall be indicated on the Fire Alarm Control Panel and Annunciator displays while remaining circuits continue to operate normally.
- J. Notification appliance circuits shall be silenceable for testing purposes by authorized persons. Protected pass-codes, keys, or another secure method that does not require entering into the system programming shall be used.

1.6 POWER REQUIREMENTS

- A. The fire alarm control panel and remote power supply shall receive 120 VAC power, 60 Hz, through a dedicated 20 amps circuit. Circuit breaker protection for the dedicated fire alarm power circuits shall be equipped with a handle lock-on device; the breaker handle shall be colored red and labeled "FIRE ALARM". Clearly label the Electrical panel name, location and circuit number on the inside of the fire alarm control panel and remote power supplies using a p-touch style labeling system. Transient voltage surge suppression shall be provided at the 120VAC input terminal.
- B. System shall be provided with sufficient battery capacity to operate entire system upon loss of normal 120 VAC power, in a normal quiescent mode, for a period of 24 hours with five minutes of alarm indication at end of this period. System shall automatically transfer to standby batteries upon power failure. Battery charging and recharging operations shall be automatic. Batteries, once discharged, shall recharge at a rate to provide a minimum of 70 percent capacity in 12 hours.
- C. Circuits requiring system operating power shall be 24 VDC and shall be individually protected at control panel.

1.7 SUBMITTALS

- A. Provide in accordance with Division 01.
- B. Component Plan Submittal: Availability and listing for its application shall be verified for system components before presentation of the submittal. Include the following information and details as applicable:
 - 1. Installer name, address, telephone number.
 - 2. List of system components, equipment and devices, including manufacturer model numbers, quantity and California State Fire Marshal listing numbers, mounting heights, and symbols per OUHSD symbol list.
 - 3. Copies of manufacturer specification sheets for equipment and devices indicated. Highlight or identify the specific components on Catalog cut sheets.
 - 4. Voltage Drop Calculations: Include the following information for the worst case:
 - a. Point-to-point or Ohms law calculations.
 - b. Zone used in calculations.

- c. Voltage drop percent. Voltage drop shall not exceed manufacturer's requirements. If voltage drop exceeds ten percent, indicate manufacturer listed operating voltage ranges for equipment and devices.
 - 5. Battery types, amp hours, and load calculations including the following:
 - a. Normal operation: 100 percent of applicable devices for 24 hours to equal control panel amps plus list of amps per device that draw power from the panel during standby power condition including, but not limited to, zone modules, detectors and devices as identified.
 - b. Alarm condition: 100 percent of applicable devices for five minutes to equal control panel amps plus list of amps per device that draw power from panel during alarm condition including, but not limited to, the following:
 - 1) Zone modules.
 - 2) Signal modules.
 - 3) Detectors.
 - 4) Signal devises.
 - 5) Annunciator.
 - 6) Other devices as identified.
 - c. Normal operation plus alarm operation load calculation shall include total amp hours required and total amp hours provided.
 - 6. Provide one copy of testing procedures.
- C. Shop Drawings: Provide Shop Drawings, in the same size as the design Drawings, include the following:
- 1. Provide drawing scale, elevations of system enclosures, and actual layout of the Fire Alarm Control Panel, power supply, annunciator, and main system components.
 - 2. Site Plan indicating PIV and related fire sprinkler system devices and equipment to be monitored or supervised; such as water flow valves, and main equipment such as control panels, power supplies, annunciators, and components such as outdoor wall-mounted horns, sprinkler bells, pull boxes, underground pull boxes , wiring routes on buildings exterior and underground locations. In each conduit or raceway run indicate conduit sizes, and quantities and type of wires.
 - a. In existing facilities make a distinction between existing and new installation.
 - 3. Complete battery calculations, and voltage drop calculation shall be included; these calculations shall be based on the devices maximum UL current rating.
 - 4. One line drawing for the entire system network indicating system components and wiring. The one line diagram shall show but not be limited to panel to panel interconnections, conductors gage and quantity, conduit size and type (designation) and specific function.

5. System panel one-line drawings indicating the quantity and type (designation) of conductors entering and exiting the fire alarm terminal cabinet in each building (enclosure) for initiating, notification, or other command control functions required for complete system operation:
 - a. Individual floor or building plan view drawings indicating device locations including end of line resistors "EOLR" in accordance with the legend provided.
 - b. Individual point addresses for initiation and notification devices.
 - c. Device "typical" wiring diagrams. These drawings shall indicate specific termination details for peripheral equipment and interface devices.
 6. Provide interfacing with equipment furnished by others including voltages, and other required coordination items. Refer to 3.01-B.
 7. Each of the pictorial diagrams included shall appear identical to the products they are intended to depict, in order to speed installation of the system, and to enhance the accuracy of the installation Work. Typical wiring diagrams or catalog sheets are not permitted.
 8. Background Drawings with device locations of DSA approved drawings are available in electronic format and may be obtained from the Owner Authorized Representative (OAR). Contractor is solely responsible for the accuracy and completeness of shop drawings. Buildings that are not part of the contract shall be clearly identified "NOT IN CONTRACT". Shop Drawings shall be prepared in the latest version of AutoCAD with three – CD ROM electronic copies submitted along with full sized Shop Drawings.
 9. Other installation and coordination drawings specifically related to this section shall be included as follows:
 - a. Size A (8 ½ by 11) and size B (11 by 17) shall be bound into the manual.
 - b. Larger drawings shall be folded and inserted into transparent envelopes and bound into the manual.
 10. Installation and coordination drawings for items in other sections shall be included with submittal of Shop Drawings. Submit blue line copies and one reproducible copy of installation and coordination drawings.
 11. Samples: Provide Samples of material and equipment as required by the Architect. If Samples are requested, they shall be submitted within ten days from date of request.
- D. In addition to the above requirements, provide submittals to meet any additional requirements of DSA.
- E. Submittal of Equivalent Systems:
1. In addition to the submittal requirements of this section, if an equivalent system listed in Section 2.01A is submitted in lieu of the designed system shown on DSA approved drawings, the Contractor shall also submit a letter stating that the system is equivalent, and that device locations and quantities of devices are unchanged. Attached to this letter shall be a copy of the revised equipment schedule with corresponding CSFM numbers and a cut sheet for each item.

- F. Modifications or additions to existing fire alarm systems shall be compatible and of the same manufacturer as the existing system. Contractor shall be solely responsible for engineering, plan check and any fees resulting from an installation that deviates from this requirement.
- G. Prior to Substantial Completion submit to the Architect or Engineer of Record and to Owner Authorized Representative a complete updated set of the Shop Drawings showing changes made to the Fire Alarm System during construction. These drawings will become the System As-Built Drawing set for the Fire Alarm System Owner's Manual.

1.8 QUALITY ASSURANCE

- A. Installer shall have successfully completed at least five projects of equal scope in the past five years, and have been in business of furnishing and installing fire alarm systems of this type for at least five years.
- B. Installer shall be a factory authorized distributor and service provider for the brand of equipment offered and shall provide documentation to the Architect upon request.
- C. Installer shall maintain a fully equipped service organization capable of furnishing repair service to the equipment and shall maintain a spare set of major parts for the system at all times.
- D. Installer shall furnish a letter from manufacturer of equipment certifying equipment has been installed according to factory standards and that system is operating properly.
- E. Certifications: Installer shall submit certification from the equipment manufacturer indicating that installer is an authorized representative of the equipment manufacturer and is trained on network applications.
- F. Materials and equipment installed shall be new.
- G. Equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment. Furnish a letter from the manufacturer of major equipment, which certifies that the installer is an authorized distributor and that the equipment has been installed according to factory intended practices. Furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.
- H. Installer shall be Underwriters Laboratory (UL) listed company under the UUJS classification, and shall certify that the installation has been made in accordance with UL requirements.
- I. The fire alarm contractor shall have a NICET II Certified Technician on staff in their facility directly involved with this project to ensure technical expertise to this project and adherence with these specifications.
- J. Contractor or Installer's Electricians and fire and life safety technicians shall be certified in accordance with Labor Code sections 3099, and 3099.2, and section 209.0 of the California Code of Regulations.
- K. System startup and testing shall be performed under the direct observation of the Project Inspector and OAR. Provide a legible half size reproduction of the original completed fire alarm red-line drawings (this copy will be retained by the Owner), an accurate copy of the fire alarm system points list, and a copy of the construction drawings on CD in AutoCad format.
- L. At the time of installation the most current software package available shall be provided.

- M. Provide at the time of Owner Acceptance of the installation, equipment, and updated software which is to include the appropriate operating system, pass-codes, electronic keys and program disks, manuals and cables employed in the installation of the system. These components shall be delivered to the OAR.
- N. Provide a backup copy of the most current software revision, in disk format. This copy shall be delivered to the OAR
- O. A software license agreement shall be made available for the responsible Owner representative to sign at the time of training.

1.9 WARRANTY

- A. The Fire Alarm Equipment Manufacturer shall provide a three year material warranty. Installer shall provide a three year labor warranty. Products shown defective in workmanship or material during the warranty period shall be repaired, replaced or adjusted at no cost to Owner.
- B. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer for a period of five years after expiration of the warranty.
- C. Owner personnel will conduct annual local Fire Department Regulation 4 Tests. Defects noted during these tests shall be corrected by the Contractor during the warranty period specified.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Fire alarm equipment shall be standard products of Silent Knight, to match existing system.
- B. Catalog and model numbers listed are intended to establish type and quality of equipment and system design as well as operating features required. Deviations from intended functions of specified system are not permitted. Equipment shall not be ordered or installed until such equipment has been reviewed and approved by the Architect.
- C. Products specified below are based on Silent Knight system components.

2.2 FIRE ALARM CONTROL PANEL (FACP) OR NETWORK NODES (EXISTING)

- A. Existing panel is Silent Knight Model No. IFP-1000 (CSFM 7165-0059:0135) Fire Alarm Control Panel as indicated on drawings.

2.3 POWER SUPPLIES (EXISTING)

- A. Remote Notification Appliance Circuit (NAC) extender power supplies is Silent Knight No. 5495 (CSFM 7300-0559:0123).

2.4 PERIPHERAL DEVICES AND EQUIPMENT

- A. (EXISTING) Manual Stations: Interior Use: Station is Silent Knight, Model No. SK-PULL (CSFM 7150-0059:0161).
- B. Smoke Detectors: Smoke Detectors shall be Silent Knight Model No. SK-PHOTO (CSFM 7272-0059:0149).

- C. Heat Detectors: Heat Detectors shall be Silent Knight Model No. SK-HEAT-HT (CSFM 7270-0059:0147)
- D. Monitor Modules:
1. Monitor module shall be Silent Knight Model No. SK-MONITOR (CSFM 7300-0059:0155), or equal. Module shall connect a supervised zone of conventional initiating devices, N.O. dry contact devices, including four-wire smoke detectors, to one of SLC loops. Monitor module shall install in a four-inch square by 2 1/8-inch deep electrical box. The module shall have its loop number, electronic address, and function label on the front cover using a P-Touch type or equal labeling system.
 2. Monitor module shall provide address-setting means using rotary decimal switches and shall store an internal type of device. An LED shall be provided which shall flash under normal conditions indicating that monitor module is operational and in regular communication with control panel.
- E. Control Modules:
1. Provide Air Products MR-101 Relay Model (CSFM 7300-1004:0101) or equal power supervision relay to monitor 24 volt DC power.
 2. Control module shall provide address-setting means using rotary decimal switches and shall store an internal identifying code which control panel shall use to identify type of device. An LED shall be provided which shall flash under normal conditions, indicating that control module is operational and in regular communication with control panel.
- F. Relay Modules:
1. Relay Module shall be Silent Knight Model No. SK-RELAY (CSFM 7300-0559:0155) the module shall provide as a minimum one set of form "C" dry contacts and have its loop number, electronic address, and function labeled on the front cover using a P-Touch type labeling system.
 2. Provide a buffer relay that is part of the control system if controlled circuit(s) exceeds the voltage or current rating of the relay module.
 3. Relays used to interface control of other systems shall be electrically supervised and shall only be wired in a fail-safe mode of function during a power failure.
- G. Horns and Strobes: Horns and strobes shall be products of the same manufacturer. In order to establish a standard of quality, items are specified from the products manufactured by System Sensor. Addressable or multifunction two wire indicating (Audible or Visual) appliances shall not be acceptable.
1. Strobe indicating appliances are System Sensor Model No. SR (CSFM 7125-1653:0186), to match existing.
 2. Horn/Strobe indicating appliances are System Sensor Model No. P4R (CSFM 7125-1653:0188), to match existing.
 3. Exterior Horn indicating appliances are System Sensor Model No. HRK (CSFM 7135-1653:0189), to match existing.
- H. Network Cables or SLC or Annunciator Data or Audio Output Cables: The construction and physical characteristics such as aqua-seal water block, wire gage, insulation and jacket types, etc. shall not be altered. Equivalent cables must be specifically approved

and recommended by the manufacturer of the fire alarm system equipment. Substitutions will require review from the Architect or Engineer of Record.

- I. The cable types listed below are based and specified on the recommendations of Gamewell-FCI. If the submitted fire alarm system requires a different cable configuration with additional conductors, multi-conductor versus twisted pairs, etcetera than is specified above, request a substitution to supply and install the configuration of cables by the make and model of the fire alarm system that is to be installed.
 1. Indoor Network and EVAC System Audio Output Circuit(s) applications shall be in conduit or in surface mounted raceway as indicated on drawings: West Penn No. D980, one pair 18 gage solid copper, unshielded, Copolene II insulated and PVC jacketed, or equal.
 2. Indoor SLC applications in conduit or in surface mounted raceway where it is indicated on drawings: West Penn No. D990, one pair 16 gage solid copper, unshielded, Copolene II insulated and PVC jacketed, or equal.
 3. Indoor Annunciator applications in conduit or in surface mounted raceway where it is indicated on drawings: West Penn No. D975, one pair 18 gage solid copper, shielded, Copolene II insulated and PVC jacketed, or equal.
 4. Outdoor or Underground Network Applications: West Penn AQ224, two-conductor 18 gage stranded copper, unshielded, water-blocked construction and PVC insulated, or equal.
 5. Outdoor or Underground SLC applications: West Penn AQ225, 2-conductor 16 gage, AQ226, 2 conductor 14 gage, or AQ227, 2 conductor 12 gage stranded copper, unshielded water-blocked construction and PVC insulated, or equal.
 6. Outdoor or Underground Annunciator applications: West Penn AQ293, 2 conductors, 18 gage stranded copper, shielded water-blocked construction and PVC insulated, or equal.
- J. Protective Covers
 1. Provide protective covers for pull stations, smoke and heat detectors, and audible and visual devices located in areas occupied by students that can be subjected to vandalism such as gyms, restrooms, locker and shower rooms, and all hallways and corridors associated with these spaces. Installation of cover must not protrude over current ADA limitations.

PART 3 - EXECUTION

3.1 GENERAL

- A. Fire alarm system shall not be used for any purpose other than fire alarm functions.
- B. Fire alarm shall be interconnected but not limited to the following systems:
 1. Systems required by code to be connected to the fire alarm systems shall be connected.
 2. Public address system for disabling the manual and automatic bell or tone class passing signals. Manual and automatic class passing signals shall not be operable during alarm conditions.
 3. Ventilation systems where required for the purpose of fan shutdown

4. Damper control or smoke management systems.
 5. Water based fire sprinkler systems.
 6. Chemical fire extinguisher systems.
 7. Central and Autonomous PA system(s).
 8. Fire pump controller for required signaling and trouble supervision.
- C. Fire alarm system shall not be interconnected to any of the following:
1. Sump warning systems,
 2. Carbon monoxide detection systems.
 3. Methane gas detection systems.
 4. Other unrelated system.

3.2 SYSTEM INSTALLATION

- A. Install required conductors to devices indicated on Drawings. Provide required conductor terminations to devices for a complete system to function as specified and indicated on Drawings. Refer to Section 26 05 19: Low-Voltage Wire (600 Volt AC), for installation and color coding requirements.
- B. Splices are not allowed in junction boxes. Terminations shall be in terminal cabinets or on equipment terminals.
- C. Conductors shall be installed within conduits, boxes, and terminal cabinets in a totally enclosed installation. Furnish and install conductors required to connect incoming and outgoing circuits, including spare conductors, to terminal strips within terminal cabinets.
- D. Wiring within equipment and terminal cabinets shall be installed to conform to contract documentation and NFPA 72 standards, and shall be terminated on terminal blocks having terminals for required connections. Wiring shall be cabled, laced, and securely fastened in place so that no weight is imposed on equipment or terminals.
- E. Install required terminal blocks within terminal cabinets. Terminal blocks shall be installed on inside back of cabinets only, not on side. Incoming wiring shall be terminated on the left side of terminal blocks; outgoing wiring shall be terminated on the right side of the terminal blocks.
- F. Conductors shall be color-coded per specification section 26 05 19 Low Voltage wires and tagged with code markers at terminal cabinets, and equipment. A wire index shall be typed and installed on terminal cabinet doors. Index shall be covered with clear plastic adhesive covers. Wiring shall be identified as to building and location of devices in the index.
- G. Wiring within equipment and terminal cabinets shall be carefully strapped, and shall be formed in rectangular configuration. Wires shall be properly numbered in numerical order and shall maintain same number throughout the Project site.
- H. Complete installation shall comply with local building codes and applicable provisions of the California Electrical Code, California Fire Code and the NFPA 72 National Fire Alarm Code.

- I. Location of outlet boxes and equipment on Drawings is approximate, unless dimensions are indicated. Do not scale Drawings to determine locations and routing of conduits and outlet boxes. Location of outlet boxes and equipment shall conform to architectural features of the building and other Work already in place, and must be ascertained in the field before the start of Work.
- J. Drawings generally indicate Work to be provided, but do not indicate all bends, transitions or special fittings required to clear beams, girders or other Work already in place. Investigate conditions where conduits are to be installed, and furnish and install required fittings.
- K. Provide P-touch label of approximately one inch wide with red lettering for each initiating device that is hidden from view. Tags shall indicate the name and type of device: Heat Detector, or Duct Smoke Detector. Tags shall be permanently attached on access panel or t-bar grid which is used to access a hidden device.

3.3 SYSTEM PROGRAMMING

- A. Programming shall be performed in accordance with District requirements set forth in this section – the local authority having jurisdiction and applicable codes. If a conflict arises or a clarification is required, the contractor through the project's OAR shall contact the Districts Fire Life Systems Testing Group (FLSTG) for clarification
- B. As part of the 50 percent construction completion label devices and locations in the manner indicted in the attached guidelines on a separate copy of the shop drawings. Request a meeting with OAR, Project Inspector, and representative of FLSTG to review, finalize and obtain approval of the proposed device, equipment and location descriptors that will be programmed into the system. The District may at time of substantial completion request minor changes to program descriptors if needed to conform to site conditions.
- C. The following functions and features as required by the site or system configuration and installed peripheral equipment and systems shall be programmed into OUHSD fire alarm systems. The definition of programming shall include but not be limited to the use of a built in keyboard, the use of a connected PC with the appropriate software, dip or rotary switches, wiring or installable or removable jumpers as required or provided in the fire alarm equipment.
 - 1. Signal Silence Switch Inhibit: The audible signal silence switch located on the remote fire alarm annunciator(s) or any fire alarm control panel(s) shall be programmed to not silence the audible or extinguish the visual alarm circuits during the first minute (60 seconds) of the fire alarm horn or strobe activation. Activation of this switch after the initial 60 seconds signaling shall silence only the audible signals. Enabling or disabling this feature shall be allowed only by authorized District maintenance personnel and shall be protected by a maintenance level password.
 - 2. Audible and Visual Signal Auto Silencing Extinguishing: Audible coded signals and visual signals throughout the site, unless silenced by the above switch, shall be programmed to automatically self-silence or extinguish in no less than 5 minutes (300 seconds) and no more than 10 minutes (600 seconds). This feature shall not apply to the fire sprinkler water flow audible appliance.
 - 3. Fire Sprinkler Water Flow Audible Appliance: The fire sprinkler water flow appliance (bell) shall not require any programming because of our requirement for this appliance to be directly controlled by a set of dry contacts within the associated sprinkler water flow switch(s). The 24 volt DC auxiliary power for the sprinkler water flow audible appliances shall be supplied by an FACP or a remote power supply. This audible appliance shall operate continuously during the

detection of fire sprinkler water flow and shall not be coded in any manner nor silenced automatically by any FACP or manually by any user controls at any FACP or remote annunciator.

4. Fire Sprinkler Water Flow Switch: Fire sprinkler water flow switches shall be programmed in a manner that shall prevent the above Signal Silence Switch from silencing the audible coded signals or visual signals after the initiation of an alarm by a fire sprinkler flow switch.
5. Audible Notification Appliance Circuits: Audible notification appliance circuits shall be programmed to emulate the temporal code (ANSI S 3.41) from fire alarm audible appliances (horns). This coding shall originate and be controlled by a single coder residing within the FACP(s). The use of coders within remote power supplies either mounted adjacent to an FACP or at a remote location or directly by an audible notification appliance will not be permitted. Programmable audible notification appliances shall be configured to emulate a steady tone at approximately 1000 Hz. Audible notification appliance circuits shall be programmed to be silenced as described above. Notification appliance circuits throughout the site shall be activated by any alarm initiating device. Coded audible signals shall be controlled by a single synchronized FACP.
6. Visual Notification Appliance Circuits: Visual notification appliance circuits shall be programmed to provide steady non-coded power to the visual appliances (strobes). As required by code and the system configuration, a synchronization signal shall be superimposed onto the NAC by the FACP, a remote power supply or an add-on synchronization module. Visual notification appliance circuits shall be programmed to be extinguished as described above. Visual notification appliance circuits through out the site shall be activated by any alarm initiating device.
7. System Reset Button: The system reset button located on FACP's and remote annunciators in addition to resetting the fire alarm system and silencing or extinguishing notification appliances except for the sprinkler water flow appliances shall be programmed to reset analog and addressable smoke detectors, duct detectors, beam detectors and relays, addressable control modules and addressable relay modules used to interface to other systems and equipment. Each installed system reset button shall be programmed to operate as a "single point of reset" for the complete system.
8. HVAC Shutdown: Relays and addressable relay modules used to interface to HVAC equipment dampers, and supply and exhaust fan motors shall be programmed to shut down this equipment only within the same building where the detection of smoke, heat or fire sprinkler water flow has taken place. Manual pull stations within any building shall not effect the operation of the HVAC equipment. These relays shall return to normal only after the system is reset.
9. Smoke Detector Maintenance Alert: Addressable smoke detectors shall be programmed with the capability of initiating a maintenance alert when any one detector becomes obscured by dust or any other contaminates at approximately 10 percent below the level of obstruction that would initiate an alarm.
10. Disabling Class Passing Signals: The relay or addressable relay module shall be programmed to disable the class passing signals during any alarm condition at the site. This relay or addressable module shall return to normal only after the system is reset.
11. Disabling Audio of a Public Address System: The relay or addressable relay module shall be programmed to mute the audio output of the associated public address system during any activation of an audible notification appliance circuit

or a voice evacuation announcement. This or these relays shall automatically restore to normal upon the silencing of the audible NACs and the voice evacuation announcement.

12. UDACT: The FACP and the associated Universal Digital Alarm Communication Transmitter shall be programmed to transmit to the central monitoring station separate indications for General Alarm, Fire Sprinkler Water Flow Alarm, System Trouble and Supervisory Conditions. These indications shall be in addition to any indications initiated by the UDACT itself.
13. Power Failure Reporting Time Delay: Main and remote NAC power supplies shall be programmed to delay the reporting of a site AC power failure for a minimum of 6 hours.

D. Device Descriptors:

1. Descriptors shall enable responding personnel to identify the location of a fire quickly and accurately, and shall indicate the status of emergency equipment or fire safety functions that might affect the safety of occupants. The minimum required information for devices intended to report smoke, fire, or fire sprinklers water flow include, but may not be limited to: Building, floor (if multiple floors exist in the building), room or space description, and device type and digital address (Smoke detector, Heat detector, Fire sprinkler water flow switch, etc).
 - a. Building: The building must always be included in the descriptor, even if there is only one building on the site. Additional building(s) may be added at a later date creating the possibility of confusion by similar designated spaces, such as "Work room" or "Staff restroom" if more than one building has these similar designated spaces. The building designation in the descriptor must be what the site-based personnel call the building. The building should be provided with signage to aid fire department personnel in the identification of the building.
 - b. Floor: In multi-floor buildings the floor designation (1st, 2nd, etc) must be included in the descriptor.
 - c. Room Description: The room or space description must be unique. Using the same designation for multiple spaces, such as "Workroom", "Counselor's Office", or "Men's restroom", etc. is not acceptable. If, during a project, the room numbers or the use of the room changes then the room or space descriptor must be changed to agree with the change. Proper signage should be provided for each space to aid fire department personnel in the identification of the room or space.
 - d. Device Type, Address and Compass Designations: The device type and digital address must be included with the descriptor, such as smoke detector or heat detector, etc. Some systems provide this information automatically in the descriptor. Compass designations, (N, S, E, and W) are required in spaces such as corridors where there are multiple detectors and this information would be helpful to responding fire department personnel in locating the device reporting alarm. It is not necessary to include compass designations in smaller spaces where there are multiple detectors located in close proximity to each other.

E. ACCEPTABLE ABBREVIATIONS

Rm.- Room	Bldg.- Building	Smk. - Smoke
Corr.- Corridor	Lby- Lobby	Asst. - Assistant

Eng.- English	N – North	Nrs. - Nurse
Flr.- Floor	S – South	Cnclr - Counselor
Ht.- Heat	E – East	Off. - Office
Lib.- Library	W – West	PE – Physical Education
Lkr. – Locker	Kit- Kitchen	RR- Rest Room
Stu Str – Student Store	Sci - Science	By = near
Stor Rm – Store Room	Café - Cafeteria	PM – Plant Manager
1 st - First	2 nd - Second	3 rd - Third
Hopr Rm – Hopper Room	Det - Detector	Elev - Elevator
Prin – Principal	Blr Rm – Boiler Room	Conf – Conference
Park – Parking	Bsmt –Basement	MPR.- Multi-Purpose room

3.4 SYSTEM OPERATION

- A. Unless otherwise specified, but not limited to actuation of manual stations, smoke detectors, heat detectors, linear heat or smoke detectors, or water-flow switches shall cause the following operations to occur, refer to Attachment B:
1. Activate audible circuits.
 2. Actuate strobe units until the panel is reset or strobe circuit time-out.
 3. Release magnetic door holders to doors to adjacent zones on the floor from which the alarm was initiated.
 4. UL listed central station shall be notified via – Universal Digital Alarm Communicator Transmitter (UDACT).

3.5 TESTING

- A. A 48 hour notice shall be provided to the Project Inspector before final testing.
- B. Testing of fire detection system shall be as required by the State Fire Marshal and local authorities having jurisdiction. Installer is responsible for identifying required testing, coordinating, scheduling, and conducting tests before Substantial Completion. Tests shall include the following:
1. Operation of signal-initiating devices (smoke detectors, heat detectors, pull stations etc.).
 2. Operation of indicating devices (alarm horns, alarm bells and alarm strobes).
 3. Operation of system features under normal operation.
 4. Operation of system supervisory features.
 5. Operation of system features on standby power, with primary power turned off.

6. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 7. Close sprinkler system flow valves and verify proper supervisory alarm at the FACP.
 8. Verify activation of flow switches.
 9. Open initiating device circuits and verify that trouble signal actuates.
 10. Open signaling line circuits and verify that trouble signal actuates.
 11. Open and short notification appliance circuits and verify that trouble signal actuates.
 12. Open and short (wire only) network communications and verify that trouble signals are received at network annunciators or reporting terminals.
 13. Ground initiating device circuits and verify response of trouble signals.
 14. Ground signaling line circuit and verify response of trouble signals.
 15. Ground notification appliance circuit and verify response of trouble signals.
 16. Check alert tone to alarm notification devices.
 17. Check installation, supervision, and operation of intelligent smoke detectors.
 18. Alarm conditions that the system is required to detect shall be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
 19. When the system is equipped with optional features, consult the manufacturer manual to determine proper testing procedures.
 20. Central and Autonomous PA systems for muting during the sounding of the audible notification appliances and voice evacuation announcements.
 21. Disabling electronic tone or electromechanical bell class passing signals until system reset.
- C. Upon completion of installation of fire alarm equipment, provide to the OAR a signed, written statement confirming that fire alarm equipment was installed in accordance with the Specifications, Shop Drawings, instructions and directions provided by the manufacturer.
- D. Demonstrate in presence of the Project Inspector that circuit and wiring tests are free of shorts and grounds and that installation performs as specified herein and within manufacturer's guidelines.
- E. Software Modifications:
1. Provide the services of a factory trained and authorized technician to perform system software modification, upgrades or changes. Response time of the technician to the Project site shall not exceed 24 hours.
 2. Provide hardware, software, programming tools, and documentation necessary to modify the fire alarm network on the Project site. Modification includes: addition and deletion of devices, circuits, zones and changes to system operation

and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modification on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being provided.

- F. Complete the inspection and testing form as required by NFPA 72, and submit one copy of the completed form to the Architect and Project Inspector.

3.6 SERVICE MANUALS

- A. Deliver to OAR, three copies of the service manuals. Each manual shall include the following:
 - 1. Installation manuals, programming manuals and user manual if applicable for every control panel, control panel power supply, FACP input or output or relay or control module, auxiliary power supply, UDACT, remote NAC extender power supply, door holder power supplies, installed annunciators, initiating and indicating devices and addressable monitor, relay and control modules. Catalog cut sheets are not acceptable.
 - 2. A printed copy of the system configuration as programmed, including system labeling codes, and passwords.
 - 3. An electronic copy on compact disk of the system configuration program
 - 4. Final test report.
 - 5. Detailed explanation of the operation of the system.
 - 6. Instructions for routine maintenance.
 - 7. Detailed wiring diagram for the connection of relays, addressable monitor, and control or relay modules as applied in the interfacing of peripheral systems or equipment to the fire alarm system. Updated shop drawings shall include revisions made in the field via plan changes, RFIs, Field Change Directives, and any other construction change documents including interface details with ancillary systems.
 - 8. An electronic copy (CD) of the posted site or fire alarm map in Auto-Cad and pdf formats.
 - 9. Provide a CD ROM electronic copy of the updated system As-Built Drawings to the OAR, prepare this copy in the latest version of AutoCAD; along with the electronic copy provide a full size bond copy. Include one CD-ROM of the updated As-Built Drawings into each of the Service Manuals. CD and folded drawings shall be secured and inserted into the Service Manuals via a three-hole punched protective CD case and protective envelopes for the drawings.
 - 10. Provide codes and passwords for fire alarm system at testing.

3.7 SPARE PARTS

- A. The following new spare parts shall be furnished in unopened boxes:
 - 1. Five percent spare pull stations including the associated monitor module (minimum one spare pull station per type).
 - 2. Five percent spare smoke and heat detectors (minimum one spare smoke and heat detector per type).

3. Five percent spare audible devices (minimum one spare audible device per type).
4. Five percent spare strobe devices (minimum one spare strobe device per type).

3.8 SYSTEM USER AND MAINTENANCE PERSONNEL TRAINING

- A. Before Substantial Completion, provide one instruction period for the Project site based Owner operators and system users. The instruction period shall be scheduled and coordinated by the OAR.
- B. Training materials and required deliverables shall be submitted to the OAR.
 1. Prior to beginning the operational demonstration, notify Central monitoring Station that an instructional activity is beginning; inform them that it includes setting and resetting the system in test mode. After the demonstration is completed and the system restored, notify the Central Monitoring Station that the system has been restored and it is back on line for continuous monitoring.
- C. User Instruction and Training
 1. Before substantial completion and with a fully functional fire alarm system installed at the site, the contractor shall provide a minimum of four hours of user training for site based staff. The date and time for this training shall be coordinated by the project OAR.
- D. Instruction period training for site based staff shall consist of the following:
 1. Overview:
 - a. Explain the fire system is “addressable” which means every device-smoke detector, heat detector, sprinkler water flow switch, manual pull station, etc. has a unique address or identity. This makes it possible to positively identify the exact device causing an alarm, trouble or supervisory condition.
 - b. Explain the fire alarm control panel also controls the horns and strobes throughout the campus or building.
 - c. Explain that the fire alarm system is interconnected to various other systems and equipment through out the site such as:
 - 1) Heating and air conditioning equipment to turn off fans and close dampers to stop the spread of smoke through out a building.
 - 2) The class passing signaling system to disable the bells or tones to not accidentally signal students and staff to return to the buildings.
 - 3) Magnetically held doors to close them to stop the spread of smoke.
 - 4) To turn up house lighting in an occupied Auditorium or Multi-Purpose room to provide adequate egress lighting.
 - 5) The Central and Autonomous PA systems to mute them during the sounding of the alarm signal.

- d. Explain the fire system has a battery backup in case of power failure and that it will continue to function for a minimum of 24 hours after a total power failure.
- e. Explain that the fire alarm system components and wiring are monitored to report a malfunction, damage or vandalism. When this occurs, a trouble indication will appear on the fire alarm annunciator and FACP and this indication will be transmitted to the central monitoring station.
- f. Explain that other equipment and systems are monitored for abnormal conditions such as the fire sprinkler water being turned off. When this occurs, a supervisory condition is created. A supervisory indication will appear on the fire alarm annunciator and FACP and this indication will be transmitted to the central monitoring station.
- g. Explain that the fire system in addition to notifying the occupants of a possible fire condition also transmits an alarm indication to the central monitoring station that will in turn notify and dispatch the local fire department to your site.

2. Basic:

- a. Hand out the SYSTEM OPERATION instructions to attendees.
- b. Point out the Fire Alarm Control Panel and have them observe the normal LED status (one green LED only should be on):
 - 1) GREEN = Normal.
 - 2) YELLOW = Trouble.
 - 3) RED = ALARM.
- c. Have the attendees observe the LCD display that should be indicating a SYSTEM NORMAL message.
- d. Point out the Fire Alarm System Annunciator and have attendees observe the LCD display that should be indicating a SYSTEM NORMAL message.

3. Operation and Demonstration:

- a. After putting the system or having someone put the system central station monitoring into the test mode demonstrate the following:
- b. Activate a Manual Pull Station to demonstrate ALARM.
 - 1) Demonstrate audible and visual notification appliances and if installed the voice evacuation signal announcement.
 - 2) Demonstrate panel or annunciator sounder tone for ALARM.
 - 3) Have staff SILENCE system.
 - 4) Show LCD display and LED of alarm.
 - 5) Demonstrate and have staff reset the manual pull station.
 - 6) Have staff RESET fire system.

- c. Activate Smoke Detector with canned smoke to demonstrate address identification:
 - 1) Have staff SILENCE system.
 - 2) Show LCD and display LED of ALARM.
 - 3) Have staff RESET fire system.

- d. Remove Smoke Detector to demonstrate SYSTEM TROUBLE.
 - 1) Demonstrate panel or annunciator sounder tone for TROUBLE.
 - 2) Have staff SILENCE system.
 - 3) Show LCD display and LED of TROUBLE.
 - 4) Replace the smoke detector.
 - 5) Have staff RESET fire system.

- e. Remove power to demonstrate function during power failure.
 - 1) Have staff SILENCE system.
 - 2) Show LCD display and LED of TROUBLE.
 - 3) Activate Manual Pull station to demonstrate audible or visual functions in power failure mode.
 - 4) Reset manual pull station.
 - 5) Reset fire system.
 - 6) If applicable, point out sprinkler riser and shut off valves.
 - 7) Show location of a water flow switch.
 - 8) Show location of a valve tamper switch.
 - 9) Point out valves must always be OPEN or fully counter clock wise.
 - 10) Point out PIV (Post Indicator Valves) if applicable.
 - 11) Have water flow through the inspectors test valve and point out the ringing water flow bell.
 - 12) After the horns are silenced by an assistant, show that the water flow bell is ringing continuously indicating water flow.
 - 13) Have the assistant turn off the inspectors test valve to show that water flow alarm bell turns off.
 - 14) Reset system.
 - 15) Unlock and turn off a PIV or riser valve to show a supervisory condition.

16) Turn valve back on, lock the valve open and demonstrate the end of the indication of a supervisory condition.

4. Training documentation.

- a. Insure fire panel is reset and indicates normal and central station monitoring is taken off of the test mode.
- b. Have staff attendees sign off training sheet and provide a copy to the PROJECT INSPECTOR.

3.9 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.10 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

END OF SECTION

FIRE ALARM CUT SHEETS

FOR THE

MECHATRONICS FACILITY

At

**Oxnard High School
3400 West Gonzales Road
Oxnard, CA 93036**

In the Oxnard Union High School District

Prepared for

**The Oxnard Union High School District
309 South "K" Street
Oxnard, CA 93030**

September 4, 2020

Farenhyt



Addressable Fire Control Panel

Analog/Addressable Fire Alarm Control System

IFP-1000/IFP-1000HV

The IFP-1000 and IFP-1000HV are intelligent analog/addressable fire alarm control panels (FACPs). The basic IFP-1000 system has one signal line circuit (SLC) loop that supports up to seven 5815XL signal line circuit expanders. The IFP-1000HV offers the same functionality and features as the IFP-1000 but is configured for 240 VAC operation.

IFP-1000/HV has six on-board Flexput™ circuits that can be configured for auxiliary power, notification outputs, or for conventional smoke detector inputs (Class A or Class B). The FACP also has a built-in, dual-line digital fire communicator, Form C trouble relay, and two programmable Form C relays. The firmware has powerful features such as detector sensitivity, day/night thresholds, drift compensation, pre-trouble maintenance alert, and calibration trouble alert.

IFP-1000/HV supports a variety of devices, including RA-1000 remote annunciator, 5824 serial/parallel printer interface module (for printing system reports), RPS-1000 intelligent power module, and Hochiki or Intelligent Device Protocol (IDP) devices.

Features

- Built-in support for up to 127 Hochiki devices or 99 IDP detectors and 99 IDP modules, expandable to 1016 Hochiki devices or 792 IDP detectors and 792 IDP modules
- Uses standard wire—no shielded or twisted pair required
- Built-in UL listed digital communicator for remote reporting of system activity and system programming
- Central station reporting by point or by zone
- Supports Class B (Style 4) and Class A (Style 6 or Style 7) configuration for SLC, and SBUS
- Distributed, intelligent power
- Sensor sensitivity settings, day/night sensitivity setting and automatic drift compensation
- Flexput™ I/O circuits configurable for auxiliary power, notification outputs, or conventional smoke detector inputs. Notification circuits can be configured as Class A (Style Z) or Class B (Style Y). 2- and 4-wire smoke detectors can be configured as Class A (Style D) or Class B (Style B)
- Built-in annunciator with a backlit 80-character LCD display
- RS-485 bus provides communication to system accessories
- Built-in RS-232 and USB interface for programming
- Upload or download programming, event history, or detector status onsite or from a remote location using a PC and 5650/5651 Silent Knight Software Suite (SKSS)
- Improvements in SKSS delivers five times faster upload/downloads
- Built-in Form C trouble relay rated at 2.5 amps at 27.4 VDC
- Two built-in Form C programmable relays rated at 2.5 amps at 27.4 VDC
- Individual addressable devices can be tested
- SLC device locator can locate a single or multiple devices on a SLC loop
- System automatically tests addressable devices

Agency Listings



MEA
429-92-E
VOL. IX



IFP-1000

- 13 preset notification cadence patterns (including ANSI 3.41) and four user programmable patterns
- Programmable to automatically display initial event first or display tally of system events
- Built-in synchronization for appliances from AMSECO, System Sensor®, Faraday, Gentex®, and Wheelock®
- Acknowledge function allows operator to keep track of event status
- Jumpstart® auto-programming
- Modular design
- Nonvolatile event history stores up to 1000 events
- 125 software zones and 250 output groups
- 6 amp power supply and maximum charging capacity of 35 amp hours (An additional cabinet enclosure is required for batteries in excess of 18 amp hours)
- Programmable date setting for Daylight Saving Time
- Plex-1 door option combines a dead front cabinet door with a clear window, limiting access to the panel while providing single button operation of the reset and silence functions

P/N 350093 Rev K2

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Installation

The IFP-1000/HV can be surface or flush mounted.

Compatibility

The IFP-1000/HV SLC supports multiple device types of the *same* protocol:

- Hochiki
- IDP

You cannot mix Hochiki and IDP devices on a FACP. However, any combination of addressable devices of the same protocol can be used on the IFP-1000/HV.

Specifications

Physical

Flush Mount Dimensions: 14.5"W x 24.75"H x 3.9"D
(36.8 W x 62.9 H x 9.8 D cm)

Overall Dimensions: 16.2"W x 26.4"H x 4.2"D
(40.6 W x 67 H x 11.8 D cm)

Weight: 28 lbs. (12.8 kg)

Color: Red

Environmental

Operating Temperature: 32°F – 120°F (0°C – 49°C)

Humidity: 10% – 93% non-condensing

Electrical

IFP-1000 Primary AC: 120 VRMS @ 50/60 Hz, 2.7A

IFP-1000HV Primary AC: 240 VRMS @ 50/60 Hz, 1.4A

Total Accessory Load: 6A @ 27.4 VDC power-limited

Standby Current: 215 mA

Alarm Current: 385 mA

Battery Charging Capacity: 7 to 35 AH

Battery Size: 18 AH max. allowed in control panel cabinet. Larger capacity batteries can be housed in RBB accessory cabinet.

Flexput Circuits

Six circuits that can be programmed individually as:
Notification Circuits: 3A per circuit @ 27.4 VDC, power-limited
Auxiliary Power Circuits: 3A per circuit @ 27.4 VDC, power-limited
Initiation Circuit: 100 mA per circuit @ 27.4 VDC, power-limited

Indicator Lights

General Alarm (Red): Flashes when in alarm; solid when alarm silenced

Supervisory (Yellow): Flashes when a supervisory condition exists; solid when supervisory silenced

System Troubles (Yellow): Flashes when a trouble condition exists; solid when trouble silenced

System Silenced (Yellow): On when an alarm, trouble or supervisory condition has been silenced but not yet cleared

System Power (Green): Flashes for AC failure; solid when power systems are normal

Telephone

Requirements: FCC Part 15 & Part 68 approved

Jack: RJ31X (two required)

Approvals

NFPA 13, NFPA 15, NFPA 16, NFPA 70, & NFPA 72: Central Station; Remote Signalling; Local Protective Signalling Systems; Auxiliary Protected Premises Unit; & Water Deluge Releasing Service. Suitable for automatic, manual, waterflow, sprinkler supervisory (DACT non-coded) signalling services.

Other Approvals: UL Listed; CSFM 7170-0559: 135; MEA 429-92-E Vol. IX; FM Approved

Approved Releasing Solenoids

Manufacturer	Part Number	Rating	Current	Freq
Asco	T8210A107	24 VDC	3 A max	0 Hz
Asco	8210G207	24 VDC	3 A max	0 Hz

Ordering Information

IFP-1000	Intelligent Fire Alarm Control Panel.
IFP-1000HV	Intelligent Fire Alarm Control Panel. High voltage (240 VAC).

SBUS Accessories

RA-100	Remote Annunciator. Similar in operation and appearance to FACP annunciator. Gray.
RA-100R	Remote Annunciator. Similar in appearance and operation to FACP annunciator. Red.
RA-1000	Remote Annunciator. Four line LCD annunciator with 20 characters per line.
5815XL	Signal Line Circuit (SLC) Expander.
RPS-1000	Intelligent Power Module.
5496	Intelligent Power Module.
5824	Serial/Parallel Printer Interface Module.
5880	LED I/O Module.
5865-3 & 5865-4	LED Fire Annunciators.
5883	Relay Interface Board.

Hochiki and IDP Devices

See the specification sheets listed below for a complete listing of the Hochiki and IDP devices.

350360	Hochiki Devices Specification Sheet
350361	Intelligent Device Protocol Devices Specification Sheet

Miscellaneous Accessories

5650/5651	Silent Knight Software Suite. Provides programming, upload/download, and event reporting.
5670	Silent Knight Software Suite. Provides facility monitoring.
Plex-1	Door Accessory. Dead front cabinet door with clear window to limit access to panel.
RBB	Remote Battery Box Accessory Cabinet. Use if backup batteries are too large to fit into FACP cabinet. Dimensions: 16" W x 10" H x 6" D (406 mm W x 254 mm H x 152 mm D)



**SILENT
KNIGHT**

by Honeywell

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice. For more information, contact Silent Knight 12 Clintonville Road, Northford, CT 06472-1610 Phone: (800) 328-0103, Fax: (203) 484-7118. www.farenhyt.com



Made in the U.S.A.

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7165-0559:0135 Page 1 of 2

CATEGORY: 7165 -- FIRE ALARM CONTROL UNIT (COMMERCIAL)

LISTEE: SILENT KNIGHT SECURITY One Fire-Lite Place, Northford, CT 06472-1653
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Models 5820, 5820XL, IFP-1000 Fire Alarm Control Units. Power limited, automatic, manual, local, remote station, central station, waterflow, water releasing and sprinkler supervisory service. Refer to listee's data sheet for additional detailed product description and operational considerations. System components:

5820, 5820XL, IFP-1000 : Control Units
058200P : Motherboard
5815/5815XL: Analog Loop Expander
7628: EOL Resistor
Intelliknight 5820 : Enclosure
5860/5860R/RA-1000: Annunciator
5496 : Power Module
5824 : Serial/Parallel Interface
5895/5895XL/RPS-1000 : Power Expander/Supply
5865-3/5965-4 : LED Annunciator
5880 : LED IO Module
5883 : Relay Interface Board
SD500-ANM : Addressable Notification Module
SD500-LIM : Line Isolation Module
SD505-6IB : Isolation Base
SD-500 SDM : Smoke Detector Module
RA-100 : Remote Annunciator
3158 : Reverse Polarity Module
5220 : Direct Connect Module
122365 : Enclosure
*RBB : Battery Cabinet
5897, 5898 : Power Supplies
058601 : User Interface

RATING: 120 VAC Primary, 24 VDC Secondary

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating, and UL label.

Rev. 04-26-11 bh



This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other

Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**
Fire Engineering Division

APPROVAL: Listed as fire alarm control units for use separately listed compatible initiating and indicating devices. Also suitable for high-rise applications when used in conjunction with Model SKE-360 Voice-Tone Evacuation Unit (CSFM Listing No. 6912-0559:122); EVAX Audio Adjunct System Models EVAX-25 (CSFM Listing No. 06911-1446:100), EVAX-50 or EVAX-50E (CSFM Listing No. 06911-1446:102); EVX-2ZA or EVX-4Z Zone Splitters (CSFM Listing No. 06912-1446:101), HMX-MP or HMX-DP Voice Evacuation System (CSFM Listing No. 06911-1446:103), two-way firefighter telephone and separately listed electrically and functionally compatible initiating and indicating devices. Refer to listee's Installation Instruction Manual for details.

These control units can generate a distinctive three-pulse Temporal Pattern Fire Alarm Evacuation Signal (for total evacuation) in accordance with NFPA 72, 2002 Edition.

This control unit meets the requirements of UL-864, 9th Edition Standards.

NOTE: For **Fire Alarm Verification Feature (delay of fire alarm signal)**, the maximum Retard/Reset/Restart period shall not exceed 30 seconds.
Formerly 7170-0559:0135

Rev. 04-26-11 bh



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Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**

Fire Engineering Division



**SILENT
KNIGHT**

by Honeywell

Model 5495 Distributed Power Module

**In an emergency,
you need maximum power**

The 5495 Distributed Power Module by Silent Knight is the most powerful and cost-effective power supply available today. It delivers 6 amps of notification appliance circuit power and built-in synchronization for appliances from System Sensor®, Gentex®, AMSECO®, Wheelock and Faraday — what you need to drive power-hungry components like ADA notification appliances. The 5495's advanced microprocessor design is years ahead of the competition. Its switch mode power supply design is up to 50% more efficient than competitive linear mode power supplies. And, ADA retrofits are easier and less expensive with the 5495 because it integrates into current systems without the costly investment in new components.

For the most sophisticated and cost-effective notification power supply available, you need the 5495. Call Silent Knight today for more information at 1-800-328-0103.

Model 5495 Distributed Power Module

The 5495 is a 6 amp notification power expander that provides its own AC power connection, battery charging circuit, and backup battery for use with fire and security controls such as the Silent Knight Model 5208 Fire Control /Communicator. The 5495 is the cost-effective solution for powering notification appliances required by the Americans with Disabilities Act (ADA). The 5495 has built-in ANSI cadence pattern, which can upgrade older control panels that lack cadence capability.

Features

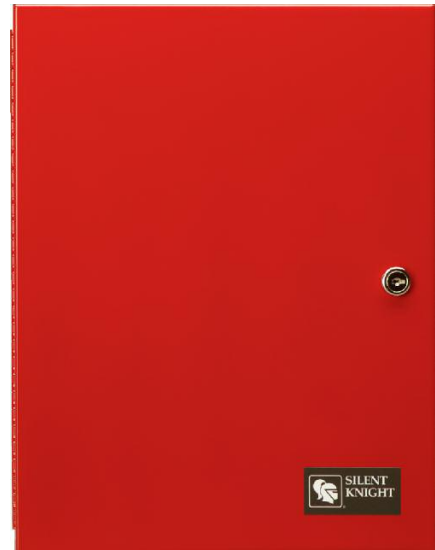
- UL Listed for 6 amps of notification power
- Power supply's advanced switch mode design reduces damaging heat and manages power up to 50% more efficiently than other systems
- Dip switches allow for easy reconfiguration
- 24 VDC filtered output voltage
- Four power-limited notification outputs; 2 Class A or 4 Class B, or 1 Class A and 2 Class B
- Additional continuous auxiliary output
- 3 amps per output circuit
- 2 inputs; 2 Class B or 2 Class A
- Ground fault detector/indicator
- Independent trouble relay
- AC loss delay option shuts off power

to non-essential high-current accessories like magnetic door holders

- Built-in synchronization for appliances from System Sensor®, Gentex®, AMSECO®, Wheelock and Faraday
- Stand alone operation
- Lightweight design adds to ease of installation and reduces shipping costs
- Operates with most polarized, UL Listed notification devices
- ANSI Cadence pattern output capability built-in

Connection to Local Fire Control

The 5495 may be connected to a local fire control which utilizes Class A or Class B type notification circuits operating between 9 and 32 VDC. The control panel's notification circuit is connected to one of the inputs on the 5495. The control panel's notification circuit end-of-line resistor is also connected across two terminals on the 5495, which provides supervision between the 5495 and the fire control panel. Polarized audible and/or visual notification devices are then connected to the 5495 signal circuits using the 4.7kΩ end-of-line resistors provided. Since the 5495 draws very little power from the control, it is possible to connect one 5495 to each notification circuit on the control panel and still provide full supervision of the notification circuits all the way back to the control panel.



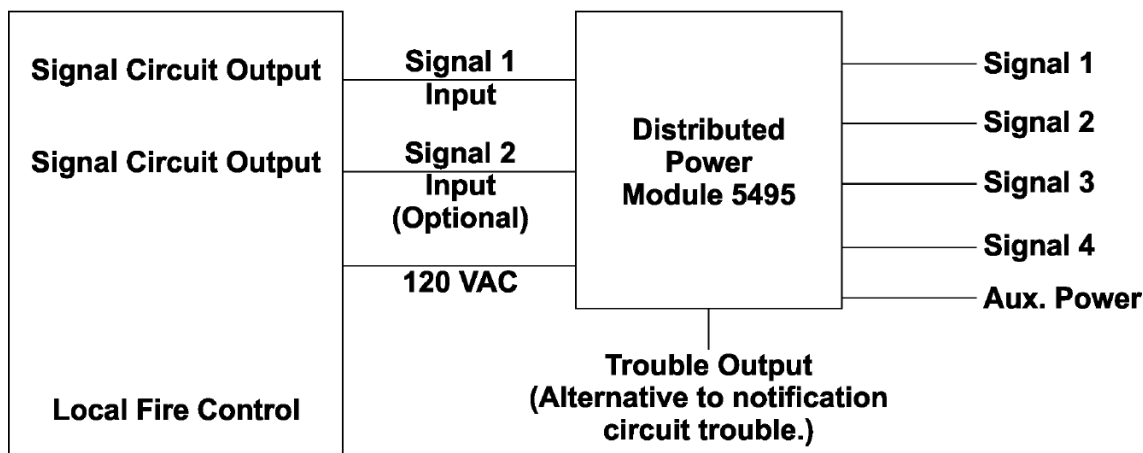
**Model 5495
Distributed Power Module**

Approvals

- UL Listed
- MEA 429-92-E Vol XII
- CSFM 7300-0559:123
- NFPA 72

Model 5495 Distributed Power Module

Model 5495 Block Diagram



Supervision

The 5495 supervises a variety of functions including:

- Low AC power
- Low battery condition
- Earth ground fault
- Auxiliary output power limit condition
- EOL supervision trouble or power limited condition at an output

When a trouble condition occurs, the 5495 creates a trouble condition on the host control signal circuits to which it is connected. The 5495 still maintains the ability to be activated by the host control. In addition, the 5495 provides a Form C trouble relay output as an alternative to using the notification circuit trouble.

Electrical Specification

AC input: 120 VAC at 2 amps
Output: 24 VDC at 6 amps

Current:

Standby 75 mA
Alarm 205 mA

Auxiliary power circuit: 1

Notification circuits: 4

Output configuration: 2 Class A (Style Z)
4 Class B (Style Y)
(1 Class A & 2 Class B)

Amps per output circuit: 3.0 (6.0 amps total)

Notification circuit output: 20.4 to 27.3 VDC @ 3.0 amps each, 4.7 kΩ EOL resistor required on each Class B circuit

No. of inputs 2

Input configuration: 2 Class B or 2 Class A

Input

voltage range: 9 - 32 VDC

Battery charging capacity: 35.0 AH

Ambient temp.: 32° to 120° F (0° to 49° C)

Mechanical

Dimensions: 12.25" W x 16" H x 3" D (30.88 cm W x 40.64 cm H x 7.62 D cm)

Indicator Lights

AC power on : Green
Battery trouble: Yellow
Ground fault: Yellow
Aux trouble: Yellow
Output troubles (1-4): Yellow

Ordering Information

5495 Distributed Power Module



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MADE IN AMERICA

FORM# 350395 Rev D
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CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7300-0559:0123 Page 1 of 1

CATEGORY: 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

LISTEE: SILENT KNIGHT SECURITY One Fire-Lite Place, Northford, CT 06472-1653
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Models 5395, *5495 and *5499 Distributed Power Module (Indicating Circuit Expander). Unit is power-limited and consists of an enclosure, printed circuit board, terminal boards, end-of-line resistors and two 12VDC, 7Ah rechargeable batteries. The unit provides up to 4 indicating zones and 1 auxiliary output. Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: Input: 120 VAC, 2A, 60 hz
Output: 24 VDC

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes & ordinances and in manner acceptable to the authority having jurisdiction. Unit must be able to provide 24 hour battery back-up as required per code.

MARKING: Listee's name, model number, electrical rating and UL label.

APPROVAL: Listed as indicating circuit expanders for use with separately listed compatible indicating devices and polarized, 24 VDC, fire alarm control unit. Model 5495 and 5499 can generate a distinctive temporal pattern fire alarm signal as required per NFPA 72, 2002 Edition. If required, models 5395 must be use with fire alarm control unit or indicating signaling devices that can produce the temporal code pattern. Refer to listee's Installation Manual for details.

NOTE:

*Recert. 08-17-2006 jw



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Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**
Fire Engineering Division

Honeywell



SK-PULL-SA / SK-PULL-DA

Intelligent Pull Stations

The SK-PULL-SA is a single action pull station requiring only one motion to activate the station. The SK-PULL-DA is a dual action pull station requiring two motions to activate the station. The SK-PULL-SA and SK-PULL-DA are for use with Honeywell Silent Knight Series fire control panel (FACP).

Extremely easy to operate, the SK-PULL-DA and SK-PULL-SA provide a fast and practical means of manually initiating a fire alarm signal. The FACP recognizes each manual pull station by its specific address saving precious seconds in determining the location of an alarm.

INSTALLATION

The SK-PULL-SA and SK-PULL-DA can be surface mounted to an SB-I/O surface back box or semi-flush mounted on a standard single-gang with a minimum depth of 2.13"(5.40 cm) or double gang or 4" (10.61 cm) square electrical box. You can also use the optional (System Sensor® PN BG-TR) trim ring if the station is being semi-flush mounted.



SK-PULL-SA



SK-PULL-DA

FEATURES & BENEFITS

- Installer can open station without causing an alarm condition
- Dual-color LED is visible through handle of station blinks green to indicate normal operation and remains steady red in an alarm condition
- Key operated test and reset lock using lock plate actuator
- Key matches compatible FACP locks
- Meets ADA requirement for 5 lbs maximum pull force to active
- Meets the Americans with Disabilities Act Accessibility Guidelines (ADAAG) controls and operating mechanisms guidelines (Section 4.1.3[13])
- Shell, door, and handle molded from durable LEXAN®
- Reliable analog communications for trouble-free operation
- Braille text on station handle
- Rotary address switches for fast installation
- Handle latches in down position and the word Activated appears, clearly indicating the station has been pulled
- UL Listed, including UL 38, Standard of Manually Actuated Signaling System
- CSFM Listed
- MEA Listed

SK-PULL-SA / SK-PULL-DA Technical Specifications

PHYSICAL

Dimensions: 5.5" H x 4" W x 1.45" D (14 x 10.2 x 3.7cm)

Housing Material: LEXAN polycarbonate resin

Bi-Colored LED:

Blinking Green: Normal

Steady Red: Alarm

Switch: Single pole, single throw (SPST) normally open (N/O) switch which closes upon activation of the pull station

ELECTRICAL

Operating Voltage: 15 – 32VDC

SLC Standby and Alarm Current: 350 μ A

Wire Gauge: Up to 12AWG (3.1 mm²)

ENVIRONMENTAL

Operating Temperature: 32°F – 120°F (0°C – 49°C)

Humidity: 10% – 93% non-condensing

ORDERING INFORMATION

SK-Pull-SA: Single Action Pull Station

SK-Pull-DA: Dual Action Pull Station

ACCESSORIES

BG-TR: Optional trim ring.

SB-I/O: Surface backbox, indoor/outdoor.

* Unless otherwise noted, specifications apply to SK-Pull-SA and SK-Pull-DA

COMPATIBILITY

The SK-PULL-SA AND SK-PULL-DA are compatible with the following Honeywell Silent Knight fire alarm control panels:

6820: Addressable fire alarm control panel

6820EVS: Addressable fire alarm control panel with an emergency voice system.

6808: Addressable fire alarm control panel

6700: Addressable fire alarm control panel

5700: Addressable fire alarm control panel

5808: Addressable fire alarm control panel

5820XL: Addressable fire alarm control panel

5820XL-EVS: Addressable fire alarm control panel with an emergency voice system

For a complete listing of all compliance approvals and certifications, please visit www.silentknight.com.

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For Technical Support, call 800-446-6444.

For more information

Learn more about Honeywell Silent Knight and other products by visiting www.silentknight.com

Honeywell Silent Knight

12 Clintonville Road
Northford, CT 06472
800-328-0103

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

Page 1 of 1

LISTING No. 7150-0559:0161

CATEGORY: 7150 -- FIRE ALARM PULL BOXES

LISTEE: SILENT KNIGHT SECURITY One Fire-Lite Place, Northford, CT 06472-1653
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Models SK-PULL-SA and SK-PULL-DA single/dual action fire alarm pull boxes. Refer to listee's data sheet for detailed product description and operational considerations.

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, rating, and UL label.

APPROVAL: Listed as fire alarm pull boxes for use with separately listed compatible fire alarm control units. Refer to listee's Installation Instruction Manual for details.

* These manual pull boxes meet the requirements of UL Standard 38, 1999 Edition with California amendments.

XLF: 7150-0028:0199

04-16-09



This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other

Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**

Fire Engineering Division

SK-PHOTO-W SERIES

Addressable Photoelectric Smoke Detectors

The Silent Knight® SK-PHOTO-W Series feature a modern design and expanded color options support a variety of contemporary aesthetic demands. In addition, each detector is constructed for exceptional installation and maintenance efficiency.



The SK-PHOTO-W Series intelligent plug-in smoke detectors are designed for both performance and aesthetics, and are direct replacements for the SK-PHOTO Series detectors. A new modern, sleek, contemporary design and enhanced optical sensing chamber is engineered to sense smoke produced by a wide range of combustion sources in accordance with more stringent code standards. The SK-PHOTO-W Series detector sensitivity can be programmed in the control panel software. Sensitivity is continuously monitored and reported to the panel. Point ID capability allows each detector's address to be set with rotary, decimal address switches, providing exact detector location for selective maintenance when chamber contamination reaches an unacceptable level. Dual electronic thermistors add 135°F (57°C) fixed temperature thermal sensing on the SK-PHOTO-T-W. The SK-PHOTO-R-W is a remote test capable detector for use with DNR Series duct detector housings.

FEATURES AND BENEFITS

- Designed to meet UL 1268 7th Edition
- Sleek and stylish contemporary design
- Stable communication technique with noise immunity
- Addressable by device
- Rotary, decimal addressing (Refer to the Silent Knight panel manuals for device capacity)
- Two-wire SLC connection
- LEDs blink every time the unit is polled
- 360°-field viewing angle of the visual alarm indicators (two bi-color LEDs); LEDs blink green in Normal condition and turn on steady red in Alarm
- Integral communications and built-in device-type identification
- Remote test feature from the panel
- Built-in functional test switch activated by external magnet
- Walk test with address display (an address of 121 will blink the detector LED 12-(pause)-1)
- Low standby current
- Built-in tamper-resistant feature
- Designed for direct-surface or electrical-box mounting
- Sealed against back pressure
- Plugs into separate base for ease of installation and maintenance
- Expanded color options
- SEMS screws for wiring of the separate base
- Optional remote, single-gang LED accessory
- Optional sounder, relay, and isolator bases

INSTALLATION

The SK-PHOTO-W Series plug-in intelligent thermal detectors use a separate base to simplify installation, service, and maintenance. Installation instructions are shipped with each detector.

Mount base (all base types) on an electrical backbox which is at least 1.5" (3.81 cm) deep. For a chart of compatible junction boxes, see SK-61045.

Note: Because of the inherent supervision provided by the SLC loop, end-of-line resistors are not required. Wiring "T-taps" or branches are permitted for Style 4 (Class "B") wiring.

Note: When using relay or sounder bases, consult the SK-ISO installation sheet I56-3627 for device limitations between isolator modules and isolator bases.

OPERATION

Each SK-PHOTO-W Series detector uses one of the panel's addresses (total limit is panel dependent) on the Signaling Line Circuit (SLC). It responds to regular polls from the control panel and reports its type and the status. If it receives a test command from the panel (or a local magnet test), it stimulates its electronics and reports an alarm. It blinks its LEDs when polled and turns the LEDs on when commanded by the panel. The SK-PHOTO-W Series offers features and performance that represent the latest in smoke detector technology.

PRODUCT LINE INFORMATION

Note: "-IV" suffix indicates ivory color.

SK-PHOTO-W: White, low-profile photoelectric sensor

SK-PHOTO-T-W: White, same as SK-PHOTO-W but includes a built-in 135°F (57°C) fixed-temperature thermal device

SK-PHOTO-R-W: White, low-profile intelligent photoelectric sensor, remote test capable, for use with DNR/DNRW

B300-6: White, standard flanged low-profile mounting base

B300-6-BP: Bulk pack of B300-6, package contains 10

B300-6-IV: Ivory, standard flanged low-profile mounting base

B501-WHITE: White, standard European flangeless mounting base

B501-BL: Black, standard European flangeless mounting base

B501-IV: Ivory, standard European flangeless mounting base

B501-WHITE-BP: Bulk pack of B501-WHITE, contains 10

B200S-WH: White, Intelligent, programmable sounder base

B200S-IV: Ivory, Intelligent, programmable sounder base

B200SR-WH: White, Intelligent sounder base for retrofit applications

B200SR-IV: Ivory, Intelligent sounder base for retrofit applications

B200S-LF-WH: White, Low Frequency Intelligent, programmable sounder base

B200S-LF-IV: Ivory, Low Frequency Intelligent, programmable sounder base

B200SR-LF-WH: White, Low Frequency Intelligent sounder base for retrofit applications

B200SR-LF-IV: Ivory, Low Frequency Intelligent sounder base for retrofit applications

B224RB-WH: White, plug-in System Sensor® relay base

B224RB-IV: Ivory, plug-in System Sensor relay base

B224BI-WH: White, plug-in System Sensor isolator detector base

B224BI-IV: Ivory, plug-in System Sensor isolator detector base

ACCESSORIES

TR300: White, replacement flange for B210LP or B300-6 bases

TR300-IV: Ivory, replacement flange for B210LP or B300-6 bases

RA100Z(A): Remote 3 – 32 VDC LED annunciator, mounts to a U.S. single-gang electrical box, for use with B501 and B300-6 bases only

M02-04-00: Test magnet

M02-09-00: Test magnet with telescoping handle

CK300: White, detector color kit, pack of 10

CK300-IV: Ivory, detector color kit, pack of 10

CK300-BL: Black, detector color kit, pack of 10

SK-PHOTO-W SERIES TECHNICAL SPECIFICATIONS

PHYSICAL/ENVIRONMENTAL

Sensitivity:

- UL Applications: 0.5% to 4.0% per foot obscuration.
- ULC Applications: 0.5% to 3.5% per foot obscuration

Size: 2.0" (5.3 cm) high; base determines diameter

- **B300-6:** 6.1" (15.6 cm) diameter
- **B501:** 4" (10.2 cm) diameter

For a complete list of detector bases, see SK-61045.

Shipping weight: 3.4 oz. (95 g)

Operating temperature range:

- SK-PHOTO-W: 32°F to 122°F (0°C to 50°C)
- SK-PHOTO-T-W: 32°F to 100°F (0°C to 38°C)
- SK-PHOTO-R-W installed in a DNR/DNRW: -4°F to 158°F (-20°C to 70°C)

UL/ULC Listed Velocity Range: 0-4000 ft/min. (1219.2 m/min.), suitable for installation in ducts

Relative humidity: 10% – 93% non-condensing

Thermal ratings: fixed-temperature set point 135°F (57°C), rate-of-rise detection 15°F (8.3°C) per minute, high temperature heat 190°F (88°C)

ELECTRICAL SPECIFICATIONS

Voltage range: 15 - 32 volts DC peak

Standby current (max. avg.): 200µA @ 24 VDC (one communication every 5 seconds with LED enabled)

Max current: 4.5 mA @ 24 VDC ("ON")

DETECTOR SPACING AND APPLICATIONS

Silent Knight recommends spacing detectors in compliance with NFPA 72. In low airflow applications with smooth ceiling, space detectors 30 feet (9.1m). For specific information regarding detector spacing, placement, and special applications refer to NFPA 72. A *System Smoke Detector Application Guide*, document A05-1003, is available at www.systemsensor.com.

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. *Consult factory for latest listing status.*

- **UL Listed:** S6173
- **FM Approved**
- **CSFM:** 7272-0559:0512

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Country of origin: Mexico

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7272-0559:0149 Page 1 of 1

CATEGORY: 7272 -- SMOKE DETECTOR-SYSTEM TYPE-PHOTOELECTRIC

LISTEE: SILENT KNIGHT SECURITY One Fire-Lite Place, Northford, CT 06472-1653
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Models IDP-PHOTO, IDP-PHOTOR*, IDP-PHOTO-T, IDP-ACCLIMATE, SK-PHOTO, SK-PHOTOR*, SK-PHOTO-T and SK-ACCLIMATE photoelectric type smoke detectors. Model IDP-PHOTO-T employs a 1350F supplement integral heat sensor which only assists in a fire situation. This thermal circuitry is NOT approved for use in lieu of a required heat detector. Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: 24 VDC

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes & ordinances and in manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, product number, electrical rating and UL label.

APPROVAL: Listed as photoelectric type smoke detector for use with listee's separately listed compatible fire alarm control units and bases. All models are suitable for open areas and inside duct installations with air velocities between 0-4000 FPM. Models IDP-PHOTO and IDP-PHOTOR are approved for installations inside System sensor duct housing DNR (OSFM Listing No. 3242-1653:209) and DNRW (OSFM Listing No. 3242-1653:210)*. Models SK-PHOTO and SK-PHOTOR are approved for installations inside Silent Knight SK-DUCT (OSFM Listing No. 3242-0559:162) and System Sensor DNRW (OSFM Listing No. 3242-1653:210)*

NOTE: The photoelectric type detectors are generally more effective at detecting slow, smoldering fires that smolder for hours before bursting into flame. Sources of these fires may include cigarettes burning in couches or bedding. The ionization type detectors are generally more effective at detecting fast, flaming fires that consume combustible materials rapidly and spread quickly. Sources of these fires may include paper burning in a waste container or a grease fire in the kitchen.

XLF: 7272-0028:0206

*Rev. 02-01-10 fm



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Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**
Fire Engineering Division

SK-HEAT-W SERIES

Addressable Heat Detectors

The Silent Knight® SK-HEAT-W Series heat detectors are designed for both performance and aesthetics. A new modern, sleek, contemporary design and advanced thermal technologies make the SK-HEAT-W Series ideal for both system operation and building design.



The series includes a 135°F/57°C fixed-temperature, rate-of-rise, and a 180°F/88°C fixed high-temperature detectors and are direct replacements for the SK-HEAT Series heat detectors. The point ID address, set using rotary decimal switches, provide specific detector locations. These thermal detectors provide effective, intelligent property protection in a variety of applications.

- SK-HEAT-W offers 135°F fixed thermal detection.
- SK-HEAT-ROR-W offers 135°F fixed and rate-of-rise thermal detection.
- SK-HEAT-HT-W provides fixed high-temperature detection at 190°F.

FEATURES AND BENEFITS

- Designed to meet UL 268 7th Edition
- Sleek and stylish contemporary design
- Advanced thermal technology for fast response
- Fixed temperature model (SK-HEAT-W) factory preset to 135°F (57°C)
- Rate-of-rise model (SK-HEAT-ROR-W), 15°F (8.3°C) per minute
- High temperature model (SK-HEAT-HT-W) factory preset to 190°F (88°C)
- Addressable by device
- Rotary, decimal addressing (Refer to the Silent Knight panel manuals for device capacity)
- Two-wire SLC connection
- LEDs blink every time the unit is polled
- 360°-field viewing angle of the visual alarm indicators (two bi-color LEDs); LEDs blink green in Normal condition and turn on steady red in Alarm
- Integral communications and built-in device-type identification
- Remote test feature from the panel
- Built-in functional test switch activated by external magnet
- Walk test with address display (an address of 121 will blink the detector LED 12-(pause)-1)
- Low standby current
- Built-in tamper-resistant feature
- Designed for direct-surface or electrical-box mounting
- Sealed against back pressure
- Plugs into separate base for ease of installation and maintenance
- SEMS screws for wiring of the separate base
- Optional remote, single-gang LED accessory
- Optional sounder, relay, and isolator bases
- Optional flanged surface mounting kit

APPLICATIONS

Use thermal detectors for protection of property. For further information, refer to manual I56-6529, Applications Manual for System Smoke Detectors, which provides detailed information on detector spacing, placement, zoning, wiring, and special applications.

INSTALLATION

The SK-HEAT-W Series plug-in intelligent thermal detectors use a separate base to simplify installation, service, and maintenance. Installation instructions are shipped with each detector.

Mount base (all base types) on an electrical backbox which is at least 1.5" (3.81 cm) deep. For a chart of compatible junction boxes, see SK-61045.

Note: Because of the inherent supervision provided by the SLC loop, end-of-line resistors are not required. Wiring "T-taps" or branches are permitted for Style 4 (Class "B") wiring.

Note: When using relay or sounder bases, consult the SK-ISO installation sheet I56-3627 for device limitations between isolator modules and isolator bases.

PRODUCT LINE INFORMATION

SK-HEAT-W: White, low-profile intelligent 135°F fixed thermal sensor

SK-HEAT-ROR-W: White, low-profile intelligent rate-of-rise thermal sensor

SK-HEAT-HT-W: White, low-profile intelligent 190°F fixed thermal sensor

B300-6: White, standard flanged low-profile mounting base

B300-6-BP: Bulk pack of B300-6, package contains 10

B300-6-IV: Ivory, standard flanged low-profile mounting base

B501-WHITE: White, standard European flangeless mounting base

B501-BL: Black, standard European flangeless mounting base

B501-IV: Ivory, standard European flangeless mounting base

B501-WHITE-BP: Bulk pack of B501-WHITE, contains 10

B200S-WH: White, Intelligent, programmable sounder base

B200S-IV: Ivory, Intelligent, programmable sounder base

B200SR-WH: White, Intelligent sounder base for retrofit applications

B200SR-IV: Ivory, Intelligent sounder base for retrofit applications

B200S-LF-WH: White, Low Frequency Intelligent, programmable sounder base

B200S-LF-IV: Ivory, Low Frequency Intelligent, programmable sounder base

B200SR-LF-WH: White, Low Frequency Intelligent sounder base for retrofit applications

B200SR-LF-IV: Ivory, Low Frequency Intelligent sounder base for retrofit applications

B224RB-WH: White, plug-in System Sensor® relay base

B224RB-IV: Ivory, plug-in System Sensor relay base

B224BI-WH: White, plug-in System Sensor isolator detector base

B224BI-IV: Ivory, plug-in System Sensor isolator detector base

ACCESSORIES

TR300: White, replacement flange for B210LP or B300-6 bases

TR300-IV: Ivory, replacement flange for B210LP or B300-6 bases

RA100Z(A): Remote 3 – 32 VDC LED annunciator, mounts to a U.S. single-gang electrical box, for use with B501 and B300-6 bases only

M02-04-00: Test magnet

M02-09-00: Test magnet with telescoping handle

CK300: White, detector color kit, pack of 10

CK300-IV: Ivory, detector color kit, pack of 10

CK300-BL: Black, detector color kit, pack of 10

SK-HEAT-W SERIES TECHNICAL SPECIFICATIONS

PHYSICAL/ENVIRONMENTAL

Size: 2.0" (5.3 cm) high; base determines diameter

-**B300-6:** 6.1" (15.6 cm) diameter

-**B501:** 4" (10.2 cm) diameter

For a complete list of detector bases, see SK-61045.

Operating temperature range: SK-HEAT-W, SK-HEAT-ROR-W: -4°F to 100°F (-20°C to 38°C)

SK-HEAT-HT-W: -4°F to 150°F (-20°C to 66°C)

Detector spacing: UL approved for 50 ft. (15.24 m) center to center; FM approved for 25 x 25 ft. (7.62 x 7.62 m) spacing

Relative humidity: 10% – 93% non-condensing

Thermal ratings: Fixed-temperature set point 135°F (57°C), rate-of-rise detection 15°F (8.3°C) per minute, high temperature heat 190°F (88°C)

ELECTRICAL SPECIFICATIONS

Voltage range: 15 - 32 volts DC peak

Standby current (max. avg.): 200uA @ 24 VDC (one communication every 5 seconds with LED enabled)

LED current (max.): 4.5mA @ 24 VDC ("ON")

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. *Consult factory for latest listing status.*

- **UL Listed:** S6228
- **FM Approved**
- **CSFM:** 7270-0559:0511

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Country of origin: Mexico

Honeywell Silent Knight

12 Clintonville Road
Northford, CT 06472-1610
203.484.7161
www.silentknight.com

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FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7270-0559:0147

Page 1 of 1

CATEGORY: 7270 -- HEAT DETECTOR

LISTEE: SILENT KNIGHT SECURITY One Fire-Lite Place, Northford, CT 06472-1653
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Models IDP-HEAT and SK-HEAT* (fixed temperature), IDP-HEAT-ROR, IDP-HEAT-HT, SK-HEAT-ROR*, and SK-HEAT-HT* (fixed temperature with Rate-of-Rise) electronic heat detectors. Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: 135°F fixed temperature for Models IDP-HEAT, IDP-HEAT-ROR, SK-HEAT* and SK-HEAT-ROR*
190°F fixed temperature for Model IDP-HEAT-HT and SK-HEAT-HT

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical ratings, and UL label.

APPROVAL: Listed as heat detectors for use with *listee's separately listed compatible base and fire alarm control units. Refer to listee's Installation Instructions Manual for details.

XLF: 7270-0028:0196

*Rev. 07-14-09 fm



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Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**

Fire Engineering Division



B501 and B210LP



Intelligent Detector Bases

B501 and B210LP plug in detector mounting bases, are just two of the variety of ways to install detectors in any application.

For more information about the IntelliKnight system, or to locate your nearest source, please call 1-800-328-0103 or in Connecticut, call (203) 484-7161.

Description

The B210LP 6" Mounting Base and the B501 4" Mounting Base are plug in detector bases for SK style detectors intended for use with Silent Knight IntelliKnight series fire alarm control panels (FACPs). The B210LP and B501 have screw terminals for power (+) and (-) and remote annunciator connections. Communication takes place over the power (+) and (-) lines.

Features

- Plug-in mounting provides ease of installation
- Tamper-proof feature prevents removal of the detector without the use of a tool
- Range of mounting options to meet any application
- B501 allows for aesthetically pleasing installation with Recessed Mounting Kit (PN RMK400)
- Rotary address switches for fast installation
- Optional remote LED annunciator (PN RA100Z)
- SEMS screws, 12–22 AWG
- UL Listed

Installation

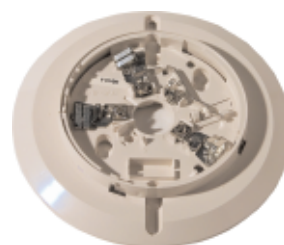
The B210LP and B501 can be mounted on a variety of junction boxes as shown in the tables below.

U.S. Junction box Selection Guide*

Model	Single Gang	3.5" Oct	4" Oct	4" Sq
B210LP	Yes	Yes	Yes	Yes
B501	No	Yes	No	No

Metric Junction box Selection Guide*

Model	50 mm	60 mm	70 mm	75 mm
B210LP	No	No	No	No
B501	Yes	Yes	Yes	No



B210LP Base



B501 Base

Compatibility

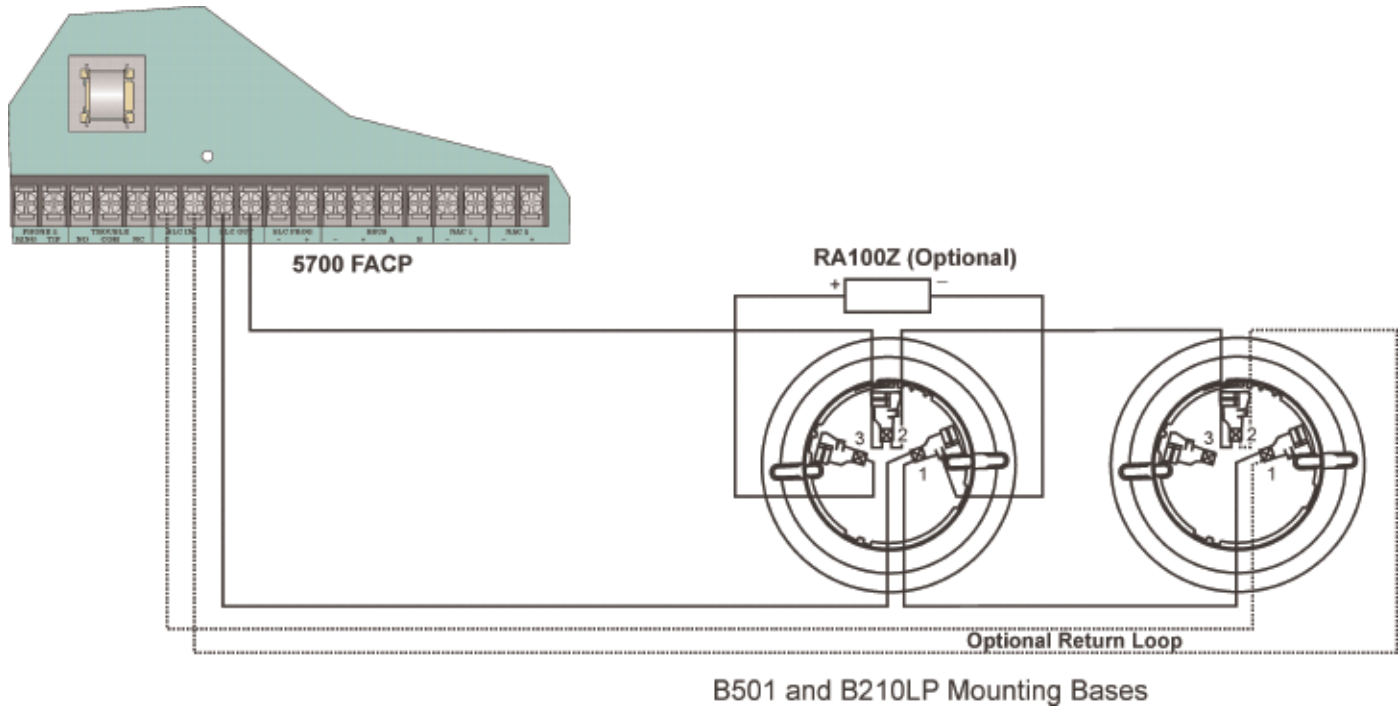
The B210LP and B501 are compatible with the following SK-series detectors:

- SK-Photo Photoelectric Smoke Detector and SK--Photo-T Photoelectric Smoke Detector with Thermal
- SK-Acclimate Multicriteria Photoelectric Smoke Detector
- SK-Ion Ionization Smoke Detector
- SK-Heat Fixed Temperature Thermal Detector, SK -Heat-ROR Rate-of-Rise Detector with Thermal, and SK-Heat-HT Fixed High Temperature Thermal Detector

The B210LP and B501 are compatible with the following IntelliKnight FACP's:

5700
5808
5820XL

Model B501 and B210LP



Specifications

Physical

B210LP Diameter: 6.1" (155 mm)

B501 Diameter: 4.1" (104 mm)

Electrical

Wire Gauge: 18-12

Terminals:

- Terminal 1: Power (-) and Optional RA100Z
- Terminal 2: Power (+)
- Terminal 3: Optional RA100Z Remote Annunciator

Environmental

Operating Temperature: 32°F – 150°F (0°C – 66°C)

Humidity: 10% – 93% non-condensing

Ordering Information

B210LP 6" Mounting Base
 B501 4" Mounting Base

Accessories

- RA100Z Remote LED Annunciator.
- RMK400 Recessed Mounting Kit. Provides low profile for use with B501.
- XR2B Detector Removal Tool. A removal and replacement tool for SK plug-in detectors. Includes the T55-127-000.
- M02-04-01 Detector Test Magnet.
- M02-09-00 Test Magnet with Telescoping Handle.
- XP-4 Extension Pole for XR2B. Extends from 5 – 15 ft.
- T55-127-000 Detector Removal Head.
- BCK-200B Black Detector Kit. For SK series detectors.



This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice. For more information, contact Silent Knight 12 Clintonville Road, Northford, CT 06472-1610 Phone: (800) 328-0103, Fax: (203) 484-7118. www.silentknight.com

MADE IN AMERICA

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LISTING SERVICE

LISTING No. 7300-1653:0109 Page 1 of 1

CATEGORY: 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Models B401, B401B, B401R, B401BR, B401BR-750, B401R-750, B402B, B404B, B404BT, B406B, B501, B501B, 14506587-002, B501BH, B501BHT, B401BH, B110LP, B110RLP, B110RLP750, B112LP, B114LP, B114LPBT, B116LP, B210LP, B501-BL, B501-IV, *B501-WHITE, B300-6, B300-6-IV, B300-6-IS detector bases. Refer to listee's data sheet for detailed product description and operational considerations.

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, *model number, *electrical rating and UL label.

APPROVAL: Listed as detector bases for use with separately listed compatible detectors. *Refer to Manufacturers Installation Instruction Manual for details.

NOTE: Formerly 7300-1209:128

*Rev 04-03-18 gt



This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other

Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**
Fire Engineering Division

FRC Series



Fire Rated Ceiling Access Doors

FRC Series access doors are rated by Underwriters Laboratories for 1-1/2 hours, "B" label in walls, and by Warnock Hersey for 3 hours in ceilings and 2 hours in walls. The FRC Series Doors should be utilized when providing access in fire rated walls and ceilings. FRC Series Doors have heavy-duty spring closures to ensure positive latching when panel closes. An interior latch release is also included on all doors to enable unlocking from inside.

Door is fabricated from 20 gage, galvanized steel with a prime coat finish. Door panel is provided with 2" of insulation in a sandwich type construction.

Frame is fabricated from 16 gage, galvanized steel with a prime coat finish and provided with masonry anchors and bolt holes.

Hinge is fully concealed and mounted on the long side of the rectangular door panel.

Exterior latch is a dual purpose lock that features a knurled knob and key operation. Both are provided at time of shipping.

Interior latch release slide is included enabling door to be opened from the inside.

Guide Specification

Provide Elmdor® FRC Series, Fire Rated Ceiling Access Doors (specify model number and options). Access door frame shall be fabricated from 16 gage galvanized steel with a prime coat finish and provided with masonry anchors and bolt holes. Access door panel shall be fabricated from 20 gage, galvanized steel with a prime coat finish. Door shall be filled with 2" thick, fire rated insulation, and be welded pan type. Access door shall have automatic closer, be self-latching and contain interior latch release. Exterior latching shall be recessed and universal self-latching bolt, operated by either a knurled knob or flush key. Finish shall be a prime coat suitable for painting.

Underwriters Laboratories classification shall be: Classified access frame and fire door assembly 1-1/2 hours, "B" Label. Meets ANSI-UL 10B standard. Finish shall be a prime coat suitable for painting.



MODEL NUMBER AND OPTIONS SELECTION

BASE MODEL NUMBER

FRC Fire Rated Ceiling Access Door

Suffix Options

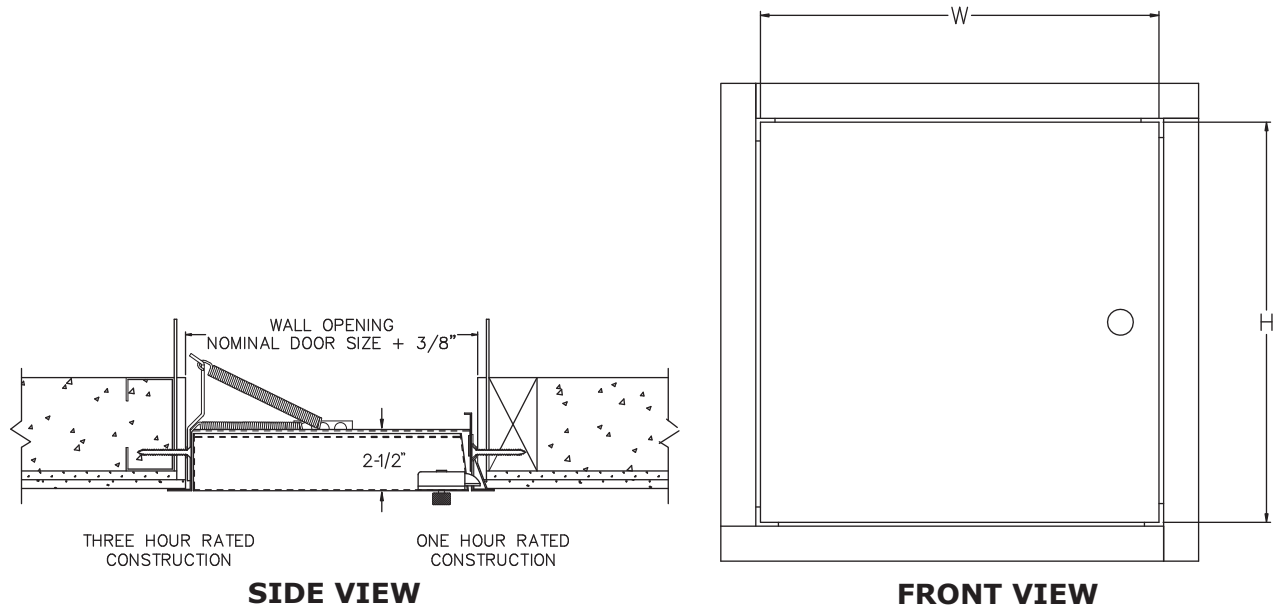
- GB Galvanized Drywall Bead
- MLP Mortise Cylinder Lock (Prep)
- SS Stainless Steel Construction.
(Type 304 No 4 Finish Satin Finish)

STANDARD AVAILABLE SIZES

Special sizes available upon request.

NOMINAL DOOR SIZE (W X H)	CEILING OPENING	WALL OPENING	LATCHES	WEIGHT
FRC 8" x 8"	9-5/8" x 9-5/8"	8-3/8" x 8-3/8"	1	11 lbs.
FRC 10" x 10"	11-5/8" x 11-5/8"	10-3/8" x 10-3/8"	1	12 lbs.
FRC 12" x 12"	13-5/8" x 13-5/8"	12-3/8" x 12-3/8"	1	15 lbs.
FRC 14" x 14"	15-5/8" x 15-5/8"	14-3/8" x 14-3/8"	1	17 lbs.
FRC 16" x 16"	17-5/8" x 17-5/8"	16-3/8" x 16-3/8"	1	18 lbs.
FRC 18" x 18"	19-5/8" x 19-5/8"	18-3/8" x 18-3/8"	1	20 lbs.
FRC 20" x 20"	21-5/8" x 21-5/8"	20-3/8" x 20-3/8"	1	24 lbs.
FRC 22" x 30"	23-5/8" x 31-5/8"	22-3/8" x 30-3/8"	2	32 lbs.
FRC 24" x 24"	25-5/8" x 25-5/8"	24-3/8" x 24-3/8"	1	28 lbs.
FRC 24" x 36"	25-5/8" x 37-5/8"	24-3/8" x 36-3/8"	2	40 lbs.

Note: On sizes 16" x 16" and larger, an extra spring is supplied with the door and must be attached from back of door pan to framing, or floor above, in such a manner to ensure that door is self closing.



Dimensions are subject to manufacturer's tolerance of plus or minus 1/4". Elmdor/Stoneman assumes no responsibility for use of void or suspended data. Please visit www.elmdorstoneman.com for most current specifications. © Copyright 2009 Elmdor/Stoneman, City of Industry, CA, A Division of Acorn Engineering Company.

SELECTION SUMMARY & APPROVAL FOR MANUFACTURING	
Model Number & Options _____	Quantity _____
Company _____	Date _____
Contact _____	Title _____
Approval for Manufacturing/Signature _____	

FRC

Revised: 7/16/09



Selectable Output Horns, Strobes, and Horn/Strobes

SpectrAlert® Advance selectable-output horns, strobes, and horn/strobes are rich with features guaranteed to cut installation times and maximize profits.



SPECTRAlert
ADVANCE
from System Sensor

Features

- Electrically compatible with existing SpectrAlert products
- Automatic selection of 12- or 24-volt operation at 15 and 15/75 candela
- Plug-in design
- Field selectable candela settings on wall and ceiling units: 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, 185
- Same mounting plate for wall- and ceiling-mount units
- Shorting spring on mounting plate for continuity check before installation
- Tamper resistant construction
- Outdoor wall and ceiling products rated from -40°F to 151°F
- Design allows minimal intrusion into the back box
- Horn rated at 88+ dbA at 16 volts
- Rotary switch for horn tone and three volume selections
- Outdoor products UL listed to UL 1638 (strobe) and UL 464 (horn) outdoor requirements
- Outdoor products NEMA 4X rated
- Compatible with MDL sync module

Agency Listings



7125-1653:186 (indoor strobes)
7300-1653:187 (outdoor strobes)
7125-1653:188 (horn/strobes,
chime/strobes)
7135-1653:189 (horns, chimes)

The SpectrAlert Advance series of notification appliances is designed to simplify installations, with features such as plug in designs, instant feedback messages to ensure correct installation of individual devices, and 11 field-selectable candela settings for wall and ceiling strobes and horn/strobes.

When installing Advance products, first attach a universal mounting plate to a four-inch square, four-inch octagon or double-gang junction box. The two-wire mounting plate attaches to a single-gang junction box.

Next, connect the notification appliance circuit wiring to the SEMS terminals on the mounting plate.

Finally, attach the horn, strobe or horn/strobe to the mounting plate by inserting the product's tabs in the mounting plate's grooves. The device will rotate into position, locking the product's pins into the mounting plate's terminals. The device will temporarily hold in place with a catch until it is secured with a captured mounting screw.

The SpectrAlert Advance series includes outdoor notification appliances. Outdoor strobes and horn/strobes (two wire and four wire) are available for wall or ceiling. Outdoor horns are available for wall only. All System Sensor outdoor products are rated between minus 40 degrees Fahrenheit and 151 degrees Fahrenheit in wet or dry applications.

SpectrAlert Advance Specifications

Architect/Engineer Specifications

General

SpectrAlert Advance horns, strobes and horn/strobes shall mount to a standard 4 × 4 × 1½-inch back box, 4-inch octagon back box or double-gang back box. Two-wire products shall also mount to a single-gang 2 × 4 × 1⅞-inch back box. A universal mounting plate shall be used for mounting ceiling and wall products. The notification appliance circuit wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance products, when used with the Sync-Circuit™ Module accessory, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts. When used with the Sync-Circuit Module, 12-volt rated notification appliance circuit outputs shall operate between nine and 17.5 volts; 24-volt rated notification appliance circuit outputs shall operate between 17 and 33 volts. Indoor SpectrAlert Advance products shall operate between 32 and 120 degrees Fahrenheit from a regulated DC, or full-wave rectified, unfiltered power supply. Strobes and horn/strobes shall have field-selectable candela settings including 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, 185.

Strobe

The strobe shall be a System Sensor SpectrAlert Advance Model _____ listed to UL 1971 and shall be approved for fire protective service. The strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system.

Horn/Strobe Combination

The horn/strobe shall be a System Sensor SpectrAlert Advance Model _____ listed to UL 1971 and UL 464 and shall be approved for fire protective service. The horn/strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. The horn shall have three audibility options and an option to switch between a temporal three-pattern and a non-temporal (continuous) pattern. These options are set by a multiple position switch. On four-wire products, the strobe shall be powered independently of the sounder. The horn on horn/strobe models shall operate on a coded or non-coded power supply.

Outdoor Products

SpectrAlert Advance outdoor horns, strobes and horn/strobes shall be listed for outdoor use by UL and shall operate between minus 40 degrees and 151 degrees Fahrenheit. The products shall be listed for use with a System Sensor outdoor/weatherproof back box with half inch and three-fourths inch conduit entries.

Synchronization Module

The module shall be a System Sensor Sync-Circuit model MDL listed to UL 464 and shall be approved for fire protective service. The module shall synchronize SpectrAlert strobes at 1Hz and horns at temporal three. Also, while operating the strobes, the module shall silence the horns on horn/strobe models over a single pair of wires. The module shall mount to a 4⅞ × 4⅞ × 2⅞-inch back box. The module shall also control two Style Y (class B) circuits or one Style Z (class A) circuit. The module shall synchronize multiple zones. Daisy chaining two or more synchronization modules together will synchronize all the zones they control. The module shall not operate on a coded power supply.

Physical/Electrical Specifications

Standard Operating Temperature	32°F to 120°F (0°C to 49°C)
K Series Operating Temperature	-40°F to 151°F (-40°C to 66°C)
Humidity Range	10 to 93% non-condensing (indoor products)
Strobe Flash Rate	1 flash per second
Nominal Voltage	Regulated 12DC/FWR or regulated 24DC/FWR ¹
Operating Voltage Range²	8 to 17.5 V (12V nominal) or 16 to 33 V (24 nominal)
Input terminal wire gauge	12 to 18 AWG
Ceiling mount dimensions (including lens)	6.8" diameter × 2.5" high (173 mm diameter × 64 mm high)
Wall mount dimensions (including lens)	5.6"L × 4.7"W × 2.5"D (142 mm L × 119 mm W × 64 mm D)
Horn dimensions	5.6"L × 4.7"W × 1.3"D (142 mm L × 119 mm W × 33 mm D)
Wall-mount back box skirt dimensions (BBS-2, BBSW-2)	5.9"L × 5.0"W × 2.2"D (151 mm L × 128 mm W × 56 mm D)
Ceiling-mount back box skirt dimensions (BBSC-2, BBSCW-2)	7.1" diameter × 2.25" high (180 mm diameter × 57 mm high)
Wall-mount weatherproof back box dimensions (SA-WBB)	5.7"L × 5.1"W × 2.0"D (145 mm L × 130 mm W × 51 mm D)
Ceiling-mount weatherproof back box dimensions (SA-WBBC)	7.1" diameter × 2.0" high (180 mm diameter × 51 mm high)
Wall-mount trim ring dimensions (TR-HS, TRW-HS)	5.7"L × 4.812"W × 0.35"D (146 mm L × 122 W mm × 9 D mm)
Ceiling-mount trim ring dimensions (TRC-HS, TRCW-HS)	6.9" diameter × 0.35 high (176 mm diameter × 9 mm high)

Notes:

1. Full Wave Rectified (FWR) voltage is a non-regulated, time varying power source that is used on some power supply and panel outputs.
2. P, S, PC, and SC products will operate at 12V nominal only for 15 and 15/75 cd.

UL Current Draw Data

UL Max. Strobe Current Draw (mA RMS)						UL Max. Horn Current Draw (mA RMS)					
	Candela	8–17.5 Volts		16–33 Volts		Sound Pattern	dB	8–17.5 Volts		16–33 Volts	
		DC	FWR	DC	FWR			DC	FWR	DC	FWR
Standard Candela Range	15*	123	128	66	71	Temporal	High	57	55	69	75
	15/75*	142	148	77	81	Temporal	Medium	44	49	58	69
	30*	NA	NA	94	96	Temporal	Low	38	44	44	48
	75*	NA	NA	158	153	Non-temporal	High	57	56	69	75
	95*	NA	NA	181	176	Non-temporal	Medium	42	50	60	69
	110	NA	NA	202	195	Non-temporal	Low	41	44	50	50
	115	NA	NA	210	205	Coded	High	57	55	69	75
High Candela Range	135	NA	NA	228	207	Coded	Medium	44	51	56	69
	150	NA	NA	246	220	Coded	Low	40	46	52	50
	177	NA	NA	281	251						
	185	NA	NA	286	258						

UL Max. Current Draw (mA RMS), 2-wire Horn/Strobe, Standard Candela Range (15–115 cd)										
DC Input	8–17.5 Volts		16–33 Volts		30	75	95	110	115	
	15	15/75	15	15/75						
Temporal High	137	147	79	90	107	176	194	212	218	
Temporal Medium	132	144	69	80	97	157	182	201	210	
Temporal Low	132	143	66	77	93	154	179	198	207	
Non-temporal High	141	152	91	100	116	176	201	221	229	
Non-temporal Medium	133	145	75	85	102	163	187	207	216	
Non-temporal Low	131	144	68	79	96	156	182	201	210	
FWR Input										
Temporal High	136	155	88	97	112	168	190	210	218	
Temporal Medium	129	152	78	88	103	160	184	202	206	
Temporal Low	129	151	76	86	101	160	184	194	201	
Non-temporal High	142	161	103	112	126	181	203	221	229	
Non-temporal Medium	134	155	85	95	110	166	189	208	216	
Non-temporal Low	132	154	80	90	105	161	184	202	211	

UL Max. Current Draw (mA RMS), 2-wire Horn/Strobe, High Candela Range (135–185 cd)										
DC Input	16–33 Volts				FWR Input	16–33 Volts				
	135	150	177	185		135	150	177	185	
Temporal High	245	259	290	297	Temporal High	215	231	258	265	
Temporal Medium	235	253	288	297	Temporal Medium	209	224	250	258	
Temporal Low	232	251	282	292	Temporal Low	207	221	248	256	
Non-temporal High	255	270	303	309	Non-temporal High	233	248	275	281	
Non-temporal Medium	242	259	293	299	Non-temporal Medium	219	232	262	267	
Non-temporal Low	238	254	291	295	Non-temporal Low	214	229	256	262	

Candela Derating

For K series products used at low temperatures, listed candela ratings must be reduced in accordance with this table.

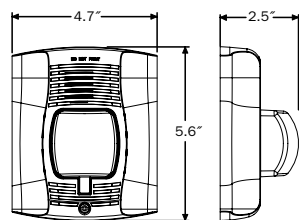
Strobe Output (cd)	
Listed Candela	Candela rating at –40°F
15	Do not use below 32°F
15/75	
30	
75	
95	44
110	70
115	110
135	115
150	135
177	150
185	177
	185

Horn Tones and Sound Output Data

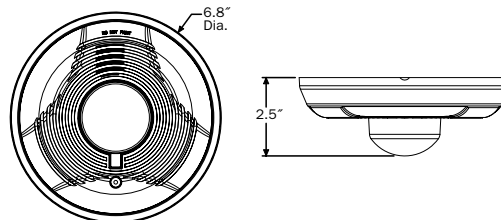
Horn and Horn/Strobe Output (dBA)											
Switch Position	Sound Pattern	dB	8–17.5 Volts		16–33 Volts		24 Volt Nominal				
			DC	FWR	DC	FWR	Reverberant		Anechoic		
							DC	FWR	DC	FWR	
1	Temporal	High	78	78	84	84	88	88	99	98	
2	Temporal	Medium	74	74	80	80	86	86	96	96	
3	Temporal	Low	71	73	76	76	83	80	94	89	
4	Non-temporal	High	82	82	88	88	93	92	100	100	
5	Non-temporal	Medium	78	78	85	85	90	90	98	98	
6	Non-temporal	Low	75	75	81	81	88	84	96	92	
7 [†]	Coded	High	82	82	88	88	93	92	101	101	
8 [†]	Coded	Medium	78	78	85	85	90	90	97	98	
9 [†]	Coded	Low	75	75	81	81	88	85	96	92	

[†]Settings 7, 8, and 9 are not available on 2-wire horn/strobe.

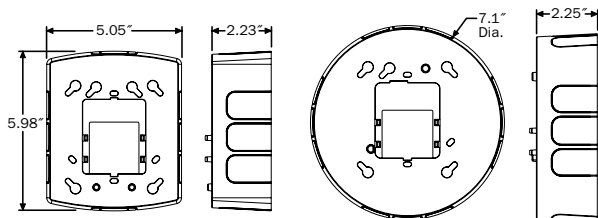
SpectrAlert Advance Dimensions



Wall-mount horn/strobes

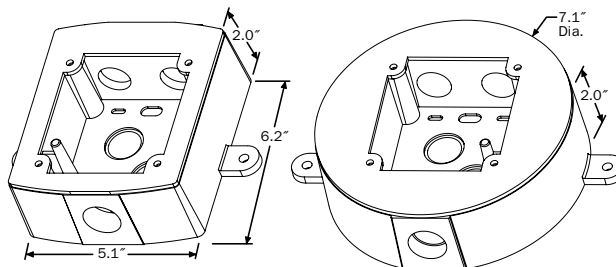


Ceiling-mount horn/strobes



Wall back box skirt

Ceiling back box skirt



Wall weatherproof back box

Ceiling weatherproof back box

SpectrAlert Advance Ordering Information

Model	Description
Wall Horn/Strobes	
P2R*†	2-wire Horn/Strobe, Standard cd†, Red
P2RH*	2-wire Horn/Strobe, High cd, Red
P2RK*‡	2-wire Horn/Strobe, Standard cd, Red, Outdoor
P2RHK‡	2-wire Horn/Strobe, High cd, Red, Outdoor
P2W*	2-wire Horn/Strobe, Standard cd, White
P2WH*†	2-wire Horn/Strobe, High cd, White
P4R*	4-wire Horn/Strobe, Standard cd, Red
P4RH*	4-wire Horn/Strobe, High cd, Red
P4RK‡	4-wire Horn/Strobe, Standard cd, Red, Outdoor
P4RHK‡	4-wire Horn/Strobe, High cd, Red, Outdoor
P4W*	4-wire Horn/Strobe, Standard cd, White
P4WH*†	4-wire Horn/Strobe, High cd, White
Wall Strobes	
SR*†	Strobe, Standard cd, Red
SRH*†	Strobe, High cd, Red
SRK‡	Strobe, Standard cd, Red, Outdoor
SRHK	Strobe, High cd, Red, Outdoor
SW*	Strobe, Standard cd, White
SWH*	Strobe, High cd, White
Ceiling Horn/Strobes	
PC2R*	2-wire Horn/Strobe, Standard cd, Red
PC2RH*	2-wire Horn/Strobe, High cd, Red
PC2RK‡	2-wire Horn/Strobe, Standard cd, Red, Outdoor
PC2RHK‡	2-wire Horn/Strobe, High cd, Red, Outdoor
PC2W*†	2-wire Horn/Strobe, Standard cd, White
PC2WH*†	2-wire Horn/Strobe, High cd, White
PC4R	4-wire Horn/Strobe, Standard cd, Red
PC4RH	4-wire Horn/Strobe, High cd, Red
PC4RK‡	4-wire Horn/Strobe, Standard cd, Red, Outdoor
PC4RHK‡	4-wire Horn/Strobe, High cd, Red, Outdoor

Model	Description
Ceiling Horn/Strobes (cont'd.)	
PC4W	4-wire Horn/Strobe, Standard cd, White
PC4WH	4-wire Horn/Strobe, High cd, White
Ceiling Strobes	
SCR*	Strobe, Standard cd, Red
SCRH*	Strobe, High cd, Red
SCRK‡	Strobe, Standard cd, Red, Outdoor
SCRHK‡	Strobe, High cd, Red, Outdoor
SCW*†	Strobe, Standard cd, White
SCWH*†	Strobe, High cd, White
Horns	
HR	Horn, Red
HRK‡	Horn, Red, Outdoor
HW	Horn, White
Accessories	
BBS-2	Back Box Skirt, Wall, Red
BBSW-2	Back Box Skirt, Wall, White
BBSC-2	Back Box Skirt, Ceiling, Red
BBSCW-2	Back Box Skirt, Ceiling, White
TR-HS	Trim Ring, Wall, Red
TRW-HS	Trim Ring, Wall White
TRC-HS	Trim Ring, Ceiling, Red
TRCW-HS	Trim Ring, Ceiling, White

Notes:

* Add "-P" to model number for plain housing (no "FIRE" marking on cover), e.g., P2R-P.

† Add "-SP" to model number for "FUEGO" marking on cover, e.g., P2R-SP.

‡ "Standard cd," refers to strobes that include 15, 15/75, 30, 75, 95, 110, and 115 candela settings. "High cd," refers to strobes that include 135, 150, 177, and 185 candela settings.

All outdoor units ending in "K" include a weatherproof back box.

⊞ Add "-R" to model number for weatherproof replacement device (no back box included).



3825 Ohio Avenue • St. Charles, IL 60174
Phone: 800-SENSOR • Fax: 630-377-6495

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Product specifications subject to change without notice. Visit systemsensor.com for current product information, including the latest version of this data sheet.
A05-0395-005 • 8/08 • #2018

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7125-1653:0186 Page 1 of 1

CATEGORY: 7125 -- FIRE ALARM DEVICES FOR THE HEARING IMPAIRED

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Synchronous type strobe lights, Models SR, SRH, SW, SW-CLR-ALERT, SWH, SCR, SCRH, SCW, SCW-CLR-ALERT and SCWH followed by the suffix -P, -SP, -PG, or none.

Intended for indoor use mounted on the wall or the ceiling. Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: 8-17.5 or 16-33 VDC/FWR
Candela: 15, 15/75, 30, 75, 95, 110, 115, *135, *150, *177, *185cd

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances, and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating and UL label.

APPROVAL: Listed as strobe lights suitable for hearing impaired application when used with separately listed compatible fire alarm control units. Suitable for indoor use, wall or ceiling mounted. Refer to listee's Installation Instruction Manual for details.

*Rev. 03-11-10 fm



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Authorized By: **DAVID CASTILLO, M.E., F.P.E.**
Fire Engineering Division



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- Horn rated at 88+ dbA at 16 volts
- Rotary switch for horn tone and three volume selections
- Outdoor products UL listed to UL 1638 (strobe) and UL 464 (horn) outdoor requirements
- Outdoor products NEMA 4X rated
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SpectrAlert Advance Specifications

Architect/Engineer Specifications

General

SpectrAlert Advance horns, strobes and horn/strobes shall mount to a standard 4 × 4 × 1½-inch back box, 4-inch octagon back box or double-gang back box. Two-wire products shall also mount to a single-gang 2 × 4 × 17⁄8-inch back box. A universal mounting plate shall be used for mounting ceiling and wall products. The notification appliance circuit wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance products, when used with the Sync-Circuit™ Module accessory, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts. When used with the Sync-Circuit Module, 12-volt rated notification appliance circuit outputs shall operate between nine and 17.5 volts; 24-volt rated notification appliance circuit outputs shall operate between 17 and 33 volts. Indoor SpectrAlert Advance products shall operate between 32 and 120 degrees Fahrenheit from a regulated DC, or full-wave rectified, unfiltered power supply. Strobes and horn/strobes shall have field-selectable candela settings including 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, 185.

Strobe

The strobe shall be a System Sensor SpectrAlert Advance Model _____ listed to UL 1971 and shall be approved for fire protective service. The strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system.

Horn/Strobe Combination

The horn/strobe shall be a System Sensor SpectrAlert Advance Model _____ listed to UL 1971 and UL 464 and shall be approved for fire protective service. The horn/strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. The horn shall have three audibility options and an option to switch between a temporal three-pattern and a non-temporal (continuous) pattern. These options are set by a multiple position switch. On four-wire products, the strobe shall be powered independently of the sounder. The horn on horn/strobe models shall operate on a coded or non-coded power supply.

Outdoor Products

SpectrAlert Advance outdoor horns, strobes and horn/strobes shall be listed for outdoor use by UL and shall operate between minus 40 degrees and 151 degrees Fahrenheit. The products shall be listed for use with a System Sensor outdoor/weatherproof back box with half inch and three-fourths inch conduit entries.

Synchronization Module

The module shall be a System Sensor Sync-Circuit model MDL listed to UL 464 and shall be approved for fire protective service. The module shall synchronize SpectrAlert strobes at 1Hz and horns at temporal three. Also, while operating the strobes, the module shall silence the horns on horn/strobe models over a single pair of wires. The module shall mount to a 4¹/₁₆ × 4¹/₁₆ × 2¹/₈-inch back box. The module shall also control two Style Y (class B) circuits or one Style Z (class A) circuit. The module shall synchronize multiple zones. Daisy chaining two or more synchronization modules together will synchronize all the zones they control. The module shall not operate on a coded power supply.

Physical/Electrical Specifications

Standard Operating Temperature	32°F to 120°F (0°C to 49°C)
K Series Operating Temperature	-40°F to 151°F (-40°C to 66°C)
Humidity Range	10 to 93% non-condensing (indoor products)
Strobe Flash Rate	1 flash per second
Nominal Voltage	Regulated 12DC/FWR or regulated 24DC/FWR ¹
Operating Voltage Range²	8 to 17.5 V (12V nominal) or 16 to 33 V (24 nominal)
Input terminal wire gauge	12 to 18 AWG
Ceiling mount dimensions (including lens)	6.8" diameter × 2.5" high (173 mm diameter × 64 mm high)
Wall mount dimensions (including lens)	5.6"L × 4.7"W × 2.5"D (142 mm L × 119 mm W × 64 mm D)
Horn dimensions	5.6"L × 4.7"W × 1.3"D (142 mm L × 119 mm W × 33 mm D)
Wall-mount back box skirt dimensions (BBS-2, BBSW-2)	5.9"L × 5.0"W × 2.2"D (151 mm L × 128 mm W × 56 mm D)
Ceiling-mount back box skirt dimensions (BBSC-2, BBSCW-2)	7.1" diameter × 2.25" high (180 mm diameter × 57 mm high)
Wall-mount weatherproof back box dimensions (SA-WBB)	5.7"L × 5.1"W × 2.0"D (145 mm L × 130 mm W × 51 mm D)
Ceiling-mount weatherproof back box dimensions (SA-WBBC)	7.1" diameter × 2.0" high (180 mm diameter × 51 mm high)
Wall-mount trim ring dimensions (TR-HS, TRW-HS)	5.7"L × 4.812"W × 0.35"D (146 mm L × 122 W mm × 9 D mm)
Ceiling-mount trim ring dimensions (TRC-HS, TRCW-HS)	6.9" diameter × 0.35 high (176 mm diameter × 9 mm high)

Notes:

1. Full Wave Rectified (FWR) voltage is a non-regulated, time varying power source that is used on some power supply and panel outputs.
2. P, S, PC, and SC products will operate at 12V nominal only for 15 and 15/75 cd.

UL Current Draw Data

UL Max. Strobe Current Draw (mA RMS)						UL Max. Horn Current Draw (mA RMS)					
	Candela	8–17.5 Volts		16–33 Volts		Sound Pattern	dB	8–17.5 Volts		16–33 Volts	
		DC	FWR	DC	FWR			DC	FWR	DC	FWR
Standard Candela Range	15*	123	128	66	71	Temporal	High	57	55	69	75
	15/75*	142	148	77	81	Temporal	Medium	44	49	58	69
	30*	NA	NA	94	96	Temporal	Low	38	44	44	48
	75*	NA	NA	158	153	Non-temporal	High	57	56	69	75
	95*	NA	NA	181	176	Non-temporal	Medium	42	50	60	69
	110	NA	NA	202	195	Non-temporal	Low	41	44	50	50
	115	NA	NA	210	205	Coded	High	57	55	69	75
High Candela Range	135	NA	NA	228	207	Coded	Medium	44	51	56	69
	150	NA	NA	246	220	Coded	Low	40	46	52	50
	177	NA	NA	281	251						
	185	NA	NA	286	258						

UL Max. Current Draw (mA RMS), 2-wire Horn/Strobe, Standard Candela Range (15–115 cd)										
DC Input	8–17.5 Volts		16–33 Volts		30	75	95	110	115	
	15	15/75	15	15/75						
Temporal High	137	147	79	90	107	176	194	212	218	
Temporal Medium	132	144	69	80	97	157	182	201	210	
Temporal Low	132	143	66	77	93	154	179	198	207	
Non-temporal High	141	152	91	100	116	176	201	221	229	
Non-temporal Medium	133	145	75	85	102	163	187	207	216	
Non-temporal Low	131	144	68	79	96	156	182	201	210	
FWR Input										
Temporal High	136	155	88	97	112	168	190	210	218	
Temporal Medium	129	152	78	88	103	160	184	202	206	
Temporal Low	129	151	76	86	101	160	184	194	201	
Non-temporal High	142	161	103	112	126	181	203	221	229	
Non-temporal Medium	134	155	85	95	110	166	189	208	216	
Non-temporal Low	132	154	80	90	105	161	184	202	211	

UL Max. Current Draw (mA RMS), 2-wire Horn/Strobe, High Candela Range (135–185 cd)										
DC Input	16–33 Volts				FWR Input	16–33 Volts				
	135	150	177	185		135	150	177	185	
Temporal High	245	259	290	297	Temporal High	215	231	258	265	
Temporal Medium	235	253	288	297	Temporal Medium	209	224	250	258	
Temporal Low	232	251	282	292	Temporal Low	207	221	248	256	
Non-temporal High	255	270	303	309	Non-temporal High	233	248	275	281	
Non-temporal Medium	242	259	293	299	Non-temporal Medium	219	232	262	267	
Non-temporal Low	238	254	291	295	Non-temporal Low	214	229	256	262	

Candela Derating

For K series products used at low temperatures, listed candela ratings must be reduced in accordance with this table.

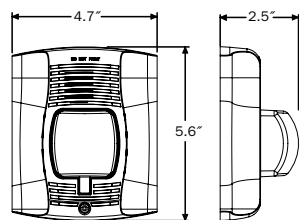
Strobe Output (cd)	
Listed Candela	Candela rating at –40°F
15	Do not use below 32°F
15/75	
30	
75	
95	44
110	70
115	110
135	115
150	135
177	150
185	177

Horn Tones and Sound Output Data

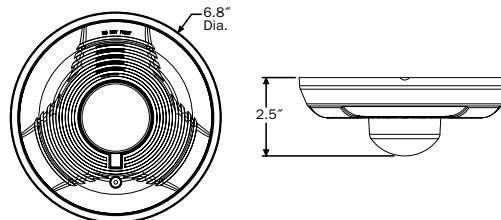
Horn and Horn/Strobe Output (dBA)											
Switch Position	Sound Pattern	dB	8–17.5 Volts		16–33 Volts		24 Volt Nominal				
			DC	FWR	DC	FWR	Reverberant		Anechoic		
							DC	FWR	DC	FWR	
1	Temporal	High	78	78	84	84	88	88	99	98	
2	Temporal	Medium	74	74	80	80	86	86	96	96	
3	Temporal	Low	71	73	76	76	83	80	94	89	
4	Non-temporal	High	82	82	88	88	93	92	100	100	
5	Non-temporal	Medium	78	78	85	85	90	90	98	98	
6	Non-temporal	Low	75	75	81	81	88	84	96	92	
7†	Coded	High	82	82	88	88	93	92	101	101	
8†	Coded	Medium	78	78	85	85	90	90	97	98	
9†	Coded	Low	75	75	81	81	88	85	96	92	

†Settings 7, 8, and 9 are not available on 2-wire horn/strobe.

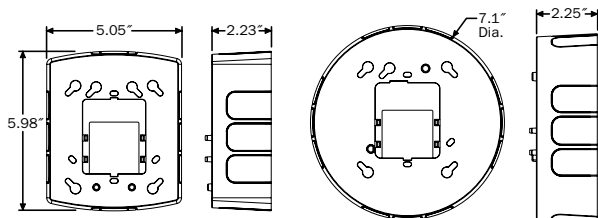
SpectrAlert Advance Dimensions



Wall-mount horn/strobes

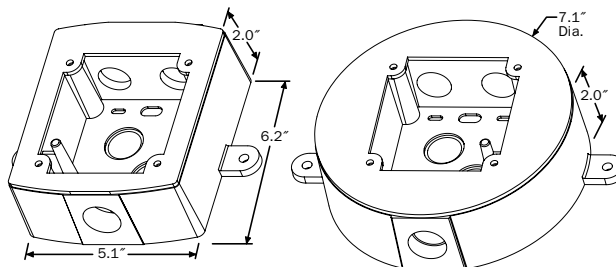


Ceiling-mount horn/strobes



Wall back box skirt

Ceiling back box skirt



Wall weatherproof back box

Ceiling weatherproof back box

SpectrAlert Advance Ordering Information

Model	Description
Wall Horn/Strobes	
P2R*†	2-wire Horn/Strobe, Standard cd†, Red
P2RH*	2-wire Horn/Strobe, High cd, Red
P2RK*‡	2-wire Horn/Strobe, Standard cd, Red, Outdoor
P2RHK‡	2-wire Horn/Strobe, High cd, Red, Outdoor
P2W*	2-wire Horn/Strobe, Standard cd, White
P2WH*†	2-wire Horn/Strobe, High cd, White
P4R*	4-wire Horn/Strobe, Standard cd, Red
P4RH*	4-wire Horn/Strobe, High cd, Red
P4RK‡	4-wire Horn/Strobe, Standard cd, Red, Outdoor
P4RHK‡	4-wire Horn/Strobe, High cd, Red, Outdoor
P4W*	4-wire Horn/Strobe, Standard cd, White
P4WH*†	4-wire Horn/Strobe, High cd, White
Wall Strobes	
SR*†	Strobe, Standard cd, Red
SRH*†	Strobe, High cd, Red
SRK‡	Strobe, Standard cd, Red, Outdoor
SRHK	Strobe, High cd, Red, Outdoor
SW*	Strobe, Standard cd, White
SWH*	Strobe, High cd, White
Ceiling Horn/Strobes	
PC2R*	2-wire Horn/Strobe, Standard cd, Red
PC2RH*	2-wire Horn/Strobe, High cd, Red
PC2RK‡	2-wire Horn/Strobe, Standard cd, Red, Outdoor
PC2RHK‡	2-wire Horn/Strobe, High cd, Red, Outdoor
PC2W*†	2-wire Horn/Strobe, Standard cd, White
PC2WH*†	2-wire Horn/Strobe, High cd, White
PC4R	4-wire Horn/Strobe, Standard cd, Red
PC4RH	4-wire Horn/Strobe, High cd, Red
PC4RK‡	4-wire Horn/Strobe, Standard cd, Red, Outdoor
PC4RHK‡	4-wire Horn/Strobe, High cd, Red, Outdoor

Model	Description
Ceiling Horn/Strobes (cont'd.)	
PC4W	4-wire Horn/Strobe, Standard cd, White
PC4WH	4-wire Horn/Strobe, High cd, White
Ceiling Strobes	
SCR*	Strobe, Standard cd, Red
SCRH*	Strobe, High cd, Red
SCRK‡	Strobe, Standard cd, Red, Outdoor
SCRHK‡	Strobe, High cd, Red, Outdoor
SCW*†	Strobe, Standard cd, White
SCWH*†	Strobe, High cd, White
Horns	
HR	Horn, Red
HRK‡	Horn, Red, Outdoor
HW	Horn, White
Accessories	
BBS-2	Back Box Skirt, Wall, Red
BBSW-2	Back Box Skirt, Wall, White
BBSC-2	Back Box Skirt, Ceiling, Red
BBSCW-2	Back Box Skirt, Ceiling, White
TR-HS	Trim Ring, Wall, Red
TRW-HS	Trim Ring, Wall White
TRC-HS	Trim Ring, Ceiling, Red
TRCW-HS	Trim Ring, Ceiling, White

Notes:

* Add "-P" to model number for plain housing (no "FIRE" marking on cover), e.g., P2R-P.

† Add "-SP" to model number for "FUEGO" marking on cover, e.g., P2R-SP.

‡ "Standard cd," refers to strobes that include 15, 15/75, 30, 75, 95, 110, and 115 candela settings. "High cd," refers to strobes that include 135, 150, 177, and 185 candela settings.

All outdoor units ending in "K" include a weatherproof back box.

⊞ Add "-R" to model number for weatherproof replacement device (no back box included).



3825 Ohio Avenue • St. Charles, IL 60174
Phone: 800-SENSOR2 • Fax: 630-377-6495

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Product specifications subject to change without notice. Visit systemsensor.com for current product information, including the latest version of this data sheet.
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CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7125-1653:0188

Page 1 of 1

CATEGORY: 7125 -- FIRE ALARM DEVICES FOR THE HEARING IMPAIRED

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Models CHSR and CHSW Chime/Strobes.
Models P2R, P2W, P2RH and P2WH Horn/Strobes two-wire type, rectangular enclosure.
Models PC2R, PC2W, PC2RH and PC2WH Horn/Strobes two-wire type, round enclosure
Models P4R, P4W, P4RH and P4WH Horn/Strobes four-wire type, rectangular enclosure.
Models PC4R, PC4W, PC4RH and PC4WH Horn/Strobes* four-wire type, round enclosure.
All models are intended for indoor use only unless other wise indicated. Models may be followed by the suffix "K" indicating indoor or outdoor use, or may be followed by suffix "P" for plain housing with no lettering. "K" suffix models are suitable for outdoor applications at temperatures from -40°F to +151°F (-40°C to +66°C) and are rated NEMA 4X when used with the System Sensor weather proof back boxes models SA-WBB (Wall), SA-WBBW (Wall), SA-WBBC (Ceiling) and *SA-WBBCW (Ceiling). Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: Standard Horn/Strobes and Chime/Strobes 8 - 17.5 or 16-33 VDC/FWR
Hi CD Horn/Strobes 16-33 VDC/FWR

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances, and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating, and UL label.

APPROVAL: Listed as *horn/strobes or chime/strobes suitable for signaling appliances and equipment for the hearing impaired applications when used with separately listed compatible fire alarm control units. Horn/strobes with -K suffix are suitable for indoor or outdoor use, ceiling or wall mount. Chime section is suitable for private mode and indoor use only.
Horn/Strobes or chime/strobes* can generate the distinctive three-pulse audible Temporal Pattern Fire Alarm Evacuation Signal (for total evacuation) in accordance with NFPA 72, 2010 Edition. Refer to listee's Installation Instruction Manual for details.

*Corrected 12-15-11 bh



This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other

Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**
Fire Engineering Division



Outdoor Selectable-Output Horns, Strobes, and Horn Strobes

SpectrAlert® Advance outdoor selectable-output horns, strobes, and horn strobes are rich with features that cut installation times and maximize profits.



Features

- Automatic selection of 12- or 24-volt operation at 15 and 15/75 candela
- Field-selectable candela settings on wall and ceiling units: 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, and 185
- Plug-in design with minimal intrusion into the back box
- Tamper-resistant construction
- Universal mounting plate for wall- and ceiling-mount units
- Mounting plate shorting spring tests wiring continuity before devices are installed
- Weatherproof per NEMA 4X, IP56
- Listed to UL 1638 (strobe) and UL 464 (horn)
- Rated from -40°F to 151°F
- Horn rated at 88+ dBA at 16 volts
- Rotary switch for horn tone and three volume selections
- Compatible with System Sensor synchronization protocol and legacy SpectrAlert products

The **SpectrAlert Advance** series offers the broadest line of outdoor horns, strobes, and horn strobes in the industry. With white and red plastic housings, wall and ceiling mounting options, and plain and FIRE-printed devices, SpectrAlert Advance can meet virtually any application requirement.

SpectrAlert Advance outdoor horns, strobes, and horn strobes can be used indoors or outdoors in wet or dry applications, and can provide reliable operation from -40°F to 151°F.

Like the entire SpectrAlert Advance product line, these devices include a variety of features that increase their application versatility while simplifying installation. All devices feature plug-in designs with minimal intrusion into the back box, which make installations fast and foolproof while virtually eliminating costly and time-consuming ground faults.

All horns, strobes, and horn strobes use a universal mounting plate with an onboard shorting spring that tests wiring continuity before the device is installed, protecting devices from damage. In addition, field-selectable candela settings, automatic selection of 12- or 24-volt operation, and a rotary switch for horn tones with three volume selections enables installers to easily adapt devices to suit a wide range of application requirements.

Agency Listings



S4011 (chimes, horn strobes, horns)
S3593 (outdoor and alert strobes)



7300-1653:187 (outdoor strobes)
7125-1653:188 (horn strobes,
chime strobes)
7135-1653:189 (horns, chimes)

SpectrAlert Advance Outdoor Horn, Strobe, and Horn Strobe Specifications

Architect/Engineer Specifications

General

SpectrAlert Advance outdoor horns, strobes and horn strobes shall mount to a weatherproof back box. A universal mounting plate shall be used for mounting ceiling and wall products. The notification appliance circuit wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance products, when used with the Sync-Circuit™ Module accessory, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts. When used with the Sync-Circuit Module, 12-volt-rated notification appliance circuit outputs shall operate between 9 and 17.5 volts; 24-volt-rated notification appliance circuit outputs shall operate between 17 and 33 volts. Outdoor SpectrAlert Advance products shall operate between –40 and 151 degrees Fahrenheit from a regulated DC or full-wave rectified unfiltered power supply. Strobes and horn strobes shall have field-selectable candela settings including 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, and 185.

Strobe

The strobe shall be a System Sensor SpectrAlert Advance Model _____ listed to UL 1971 and shall be approved for fire protective service. The strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. The strobe must be installed with its weatherproof back box in order to remain outdoor approved per UL. The strobe shall be suitable for use in wet environments.

Horn Strobe Combination

The horn strobe shall be a System Sensor SpectrAlert Advance Model _____ listed to UL 1971 and UL 464 and shall be approved for fire protective service. The horn strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. The horn shall have three audibility options and an option to switch between a temporal three-pattern and a non-temporal (continuous) pattern. These options shall be set by a multiple position switch. On four-wire products, the strobe shall be powered independently of the sounder. The horn or horn strobe models shall operate on a coded or non-coded power supply. The horn strobe must be installed with its weatherproof back box in order to remain outdoor approved per UL. The horn strobe shall be suitable for use in wet environments.

Physical/Electrical Specifications

Operating Temperature	–40°F to 151°F (–40°C to 66°C)
Strobe Flash Rate	1 flash per second
Nominal Voltage	Regulated 12 DC/FWR or regulated 24 DC/FWR ¹
Operating Voltage Range²	8 to 17.5 V (12 V nominal) or 16 to 33 V (24 V nominal)
Input Terminal Wire Gauge	12 to 18 AWG
Ceiling-Mount Dimensions (including lens)	6.8" diameter × 2.5" high (173 mm diameter × 64 mm high)
Wall-Mount Dimensions (including lens)	5.6" L × 4.7" W × 2.5" D (142 mm L × 119 mm W × 64 mm D)
Horn Dimensions	5.6" L × 4.7" W × 1.3" D (142 mm L × 119 mm W × 33 mm D)
Wall-Mount Weatherproof Back Box Dimensions (SA-WBB)	5.7" L × 5.1" W × 2.0" D (145 mm L × 130 mm W × 51 mm D)
Ceiling-Mount Weatherproof Back Box Dimensions (SA-WBBC)	7.1" diameter × 2.0" high (180 mm diameter × 51 mm high)

Notes:

1. Full Wave Rectified (FWR) voltage is a non-regulated, time-varying power source that is used on some power supply and panel outputs.
2. P, S, PC, and SC products will operate at 12 V nominal only for 15 and 15/75 cd.

UL Current Draw Data

UL Max. Strobe Current Draw (mA RMS)						UL Max. Horn Current Draw (mA RMS)					
	Candela	8–17.5 Volts		16–33 Volts		Sound Pattern	dB	8–17.5 Volts		16–33 Volts	
		DC	FWR	DC	FWR			DC	FWR	DC	FWR
Standard Candela Range	15	123	128	66	71	Temporal	High	57	55	69	75
	15/75	142	148	77	81	Temporal	Medium	44	49	58	69
	30	NA	NA	94	96	Temporal	Low	38	44	44	48
	75	NA	NA	158	153	Non-Temporal	High	57	56	69	75
	95	NA	NA	181	176	Non-Temporal	Medium	42	50	60	69
	110	NA	NA	202	195	Non-Temporal	Low	41	44	50	50
	115	NA	NA	210	205	Coded	High	57	55	69	75
High Candela Range	135	NA	NA	228	207	Coded	Medium	44	51	56	69
	150	NA	NA	246	220	Coded	Low	40	46	52	50
	177	NA	NA	281	251						
	185	NA	NA	286	258						

UL Max. Current Draw (mA RMS), 2-Wire Horn Strobe, Standard Candela Range (15–115 cd)										
DC Input	8–17.5 Volts		16–33 Volts		30	75	95	110	115	
	15	15/75	15	15/75						
Temporal High	137	147	79	90	107	176	194	212	218	
Temporal Medium	132	144	69	80	97	157	182	201	210	
Temporal Low	132	143	66	77	93	154	179	198	207	
Non-Temporal High	141	152	91	100	116	176	201	221	229	
Non-Temporal Medium	133	145	75	85	102	163	187	207	216	
Non-Temporal Low	131	144	68	79	96	156	182	201	210	
FWR Input										
Temporal High	136	155	88	97	112	168	190	210	218	
Temporal Medium	129	152	78	88	103	160	184	202	206	
Temporal Low	129	151	76	86	101	160	184	194	201	
Non-Temporal High	142	161	103	112	126	181	203	221	229	
Non-Temporal Medium	134	155	85	95	110	166	189	208	216	
Non-Temporal Low	132	154	80	90	105	161	184	202	211	

UL Max. Current Draw (mA RMS), 2-Wire Horn Strobe, High Candela Range (135–185 cd)										
DC Input	16–33 Volts				FWR Input	16–33 Volts				
	135	150	177	185		135	150	177	185	
Temporal High	245	259	290	297	Temporal High	215	231	258	265	
Temporal Medium	235	253	288	297	Temporal Medium	209	224	250	258	
Temporal Low	232	251	282	292	Temporal Low	207	221	248	256	
Non-Temporal High	255	270	303	309	Non-Temporal High	233	248	275	281	
Non-Temporal Medium	242	259	293	299	Non-Temporal Medium	219	232	262	267	
Non-Temporal Low	238	254	291	295	Non-Temporal Low	214	229	256	262	

Candela Derating

For K series products used at low temperatures, listed candela ratings must be reduced in accordance with this table.

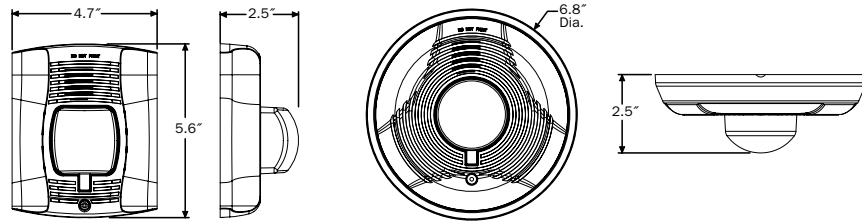
Strobe Output (cd)	
Listed Candela	Candela rating at –40°F
15	Do not use below 32°F
15/75	
30	
75	
95	44
110	70
115	110
135	115
150	135
177	150
185	177
	185

Horn Tones and Sound Output Data

Horn and Horn Strobe Output (dBA)											
Switch Position	Sound Pattern	dB	8–17.5 Volts		16–33 Volts		24-Volt Nominal				
			DC	FWR	DC	FWR	Reverberant		Anechoic		
							DC	FWR	DC	FWR	
1	Temporal	High	78	78	84	84	88	88	99	98	
2	Temporal	Medium	74	74	80	80	86	86	96	96	
3	Temporal	Low	71	73	76	76	83	80	94	89	
4	Non-Temporal	High	82	82	88	88	93	92	100	100	
5	Non-Temporal	Medium	78	78	85	85	90	90	98	98	
6	Non-Temporal	Low	75	75	81	81	88	84	96	92	
7 [†]	Coded	High	82	82	88	88	93	92	101	101	
8 [†]	Coded	Medium	78	78	85	85	90	90	97	98	
9 [†]	Coded	Low	75	75	81	81	88	85	96	92	

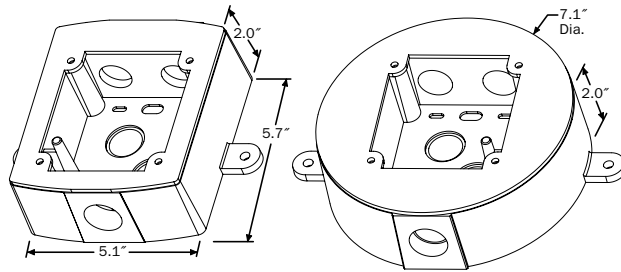
[†]Settings 7, 8, and 9 are not available on 2-wire horn strobe.

SpectrAlert Advance Dimensions



Wall-mount horn strobes

Ceiling-mount horn strobes



Wall weatherproof back box

Ceiling weatherproof back box

SpectrAlert Advance Ordering Information

Model	Description
Wall Horn Strobes	
P2RK*†	2-Wire Horn Strobe, Standard cd, Red, Outdoor
P2RHK*†	2-Wire Horn Strobe, High cd, Red, Outdoor
P2WK*†	2-Wire Horn Strobe, Standard cd, White, Outdoor
P2WHK*†	2-Wire Horn Strobe, High cd, White, Outdoor
P4RK†	4-Wire Horn Strobe, Standard cd, Red, Outdoor
P4WK	4-Wire Horn Strobe, Standard cd, White, Outdoor
P2RHK-120	2-Wire Horn Strobe, High cd, Red, Outdoor, 120 V
Wall Strobes	
SRK*†	Strobe, Standard cd, Red, Outdoor
SRHK*†	Strobe, High cd, Red, Outdoor
SWK*†	Strobe, Standard cd, White, Outdoor
SWHK*†	Strobe, High cd, White, Outdoor

Model	Description
Ceiling Horn Strobes	
PC2RK	2-Wire Horn Strobe, Standard cd, Red, Outdoor
PC2RHK	2-Wire Horn Strobe, High cd, Red, Outdoor
PC2WK	2-Wire, Horn Strobe, Standard cd, White, Outdoor
PC2WHK	2-Wire, Horn Strobe High cd, White, Outdoor
PC4WK	4-Wire, Horn Strobe, Standard cd, White, Outdoor
PC4WHK	4-Wire, Horn Strobe, High cd, White, Outdoor
Ceiling Strobes	
SCRK	Strobe, Standard cd, Red, Outdoor
SCRHK	Strobe, High cd, Red, Outdoor
SCWK	Strobe, Standard cd, White, Outdoor
SCWHK	Strobe, High cd, White, Outdoor
Horns	
HRK	Horn, Red, Outdoor

Notes:

* Add "-P" to model number for plain housing (no "FIRE" marking on cover), e.g., P2RK-P.

† Add "-R" to model number for weatherproof replacement device (no back box included), especially for use with weatherproof outdoor flush mounting plate, WTP and WTPW.

"Standard cd" refers to strobes that include 15, 15/75, 30, 75, 95, 110, and 115 candela settings. "High cd" refers to strobes that include 135, 150, 177, and 185 candela settings.



3825 Ohio Avenue • St. Charles, IL 60174
Phone: 800-SENSOR2 • Fax: 630-377-6495

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Product specifications subject to change without notice. Visit systemsensor.com for current product information, including the latest version of this data sheet.
A05-0456-001 • 06/09 • #2190

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7135-1653:0189

Page 1 of 1

CATEGORY: 7135 -- AUDIBLE DEVICES

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Models HR, HW Horns and CHR, CHW chimes. Intended for indoor use only unless otherwise indicated. Models may be followed by the suffix "K" indicating indoor or outdoor use. "K" suffix models are suitable for outdoor applications at temperatures from -40°F to +151°F (-40°C to +66°C) and are rated NEMA *4X when used with the System Sensor weather proof back boxes models SA-WBB (Wall), *SA-WBBW (Wall), SA-WBBC (Ceiling) and *SA-WBBCW (Ceiling). Models CHR and CHW are intended for private mode use only. Suitable for wall or ceiling mount.
Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: 8 - 17.5 or 16-33 Vdc/VFWR

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances, and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating, and UL label.

APPROVAL: Listed as audible devices when used with separately listed compatible fire alarm control units.

Units can generate the distinctive three-pulse Temporal Pattern Fire Alarm Evacuation Signal (for total evacuation) in accordance with NFPA 72, 2002 Edition. Refer to listee's Installation Instruction Manual for details.

*Rev 12-01-08 bh



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Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**

Fire Engineering Division

Honeywell



SK-RELAY

Intelligent Relay Module

The SK-RELAY is an addressable relay module for use with Honeywell Silent Knight Series fire alarm control panels (FACPs). The SK-RELAY allows a Silent Knight FACP to switch discrete contacts by code command. The relay contains two isolated sets of Form C contacts, which operate as a DPDT switch. No supervision is provided for the notification appliance circuit.

The SK-RELAY contacts can be used for virtually any normally open or normally closed application. Each SK-RELAY is programmed with a unique signaling line circuit (SLC) loop address. When an event occurs that controls the SK-RELAY, the relay is triggered by the FACP.

INSTALLATION

The SK-RELAY mounts directly into a 4" square electrical box. The box must have a minimum depth of 2-1/8". A surface mount electrical box (System Sensor® PN SMB500) is available from Silent Knight.



SK-RELAY

FEATURES & BENEFITS

- Two sets of Form C contacts
- Rotary address switches for fast installation
- Contacts are rated for a variety of amps (see Specifications)
- Panel controlled status LED that flashes green in normal state and is solid red in alarm
- Relay programming is completely flexible—can be mapped to zone conditions
- Polling LED visible through the cover plate
- SEMS screws for easy wiring
- UL Listed

SK-RELAY Technical Specifications

PHYSICAL

4.675" H x 4.275" W x 1.4" D

Shipping Weight: 6.3 oz (196 g)

ELECTRICAL

Operating Voltage: 15 – 32 VDC

End-of-Line Resistance: Not used

SLC Standby & Alarm Current: .255mA max @ 24VDC (one communication every 5 sec with LED enabled)

ENVIRONMENTAL

Operating Temperature: 32°F – 120°F (0°C – 49°C)

Humidity: 10% – 93% non-condensing

RELAY CONTACT RATINGS

3.0A @ 30VDC resistive

0.9A @ 110VDC resistive

0.9A @ 125VAC resistive

0.5A @ 125VAC inductive (PF = .35)

0.7A @ 75VAC inductive (PF = .35)

ORDERING INFORMATION

SK-RELAY: Relay Module

ACCESSORIES

SMB500: 4" Square Surface Mount Electrical Box

CB500 :Module Barrier

COMPATIBILITY

The SK-RELAY is compatible with the following Honeywell Silent Knight fire alarm control panels:

6820: Addressable fire alarm control panel

6820EVS: Addressable fire alarm control panel with an emergency mass notification system.

6808: Addressable fire alarm control panel

6700: Addressable fire alarm control panel

5700: Addressable fire alarm control panel

5808: Addressable fire alarm control panel

5820XL: Addressable fire alarm control panel

5820XL-EVS: Addressable fire alarm control panel with an emergency mass notification system.

For a complete listing of all compliance approvals and certifications, please visit www.silentknight.com.

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This document is not intended to be used for installation purposes. We try to keep our product information up-to date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For Technical Support, call 800-446-6444.

For more information

Learn more about Honeywell Silent Knight and other products by visiting www.silentknight.com

Honeywell Silent Knight

12 Clintonville Road
Northford, CT 06472
800-328-0103

Doc 3501271 Rev GI 11/17
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Honeywell



SK-MONITOR

Intelligent Monitor Module

The SK-MONITOR is an addressable monitor module for use with Honeywell Silent Knight Series fire alarm control panels (FACPs). The SK-MONITOR is intended for use in intelligent, two-wire systems, where individual address of each module is selected using the built-in rotary switches.

The SK-MONITOR supports Class A supervised or Class B supervised wiring to the load device. Conventional 4-wire smoke detectors can be monitored for alarm and trouble conditions.

INSTALLATION

The SK-MONITOR mounts directly into a 4" square electrical box. The box must have a minimum depth of 2-1/8". A surface mount electrical box (System Sensor® PN SMB500) is available from Silent Knight.



SK-MONITOR

FEATURES & BENEFITS

- Single contact monitor
- Support for Class A and Class B wiring
- Fully supervised
- Panel controlled status LED that flashes green in normal state and is solid red in alarm
- SEMS screws for easy wiring
- UL Listed
- Rotary address switches for fast installation

SK-MONITOR Technical Specifications

PHYSICAL

Height: 4.5"H x 4" W x 1.25"D (11.4 X 10.2 X 3cm)

Shipping Weight: 6.3 oz (196 g)

ELECTRICAL

Operating Voltage: 15 – 32VDC

Current Draw (LED on): 5.0mA max

Operating Current (LED flashing): 375µA

Standby Current: 400 µA max @ 24 VDC (one communication every 5 sec with 47K EOL); 550 µA max @ 24 VDC (one communication every 5 sec with EOL <1K)

5.5 mA (with LED latched on)

LED Current: 5.5 mA (with LED latched on)

End-of-Line Resistance: 47K Ω

Initiating Device Circuit Wiring Resistance: 1,500 Ω max

SLC Loop Resistance: 40 Ω max.

ENVIRONMENTAL

Operating Temperature: 32°F – 120°F (0°C – 49°C)

Humidity: 10% – 93% non-condensing

ORDERING INFORMATION

SK-MONITOR: Monitor Module

ACCESSORIES

SMB500: 4" Square surface mount electrical box

COMPATIBILITY

The SK-MONITOR is compatible with the following Honeywell Silent Knight fire alarm control panels:

6820: Addressable fire alarm control panel

6820EVS: Addressable fire alarm control panel with an emergency mass notification system.

6808: Addressable fire alarm control panel

6700: Addressable fire alarm control panel

5700: Addressable fire alarm control panel

5808: Addressable fire alarm control panel

5820XL: Addressable fire alarm control panel

5820XL-EVS: Addressable fire alarm control panel with an emergency mass notification system

For a complete listing of all compliance approvals and certifications, please visit www.silentknight.com.

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Honeywell Silent Knight

12 Clintonville Road
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CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7300-0559:0155 Page 1 of 1

CATEGORY: 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

LISTEE: SILENT KNIGHT SECURITY One Fire-Lite Place, Northford, CT 06472-1653
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Models IDP-Relay-6, SK-Relay-6, relay module, IDP-Control-6, SK -Control-6, supervising control module, IDP-Monitor-10, SK-Mon-10, input monitor module, IDP-Zone-6, SK-Zone-6 six zone interface module, IDP-Monitor, IDP-Minimon, IDP-Zone, SK-Monitor, SK-Minimon, SK-Zone monitor modules, IDP-Control, IDP-Relay, SK-Control, SK-Relay, control modules, IDP-Monitor-2, SK-Monitor-2, dual monitor modules, and *IDP-RELAYMON-2, *SK-RELAYMON-2 with 2 input/2 output relay modules. All devices are intended to be connected between the signaling line circuit of a compatible fire alarm control panel. Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: 16-33 VDC Primary

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes & ordinances and in manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, product number and UL label.

APPROVAL: Listed as control unit accessories for use with listee's separately listed compatible fire alarm control units.

NOTE: If an external power supply is used for Model SK-Zone-6 and IDP-Zone-6, the negative of the external power supply is referenced to the negative of the auxiliary supply of the compatible control panel. This is done in order to detect ground faults on the initiating circuit.

XLF: 7300-0028:0219

*Rev. 10-25-11 mt



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Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**
Fire Engineering Division



U.S. Pat. No. 3921989
Canadian Pat. No. 1009680
Other Patents Pending
Potter Electric, Rd., 1990

UL, ULC and CSFM Listed, FM and LPCB Approved, NYMEA Accepted, CE Marked

Service Pressure: Up to 450 PSI (31 BAR)

Minimum Flow Rate for Alarm: 10 GPM (38 LPM)

Maximum Surge: 18 FPS (5,5 m/s)

Contact Ratings: Two sets of SPDT (Form C)
15.0 Amps at 125/250VAC
2.0 Amps at 30VDC Resistive

Conduit Entrances: Two knockouts provided for 1/2" conduit

Environmental Specifications:

- Suitable for indoor or outdoor use with factory installed gasket and die-cast housing.
- NEMA 4/IP54 Rated Enclosure - use with appropriate conduit fitting.
- Temperature Range: 40°F/120°F, 4,5°C/49°C
- Non-corrosive sleeve factory installed in saddle.

Caution: This device is not intended for applications in explosive environments.

Sizes Available: Steel Pipe schedules 10 thru 40, sizes 2" thru 8"
BS 1387 pipe 50mm thru 200mm

Note: For copper or plastic pipe use Model VSR-CF.

Service Use:

Automatic Sprinkler	NFPA-13
One or two family dwelling	NFPA-13D
Residential occupancy up to four stories	NFPA-13R
National Fire Alarm Code	NFPA-72

Optional: Cover Tamper Switch Kit, Stock No. 0090018

GENERAL INFORMATION

The Model VSR-F is a vane type waterflow switch for use on wet sprinkler systems. It is UL Listed and FM Approved for use on steel pipe; schedules 10 through 40, sizes 2" thru 8" (50mm thru 200mm).

LPC approved sizes are 2" thru 8" (50mm thru 200mm).

The unit may also be used as a sectional waterflow detector on large systems.

The unit contains two single pole, double throw, snap action switches and an adjustable, instantly recycling pneumatic retard. The switches are actuated when a flow of 10 gallons per minute (38 LPM) or more occurs downstream of the device. The flow condition must exist for a period of time necessary to overcome the selected retard period.

ENCLOSURE: The unit is enclosed in a general purpose, die-cast housing. The cover is held in place with two tamper resistant screws which require a special key for removal. A field installable cover tamper switch is available as an option which may be used to indicate unauthorized removal of the cover. See bulletin no. 5400775 for installation instructions of this switch.

INSTALLATION: See Fig.2

These devices may be mounted on horizontal or vertical pipe. On horizontal pipe they should be installed on the top side of the pipe where they will be accessible. The units should not be installed within 6" (15cm) of a fitting which changes the direction of the waterflow or within 24" (60 cm) of a valve or drain.

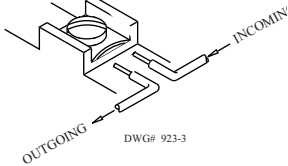
Drain the system and drill a hole in the pipe using a circular saw in a slow speed drill. The 2" (50mm) and 2 1/2" (65mm) devices require a hole with a diameter of 1 1/4" + 1/8" - 1/16" (33mm ±2mm). All other sizes require a hole with a diameter of 2" ±1/8" (50mm ±2mm).

Clean the inside pipe of all growth or other material for a distance equal to the pipe diameter on either side of the hole.

Roll the vane so that it may be inserted into the hole; do not bend or crease it. Insert the vane so that the arrow on the saddle points in the direction of the waterflow. Install the saddle strap and tighten nuts alternately to an eventual 50 ft-lbs. (68 n-m) of torque (see Fig. 2). The vane must not rub the inside of the pipe or bind in any way.

Specifications subject to change without notice.

FIG. 1
SWITCH TERMINAL CONNECTIONS
CLAMPING PLATE
TERMINAL



CAUTION:
An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire becomes dislodged from under the terminal.

FIG. 2

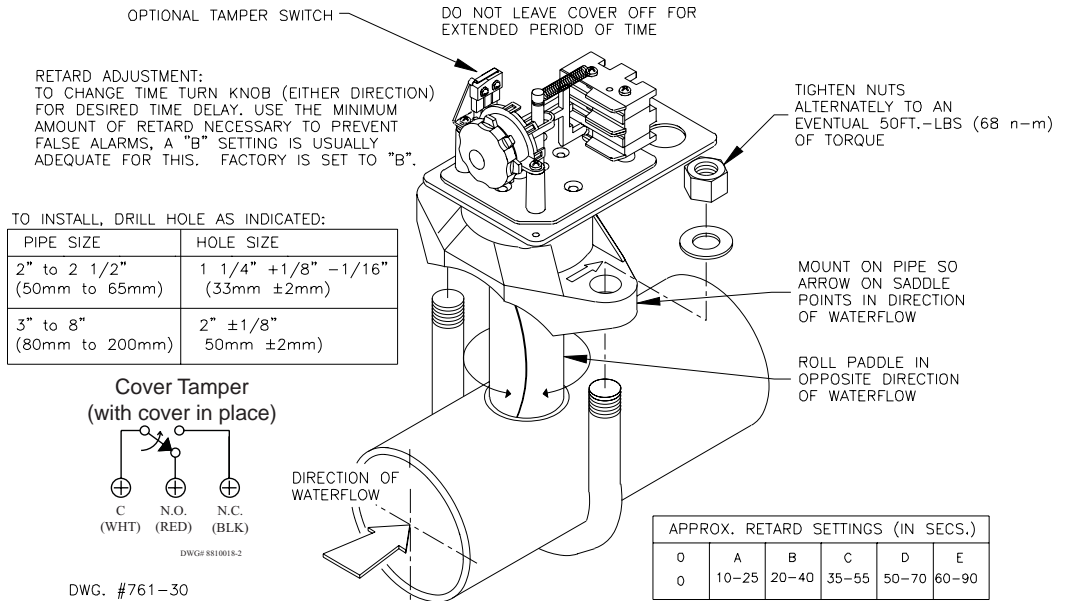
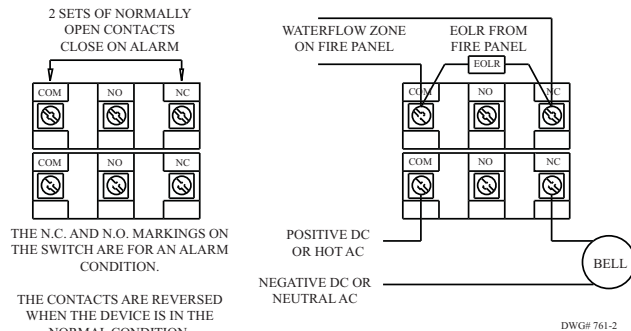


FIG. 3 TYPICAL ELECTRICAL CONNECTIONS

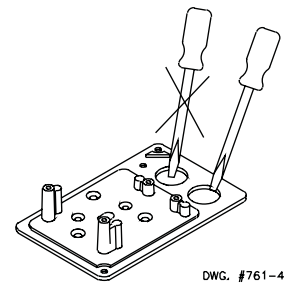


NOTES:

1. The Model VSR-F has two switches, one can be used to operate a central station, proprietary or remote signaling unit, while the other contact is used to operate a local audible or visual annunciator.
2. A condition of LPC Approval of this product is that the electrical entry must be sealed to exclude moisture.
3. For supervised circuits see "Switch Terminal Connections" drawing and caution note (Fig. 1).

FIG. 4

To remove knockouts: Place screwdriver at edge of knockouts, not in the center.



APPLICATION WARNING!

Due to the possibility of unintended discharges caused by pressure surges, trapped air, or short retard times, waterflow switches that are monitoring wet pipe sprinkler systems should not be used as the sole initiating device to discharge AFFF, deluge, or chemical suppression systems.

TESTING

The frequency of inspection and testing for the model VSR-F and its associated protective monitoring system should be in accordance with applicable NFPA Codes and Standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently). If provided, the inspector's test valve, that is usually located at the end of the most remote branch line, should always be used for test purposes. If there are no provisions for testing the operation of the flow detection device on the system, application of the VSR-F is not recommended or advisable.

A minimum flow of 10 gpm (38 Lpm) is required to activate this device.

IMPORTANT NOTICE: Please advise the person responsible for testing of the fire protection system that this system must be tested in accordance with the testing instructions.

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
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FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7770-0328:0001

Page 1 of 1

CATEGORY: 7770 -- VALVES/SWITCHES

LISTEE: Potter Electric Signal Co 1609 Park 370 Place, Hazelwood, MO 63042 United States
Contact: Bill Witherspoon (314) 595-6731 Fax (314) 595-6999
Email: BillW@pottersignal.com

DESIGN: Vane and pressure type water flow alarm switches listed below. Refer to listee's data sheet for detailed product description and operational considerations.

Vane Types:

VSR-CF	VSR-D	VSR-F	VSR-SF
VSR-FE-2	VS-SP	VS-F	VSR-SFG
VSR-SFT	VSG	VSR	VSR-S
VSR-C	VSR-ST	VSR-SG	

Pressure Type:

WFS-B	WFSR-C	WFSPD-B	PS10
PS-10A	PS-100A	WFSR-F	PS100

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number and UL or FM label.

APPROVAL: Listed as waterflow alarm switches for use with fire sprinkler systems. Vane models may be used in wet pipe systems; pressure models may be used in wet or dry systems. Model VSR-CF is for use on K, L or M copper pipe (2", 2-1/2", 3", 4") and listed CPVC pipe (2", 2-1/2", 3"). Model VSR-SF for use on 1", 1-1/4", 1-1/2" and *2" steel, copper or listed plastic pipe. Model VSG is for low flow rate. Model VSR-SFG and VSR-SFT are for use on 1", 1-1/4", 1-1/2" and *2" plastic pipe. Models VS-F, VSR-F, VSR-FE and VSR-FE-2 is for use on 2", 2-1/2", 3", 3-1/2", 4", 5", 6", 8" and 10" pipe. *Model VSR is for use on steel pipe sizes from 2" through 8". Vane type switches may be used outdoors when the outdoor temperature never falls below 40oF.

Rev*5-17-2007 jw



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Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**
Fire Engineering Division



OSY2 Supervisory Switch

System Sensor's OSY2 is used to monitor the open position of an Outside Screw and Yoke (OS&Y) type gate valve.



Features

- NEMA 3R rated enclosure
- User-friendly mounting bracket fits newer valve yokes
- Single side conduit entry does not require right angle fittings
- Adjustable length actuator eliminates the need for cutting the shaft
- Accommodates up to 12 AWG wire
- Three position switch monitors vandal and valve close signals
- Two SPDT contacts are enclosed in a durable terminal block for added strength
- 100% synchronization activates both alarm panel and local bell simultaneously

Robust Construction. The OSY2 consists of a rugged housing, intended for indoor and outdoor use. When installed with the actuator in the vertical position, the OSY2 is NEMA 3R rated per UL.

Application Flexibility. The OSY2 features a user-friendly mounting bracket and adjustable shaft to permit mounting to most OS&Y valves, ranging in size from 1" to 12". Its right angle design and wide bracket span provides maximum clearance for valve components, to accommodate troublesome valves. Removing the OSY2's gate valve bracket allows the unit to monitor side-bracket style pressure reducing valves.

Simplified Operation. Installation is made easier with the OSY2's single side conduit entrance. By providing a direct conduit pathway to the electrical source, right angle fittings are not required. Installation is further simplified by the OSY2's adjustable length actuator, which eliminates the need for cutting the shaft.

Reliable Performance. The OSY2 is equipped with tamper resistant cover screws to prevent unauthorized entry. Inside, two sets of SPDT (Form C) synchronized switches are enclosed in a durable terminal block to assure reliable performance.

Agency Listings



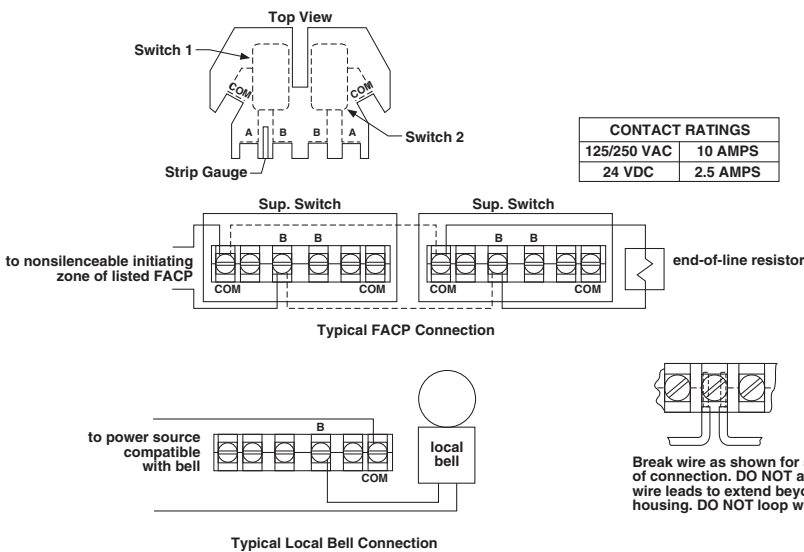
OSY2 Specifications

Architectural/Engineering Specifications

Model shall be model number OSY2 supervisory switch as manufactured by System Sensor. OSY2 shall be installed on each valve as designated on the drawings and/or as specified herein. Switches shall be mounted so as not to interfere with the normal operation of the valve and shall be adjusted to operate within two revolutions of the valve control or when the stem has moved no more than one-fifth of the distance from its normal position. The mechanism shall be contained in a weatherproof die cast metal housing, which shall provide a side entrance for 1/2" conduit and incorporate the necessary facilities for attachment to the valve. A grounding provision is provided. The switch assembly shall include two switches each with a rated capacity of 10 Amp @ 125/250VAC and 2.5 Amp @ 24VDC. The cover shall contain tamper-resistant screws for which a security wrench will be provided with each switch. The OSY2 shall be Underwriters Laboratories listed for indoor or outdoor use. The OSY2 shall be Factory Mutual, CSFM, and MEA approved.

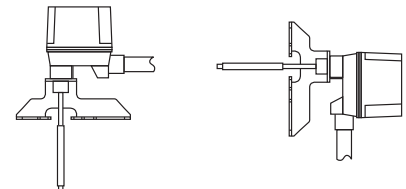
Physical Specifications		Operating Specifications	
Overall Switch Dimensions	5 3/4" H x 3 1/2" W x 3 1/4" D (14.6cm x 8.9cm x 8.2cm)	Contact Ratings	Two sets of SPDT (Form C) 10.0 A @ 125/250VAC; 2.5 @ 6/12/24VDC
Shipping Weight	2.8 lbs. (1.3 kg)	Enclosure Rating	UL indoor/outdoor NEMA 3R when mounted with the actuator vertical
Operating Temperature Range	32°F to 120°F (0°C to 49°C) NOTE: The OSY2 will operate from -40°F to 120°F (-40°C to 49°C); however UL does not test control valve supervisory switches below 32°F (0°C).	Cover Tamper Switch	Standard with ULC model Optional for UL model, part no. 546-7000
Maximum Stem Extension	2 3/8" (6.7cm)	Service Use	Automatic Sprinkler: NFPA 13 One or Two Family Dwelling: NFPA 13D Residential Occupancies up to 4 stories: NFPA 13R National Fire Alarm code: NFPA 72
Bracket Span	1/4" H x 6 3/4" W x 1" D (5.7cm x 17.1cm x 2.5cm)	Warranty	3 years
Conduit Entrances	One single side open for 1/2" conduit	U.S. Patent Nos.	5,478,038; 5,213,205

Electrical Connections for OSY2



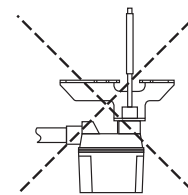
OSY2 Mounting

The following are examples of acceptable mounting positions:



Actuator Vertical (Down) Actuator Horizontal

The following mounting position is not acceptable:



Actuator Vertical (Pointing Up)

Ordering Information

Part No.	Description		
OSY2	Outside Screw and Yoke valve supervisory switch		
OSY2A	Outside Screw and Yoke valve supervisory switch (ULC model)		
Accessories			
OSYRK	Replacement hardware kit (wrenches, screw pack and J-hooks)	WFDW	Replacement tamper proof wrench for cover
546-7000	Cover tamper switch kit	HEXW	Replacement hex wrench
S07-66-XX	Tamper screws for cover		



3825 Ohio Avenue • St. Charles, IL 60174
Phone: 800-SENSOR2 • Fax: 630-377-6495

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A05-0196-009 • 11/06 • #1676

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7770-1653:0118 Page 1 of 1

CATEGORY: 7770 -- VALVES/SWITCHES

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Models PIBV2 and OSY2 valve supervisory switches. Suitable for outdoor use. Refer to listee's data sheet for detailed product description and operational considerations.

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model designation, electrical rating and UL label.

APPROVAL: Listed as valve supervisory switches for use in fire sprinkler systems. Suitable for outdoor use.

NOTE: Formerly 7770-1209:149

06-17-05



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Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**
Fire Engineering Division



SSM/SSV Series Alarm Bells

System Sensor's SSM and SSV series bells are low current, high decibel notification appliances for use in fire and burglary systems or other signaling applications.



Features

- Approved for indoor and outdoor use
- Low current draw
- High dB output
- Available in six-inch, eight-inch, and ten-inch sizes
- AC and DC models
- DC models polarized for use with supervision circuitry
- Mount directly to standard four-inch square electrical box indoors
- SSM and SSV series pre-wired

Reliable Performance. The SSM and SSV series provide loud resonant tones. The SSM series operates on 24VDC and are motor driven, while the SSV series operates on 120VAC utilizing a vibrating mechanism.

Simplified Installation. For indoor use, the SSM and SSV series mount to a standard four-inch square electrical box. For outdoor applications, weatherproof back box, model number WBB, is used.

The SSM and SSV series come pre-wired, to reduce installation time. The SSM series incorporates a polarized electrical design for use with supervision circuitry.

Agency Listings



SSM/SSV Specifications

Architectural/Engineering Specifications

Model shall be a SSM or SSV Series alarm bell. Bells shall have underdome strikers and operating mechanisms. Gongs on said bells shall be no smaller than nominal 6" / 8" / 10" (specify size) with an operating voltage of 24VDC or 120VAC (specify by part number). Bells shall be suitable for surface or semi-flush mounting. Outdoor surface mounted installations shall be weatherproof (using optional WBB weatherproof electrical box). Otherwise bells shall mount to a standard 4" square electrical box having a maximum projection of 2½". Bells shall be located as shown on the drawings or as determined by the Authority Having Jurisdiction. Bells shall be listed for indoor/outdoor use by Underwriters Laboratories and the California State Fire Marshal, and approved by Factory Mutual and MEA.

Physical/Operating Specifications

Operating Temperature Range	-31°F to 140°F
Operating Voltage	SSM series: 24VDC SSV series: 120VAC
Termination	Provided with 2 sets of leads for in/out wiring
Service Use	Fire Alarm, General Signaling, Burglar Alarm
Warranty	3 years

Electrical Specifications

Model	Gong Diameter (inches)	Nominal Voltage	Operating Voltage Limit	Maximum Current	Sound Output (dBA)
SSM24-6	6	Regulated 24VDC	16 to 33VDC	DC-31.1mA/ FWR-53.5mA	82
SSM24-8	8	Regulated 24VDC	16 to 33VDC	DC-31.1mA/ FWR-53.5mA	80
SSM24-10	10	Regulated 24VDC	16 to 33VDC	DC-31.1mA/ FWR-53.5mA	81
SSV120-6	6	Regulated 120VAC	96 to 132VAC	53mA	85
SSV120-8	8	Regulated 120VAC	96 to 132VAC	53mA	82
SSV120-10	10	Regulated 120VAC	96 to 132VAC	53mA	82

* Sound output measured at Underwriter Laboratories, as specified in UL464

Ordering Information

UL/FM Model No.	ULC/Canadian Model No.	Description
SSM24-6	SSM24-6A	Bell, 6", 24VDC, Polarized, 82dBA
SSM24-8	SSM24-8A	Bell, 8", 24VDC, Polarized, 80dBA
SSM24-10	SSM24-10A	Bell, 10", 24VDC, Polarized, 81dBA
SSV120-6	SSV120-6A	Bell, 6", 120VAC, 85dBA
SSV120-8	SSV120-8A	Bell, 8", 120VAC, 82dBA
SSV120-10	SSV120-10A	Bell, 10", 120VAC, 82dBA
WBB		Weatherproof back box for SSM and SSV series, when installed outdoors



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Phone: 800-SENSOR2 • Fax: 630-377-6495

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Product specifications subject to change without notice. Visit systemsensor.com for current product information, including the latest version of this data sheet.
A05-0260-008 • 4/07 • #1676

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FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7135-1653:0217

Page 1 of 1

CATEGORY: 7135 -- AUDIBLE DEVICES

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Models SSM24-6, -8, -10 and SSV120-6, -8, -10 audible signal devices. Models are AC or DC powered and available in 6", 8" and 10" bells. Refer to listee's data sheet for detailed product description and operational considerations. The units may be employed outdoors when used with NEMA 3R weather resistant back box Model WBB.

RATING: SSM24-6 Sound output: 82 dBA
SSM24-8 Sound output: 80 dBA
SSM24-10 Sound output: 81 dBA
SSV120-6 Sound output: 85 dBA
SSV120-8 Sound output: 82 dBA
SSV120-10 Sound output: 82 dBA
SSM Series Voltage Range: 16-33 VDC
SSV Series Voltage Range: 96-132 VAC
Temperature Range: -31°F to 150° F (-35°C to 66°C)

INSTALLATION: In accordance with listee's printed installation instruction, applicable codes & ordinances, and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number and UL label.

APPROVAL: Listed as audible devices for use with separately listed compatible fire alarm control units. If this appliance is required to produce a distinctive three-pulse Temporal Pattern Fire Alarm Evacuation Signal (for total evacuation) in accordance with NFPA 72, 2002 Edition, the appliance must be used with a fire alarm control unit that can generate the temporal pattern signal. Refer to manufacturer's Installation Manual for details.

07-30-10 fm



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Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**

Fire Engineering Division

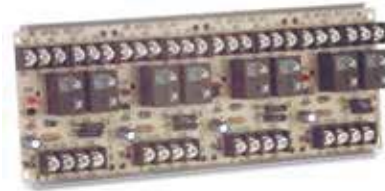


You in Control

MR-100, 200 SERIES MULTI-VOLTAGE CONTROL RELAYS

PRODUCT DESCRIPTION

The MR Series Multivoltage Control Relays offer SPDT or DPDT 10 Amp resistive contacts which may be operated by one of four input control voltages. A single relay may be energized from a voltage source of 24VDC, 24VAC, 120VAC or 230VAC by wiring to appropriate input terminals.



Each relay position contains a red LED which indicates the relay coil is energized. Relays may be "snapped apart" from a standard 4 module assembly and used independently. These Devices are Ideal for applications where local contacts are required for system status, remote contacts for control of electrical loads and general purpose switching. They are suitable for use with HVAC, Temperature Control, Fire Alarm, Security, Energy Management and Lighting Control Systems.

FEATURES

- ❖ Relays may be energized from a voltage source of 18 to 35VDC or VAC, 120VAC or 230VAC
- ❖ Each relay position contains a red LED, which illuminates when the coil is energized. This provides a time saving device when checking an installed system – no metering is required
- ❖ Single, dual or triple relay modules may be "snapped apart" from standard 4-position master
- ❖ DC control inputs are polarized
- ❖ For continuous duty use at 24VAC, 24VDC, 120VAC, or 230VAC
- ❖ Available in dust resistant enclosures with LED viewing port(s)
- ❖ /C versions mounted in enclosures
- ❖ /C/R versions with red covers for NYC and other uses
- ❖ /T versions come complete with track mounting hardware which facilitates installation in standard cabinets
- ❖ UL recognized relays rated at 10,000,000 mechanical operations
- ❖ UL listed as Control Unit Accessory

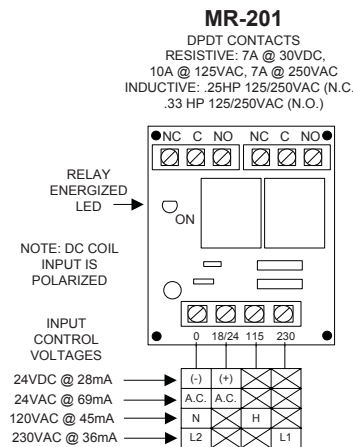
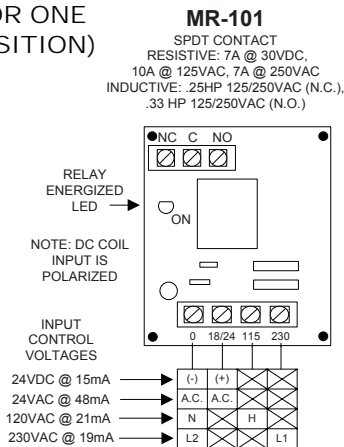


CSFM LISTED

MEA ACCEPTED



WIRING (TYPICAL FOR ONE MODULE POSITION)



*Air Products and Controls is
a Brand of Apollo America*
25 Corporate Drive
Auburn Hills, MI 48326
(248) 332-3900 Phone
(888) 332-2241 Toll free
(248) 332-8807 Fax
www.ap-c.com

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PRODUCT SPECIFICATIONS

MODEL NUMBER:	MODULE POSITIONS	CONTACT CONFIGURATION PER POSITION	TRACK MOUNTED H X W X D	ENCLOSURE MOUNTED H X W X D	COVER MATERIAL	UL* FILE S3403	MEA FILE 73-92-E	CSFM FILE 7300-1004
MR-101/T	1	SPDT	3.25" (82mm) 2.125" (54mm) 1.50" (38mm)			UOXX2		:106
MR-101/C	1	SPDT		5.125" (130mm) 3.125" (79mm)	Grey ABS-94VO Plastic	UOXX UOXX2	Vol. 14	:101
MR-101/C/R	1	SPDT		2.50" (63mm)	Red ABS-94VO Plastic	UOXX7	Vol. 22	
MR-104/T	4	SPDT	3.25" (82mm) 8.50" (215mm) 1.50" (38mm)			UOXX2		:106
MR-104/C	4	SPDT		5.125" (130mm) 9.50" (241mm)	Plated 18ga CRS	UOXX UOXX2	Vol. 14	:101
MR-104/C/R	4	SPDT		2.50" (63mm)	Red 18ga CRS	UOXX7		
MR-201/T	1	DPDT	3.25" (82mm) 2.125" (54mm) 1.50" (38mm)			UOXX2		:106
MR-201/C	1	DPDT		5.125" (130mm) 3.125" (79mm)	Grey ABS-94VO Plastic	UOXX UOXX2	Vol. 16	:101
MR-201/C/R	1	DPDT		2.50" (63mm)	Red ABS-94VO Plastic	UOXX7	Vol. 22	
MR-204/T	4	DPDT	3.25" (82mm) 8.5" (215mm) 1.50" (38mm)			UOXX2		:106
MR-204/C	4	DPDT		5.125" (130mm) 9.50" (241mm)	Plated 18ga CRS	UOXX UOXX2	Vol. 16	:101
MR-204/C/R	4	DPDT		2.50" (63mm)	Red 18ga CRS	UOXX7		

COIL VOLTAGE: MR-100: 24(18-35)VDC, 24(18-35)VAC, 120VAC, 230VAC
 MR-200: 24(18-35)VDC, 24VAC, 120VAC, 230VAC
 (Pull in voltage: 75% of nominal max. @ 25°C; Drop out voltage: 25% of nominal min. @ 25°C)

POLARIZED: DC input only

ENERGIZED LED INDICATOR: One per module position

CURRENT REQUIREMENT: Per module position: MR-100 Series = 48mA max/ MR-200 Series = 69mA max

CONTACT RATINGS: 7A @ 28VDC / 10A (NO:1/6HP, NC:1/8HP) @ 120VAC / 7A @ 230VAC

CONTACT CONSTRUCTION: Dry Form "C"

ENVIRONMENTAL: 32°F to 120°F (0°C to 49°C) @ 85% RH (@ 32°F), Non-condensing, Non-freezing

WIRING: Solid or stranded; #14 to #22 AWG terminals

/T VERSIONS: 3.5" wide, low profile plastic snap track provided with mounting screws

/C VERSIONS: Backbox: 18ga CRS, plated with 1/2" conduit knockouts top and bottom

*UOXX=Control Unit Accessories, System; 2=Component; 7=Certified for Canada

NOTICE: The information contained in this document is intended only as a summary and is subject to change without notice. The products described have specific instructional/installation documentation, which covers various technical, approval, code, limitation and liability information. Copies of this documentation along with any general product warning and limitation documents, which also contain important information, are provided with the product and are also available from Air Products and Controls Inc. The information contained in all of these documents should be considered before specifying or using the products. Any example applications shown are subject to the most current enforced local/national codes, standards, approvals, certifications, and/or the authority having jurisdiction. All of these resources, as well as the specific manufacturer of any shown or mentioned related equipment, should be consulted prior to any implementation. For further information or assistance concerning the products, contact Air Products and Controls Inc. Air Products and Controls Inc. reserves the right to change any and all documentation without notice.

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LISTING SERVICE

LISTING No. 7300-1004:0101

Page 1 of 1

CATEGORY: 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

LISTEE: Apollo America Inc. 25 Corporate Dr., Auburn Hills, MI 48326
Contact: John Schertel (248) 332-3900 Fax (248) 332-8807
Email: John.Schertel@apollo-fire.com

DESIGN: Models MR-101/C, *MR-101/C/R, *MR-101-SSE/C, *MR-101-SSE/C/R, MR-104/C, *MR_104/C/R, *MR-104-SSE/C, *MR-104-SSE/C/R, MR-201/C, MR-201/C/*R, *MR-201-SSE/C, *MR-201-SSE/C/R, MR-204/C, MR-204/C/*R, *MR-204-SSE/C, *MR-204-SSE/C/R, PAM-1, PAM-2, PAM-3, PAM-4, PAM-SD, RIC-1, RIC-2, RIC-3, RIC-4, MR-RIC-301/*C, *MR-RIC-301/C/R, MR-RIC-305/*C, *MR-RIC-305/C/R, MR-RIC-401/*C, *MR-RIC-401/C/R, MR-RIC-405/*C and *MR-RIC-405/C/R relay modules. *Models MR-ITM/C and MR-ITM/C/R relay modules (with test mode). Refer to listee's data sheet for detailed product description and operational considerations.

INSTALLATION: In accordance with listee's printed installation instruction, applicable codes & ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, electrical rating and UL label.

APPROVAL: Listed as relay modules for use with separately listed compatible fire alarm control units. Refer to manufacturer's Installation Manual for details.

NOTE: 1. Formerly Air Products and Controls, Inc.

*Rev. 04-03-14 gt



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Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**
Fire Engineering Division



60994B

12/2 Solid Shielded FPLP
Fire Alarm Signaling

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	12
• Conductor Stranding	Solid
• Conductor Type	Bare Copper
• Nominal DCR	1.8 Ohm/1000ft
• Cabling Lay Length	4 in
• Twists/Foot	3 twist/ft
INSULATION PARAMETER	-
• Insulation Type	Plenum PVC
• Insulation Thickness	0.009 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	Overall 100% Aluminum Foil
• Drain Wire Type	Tinned Copper
• Drain Wire AWG	24 AWG
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	84 pF/ft
• Nom. Cap. Conductor to Shield	151 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	Flexible Plenum
Jacket Thickness	0.015 in
Nominal Cable O.D.	0.243 in
Plenum	Yes
NEC UL Rating	FPLP
RoHS Compliant	Yes
Pull Tension	166 lbs
Bend Radius	2.187 in
Cable Weight	54 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	NFPA 262 Plenum
Operating Range	-0 to 60 Deg C
UL Voltage Rating	300



60994B

12/2 Solid Shielded FPLP
Fire Alarm Signaling

Related Products

RELATED PRODUCTS	-
Non Plenum Number	999
Aquaseal Number	AQC296
Aquaseal Direct Burial Number	AQ296

Technical Data Sheet

Fire Alarm Cables- Addressable



2833 West Chestnut Street
Washington, PA 15301
Toll Free: (800) 245-4964
Fax: (724) 222-6420
www.westpenn-wpw.com

PART NUMBER:	D990
DESCRIPTION:	16/2 Solid bare copper conductors, unshielded with an overall jacket.
NEC RATING:	FPL, NEC Article 760
APPROVALS:	(UL) or (ETL)us Listed
APPLICATION:	Indoor data fire alarm cable for (Data Circuits, Initiating Circuits, Notification Circuits, Addressable Systems)

Construction Parameters:

Conductor	16 AWG Bare Copper
Stranding	Solid
Insulation Material	Copolene
Insulation Thickness	0.015" Nom.
Number of Conductors	2
Shield	None
Drain	None
Jacket Material	PVC
Jacket Thickness	0.030" Nom.
Overall Cable Diameter	0.223" Nom.
Approximate Cable Weight	29 Lbs/1M' Nom.
Flame Rating	UL 1581 Vertical Tray Flame Test

Electrical & Environmental Properties:

Temperature Rating	-20deg C to 60deg C
Operating Voltage	300 V RMS
Max.Capacitance Between Conductors @ 1 KHz	18 pf/ft Nom.
DC Resistance per Conductor @ 20deg C	4.2 Ohms/1M' Nom.
Velocity of Propagation	71% Nom.
Insulation Colors	Black, Red
Jacket Color	Red
RoHS Compliant	--

Mechanical Properties:

Max. Recommended Pull Tension	62.4 lbs.
Min. Bend Radius (Install)	2.25"

Specification Issue Date: 7/06

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SK-FIRE-CO-W

Multi-Criteria Fire/CO Detector

General Description

SK-FIRE-CO-W is a plug-in, addressable device that provides both fire and carbon monoxide (CO) detection. The detector combines four separate sensing elements to sense multiple components of a fire: smoke, CO, light/flame, and heat. This approach enables enhanced sensitivity to real fire with heightened immunity to nuisance particulates. For CO, the detector's electrochemical sensing cell creates a separate signal for life safety CO detection.

Multiple sensors and communication can greatly reduce nuisance alarms compared to single sensing methods. Sophisticated algorithms maximize the advantages of all four sensor types creating our best detection strategy offering heightened immunity to nuisance particulate and enhanced sensitivity to real fire.

- Photoelectric sensors detect airborne particles associated with smoke.
- Thermal sensors detect heat and rate-of-rise (135°F fixed temperature threshold).
- Infrared sensors discern light patterns in the environment as an additional data point for alarm determination.

This ability to reject certain nuisance alarm triggers, such as theater smoke, supports the use of the fire/CO detector in applications where moderate to heavy nuisance conditions exist that might cause single sensing detectors to false alarm.

UL models meet UL 268 7th edition and UL 521 listing requirements for fire detection and UL 2075 standard for system-connected life safety carbon monoxide detection.

Released through the incomplete burning of various fuels, CO is a colorless, odorless and deadly gas that is virtually impossible to detect with the human senses. Because the potential exists for dangerous levels of CO to accumulate in almost any building, legislation mandating the use of CO detection in commercial spaces continues to grow.

B200S series intelligent sounder bases are recommended for use with SK-FIRE-CO-W. These bases can generate either a Temp 3 pattern for fire or a Temp 4 pattern for CO alarm indication. The B200S series bases recognize the System Sensor synchronization protocol for use as a component of the general evacuation signal – along with other System Sensor Audible/Visible devices – when connected to a power supply or Fire Alarm Control Panel (FACP) output capable of generating the System Sensor synchronization pulses.



SK-FIRE-CO-W in B200S-WH sounder base

FEATURES & BENEFITS

- Detects all four major elements of a fire
- Separate CO detection signal
- Separate audible signal for fire or CO alarm when used with a B200S series base
- Highest nuisance alarm immunity
- Automatic drift compensation for smoke and CO sensors
- RealTest® CO testing capability
- New modern profile with expanded color options
- Uses only one address on the SLC loop
- UL 268 7th edition, UL 521, and UL 2075 listed
- 10-year CO cell with end-of-life warning

SK-FIRE-CO-W Technical Specifications

PHYSICAL/OPERATING

Dimensions:

Height: 2.7" (69 mm) installed in B200S series sounder base

Diameter: 6.875" (175 mm) installed in B200S series sounder base

Weight: 3.4 oz. (95 g)

Operating Humidity Range: 15% to 90% Relative Humidity, Non-condensing

Operating Temperature Range: 32°F to 100°F (0°C to 38°C)

Air Velocity: 0 to 4000 ft./min. (0 to 1219.2 m/min.)

ELECTRICAL SPECIFICATIONS

Operating Voltage Range: 15 to 32 VDC

Operating Current @ 24 VDC: 200 uA (one communication every 5 seconds with green LED blink on communication)

Maximum Alarm Current: 2 mA @ 24 VDC (one communication every 5 seconds with red LED solid on)

Maximum Current: 4.5 mA @ 24 VDC (one communication every 5 seconds with amber LED solid on)

Isolator Load Rating: 0.0063

CO MONITORING UL STANDARD REFERENCE

Alarm thresholds (in parts per million) are as follows for:

70 ± 5ppm: Detector response time 60 – 240 min.

150 ± 5ppm: Detector response time 10 – 50 min.

400 ± 10ppm: Detector response time 4 – 15 min.

STANDARDS

Per UL standard 2075, the SK-FIRE-CO-W has have been tested to the sensitivity limits defined in UL Standard 2034.

UL Standard: UL 268 7th Edition

AGENCY LISTINGS AND APPROVALS

The listings and approvals below apply to the SK-FIRE-CO-W. In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult the factory for the latest listing status.

UL: S6173

CSFM: 7272-0559:0517

ORDERING INFORMATION

SK-FIRE-CO-W: Advanced multi-criteria fire/CO detector, white

Bases

B501-WHITE: 4" Mounting base, white

B501-WHITE-BP: 4" mounting base, white, 10-pack

B501-IV: 4" Mounting base, ivory

B501-BL: 4" Mounting base, black

B300-6: 6" Flanged mounting base, white

B300-6-BP: 6" Flanged mounting base, white, 10-pack

B300-6-IV: 6" Flanged mounting base, ivory

B200S-WH: Intelligent addressable sounder base, white

B200S-IV: Intelligent addressable sounder base, ivory

B200S-LF-WH: Intelligent addressable sounder base, low-frequency, white

B200S-LF-IV: Intelligent addressable sounder base, low-frequency, ivory

B224BI-WH: Isolator base, white

B224BI-IV: Isolator base, ivory

B224RB-WH: Relay base, white

B224RB-IV: Relay base, ivory

Accessories

SMB600: Surface mounting kit (flanged)

TR300: Trim ring, white

TR300-IV: Trim ring, ivory

CK300-IR: IR color kit (includes cover and trim ring), white, 10 pack

CK300-IR-IV: IR color kit (includes cover and trim ring), ivory, 10 pack

CK300-IR-BL: IR color kit (includes cover and trim ring), black, 10 pack

RA100Z: Remote LED annunciator

M02-04-00: Detector test magnet

M02-09-00: Telescoping test magnet

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This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

Country of origin: Mexico

Honeywell Silent Knight

12 Clintonville Road

Northford, CT 06472-1610

203.484.7161

www.silentknight.com

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LISTING SERVICE

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LISTING No. 7275-0559:0170

CATEGORY: 7275 -- COMBINATION SMOKE/CO DETECTOR-PHOTOELECTRIC TYPE

LISTEE: SILENT KNIGHT SECURITY One Fire-Lite Place, Northford, CT 06472-1653
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309
Email: megan.sisson@honeywell.com

DESIGN: Models SK-FIRE-CO and IDP-FIRE-CO combination multi-criteria photoelectric smoke and Carbon Monoxide detector with supplement heat sensor. Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: 15-32 VDC

INSTALLATION: In accordance with listee's printed installation instructions, NFPA 72, NFPA 720, applicable codes & ordinances and in manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, rating, and UL label.

APPROVAL: Listed as smoke detectors for use with Model B200S base and listee's separately listed compatible fire alarm control units. Also suited for gas and vapor detection. The supplemental heat sensor is intended for use to reduce the nuisance alarm and is not intended for use as a stand alone heat detector.

XLF: 7275-0028:0264

12-13-12 gt



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Date Issued: **July 01, 2020**

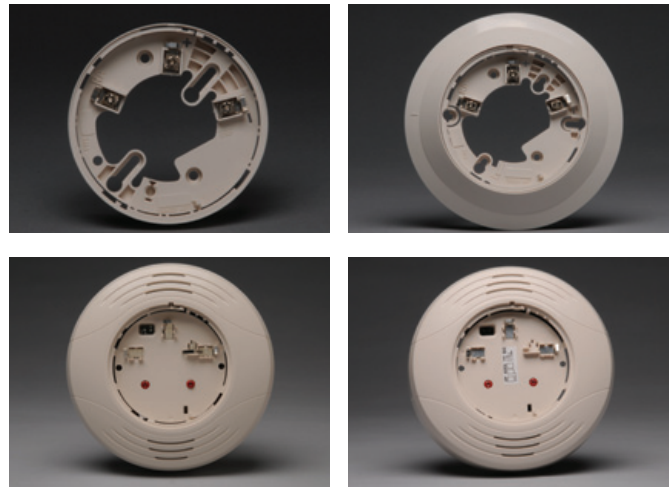
Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**
Fire Engineering Division



200 Series Mounting Base Options

System Sensor mounting bases and kits provide a variety of installation options for detectors in any application.



Features

- Bases enable quick and secure detector plug-in
- SEMS screws provide easy wiring connection
- Support for 12-24 AWG provides installation flexibility
- Multiple accessory options provide mounting flexibility
- Sounder bases are compliant with UL 464 and UL 268

To meet local code and application requirements,

System Sensor offers relay, isolator, and sounder base options for 200 Series detectors. Relay bases provide one form C contact relay for control of auxiliary functions, such as door closure and elevator recall. Isolator bases allow loops to continue to operate under fault conditions and automatically restore when the fault is removed. Sounder bases are available in a combination temporal 3 and continuous tone model (B200SR) or an addressable model (B200S) that can be activated by the fire alarm control panel based on the event.†

200 Series Bases provide a variety of mounting options to meet your installation challenges. Bases come in flanged or flangless versions for mounting to a variety of junction boxes. See the 200 Series Junction Box Selection Guide on the next page for junction box options. Surface mounting boxes are also available.

Agency Listings

Model	Listings
B501	UL, ULC,* FM, CSFM
B210LP	UL, ULC, FM, CSFM
B200S	UL, ULC, FM, CSFM
B200SR	UL, ULC, FM, CSFM
B224RB	UL, ULC, FM, CSFM
B224BI	UL, ULC, FM, CSFM

* For ULC-listed products, add "A" to the model number (e.g., B501A).

† Consult your fire alarm control panel manufacturer for compatibility with the addressable model of the sounder base.

Specifications – 200 Series Bases

Physical Specifications			
Diameter	B501: 4.1" (104 mm); B210LP: 6.1" (155 mm); B224BI, B224RB, B200SR, B200S: 6.875" (175 mm)		
Wire Gauge	B224BI, B224RB, B200SR, B200S, B210LP, B501: 24 to 12 AWG		
Temperature Range	Refer to applicable sensor Operating Temperature Range using the Base/Sensor Cross Reference Chart at systemsensor.com		
Humidity Range	10% to 93% RH non-condensing		
B224RB/B224BI Electrical Ratings		B200SR/B200S Electrical Ratings	
Operating Voltage	15 to 32 VDC (powered by SLC)	External Supply Voltage	16 to 33 VDC (VFWR)
Standby Current	170/450 μ A max.	Standby Current	500 μ A max.
Set Time (B224RB only)	Short Delay: 60 to 100 msec Long Delay: 6 to 10 sec		
Reset Time (B224RB only)	20 msec max.		
Relay Characteristics (B224RB only)	2 coil latching relay 1 Form C contact UL/ULC Rating: 0.5 A @ 125 VAC 0.9 A @ 125 VDC 3 A @ 30 VDC	Sound Output	Greater than 90 dBA measured in anechoic room at 10 feet, 24 volts. 85 dBA minimum in UL reverberant room
		Alarm Current	35 mA max.

200 Series Junction Box Selection Guide

Model	Single Gang	3.5" Octagonal	4" Octagonal	4" Square	4" Square*	50 mm	60 mm	70 mm	75 mm
B501	No	Yes	No	No	Yes	Yes	Yes	Yes	No
B210LP	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No
B224RB	Yes	No	Yes	Yes	Yes	No	No	Yes	No
B224BI	Yes	No	No	Yes	Yes	No	No	Yes	No
B200SR/B200S	Yes	Yes†	Yes	Yes	Yes†	No	No	Yes	No

* with 3.0" mud ring

† B200SA is not compatible with this junction box

Note: Box depth contingent on base and wire size. Refer to National Electric Code or applicable local codes for appropriate recommendations.

Ordering Information, 200 Series Bases

Model	Description
B501*	4" Flangeless Mounting Base
B501BP*	4" Flangeless Mounting Base Bulk Pack
B210LP*	6" Flanged Mounting Base
B210LPBP*	6" Flanged Mounting Base Bulk Pack
B200SR*	Standard Sounder Base (Compatible with B501BH Series)
B200S*	Intelligent Addressable Sounder Base
B224RB*	Relay Base
B224BI*	Isolator Base

200 Series Accessories

SMB600	Surface Mounting Kit (flanged)
F110	Accessory Flange Ring for 6" Base
F110BP	Accessory Flange Ring for 6" Base Bulk Pack
F210	Accessory New Smaller Flange Ring for 6" Base
RA100Z*	Remote LED Annunciator
M02-04-00	Detector Test Magnet
M02-09-00	Test Magnet with Telescoping Handle
XR2B	Detector Removal Tool (T55-127-000 included)
XP-4	Extension Pole for XR2B (5 to 15 ft.)
T55-127-000	Detector Removal Head
BCK-200B	Black Detector Kit
WCK-200B	White Detector Kit

* Add "A" to model number for ULC-listed product (e.g., B501A)

B200S Addressable Sounder Base Product Overview

When used with compatible fire alarm control panels, the B200S sounder base provides unmatched flexibility to configure the output to various events. When combined with System Sensor SpectrAlert® Advance notification appliances, the B200S can serve as a UL464 compliant component of the general evacuation signaling, improving aesthetics and reducing system costs.

Features*:

- Simple addressing scheme - base adopts the same address as attached sensor
- Synchronizable with SpectrAlert Advance notification appliances
- Four standard tone patterns at two selectable volumes
- Custom tone capability
- Support for Temporal-4 CO annunciation

* Note: Some features are dependent on Fire Alarm Panel programming. Consult your Fire Alarm Panel manual for more information on the capabilities of your system.



3825 Ohio Avenue • St. Charles, IL 60174
Phone: 800-SENSOR2 • Fax: 630-377-6495
www.systemsensor.com

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Product specifications subject to change without notice. Visit systemsensor.com for current product information, including the latest version of this data sheet.
SPDS13801 • 09/12

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7300-1653:0213

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CATEGORY: 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174

Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309

Email: megan.sisson@honeywell.com

DESIGN: Models B200S and B200SR detector audible sounder bases. Model B200S is capable of producing sound output in High and Low output with T3, T4, continuous tone, marching tone, and custom tone. Model B200SR can only be configured for T3 and continuous tone depending on the jumper setting. *Models B200S and B200SR may be followed by a two digit suffix, indicating the color of the detector's enclosure: -WH for white, -IV for ivory, -BL for black etc.

Refer to listee's data sheet for additional detailed product description and operational considerations.

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating and UL label.

APPROVAL: Listed as audible devices/detector bases for use with listee's separately listed compatible detectors. Units can generate the distinctive three-pulse Temporal Pattern Fire Alarm Evacuation Signal (for total evacuation) in accordance with NFPA 72, 2007 Edition. Refer to listee's Installation Instruction Manual for details.

*Rev 04-03-18 gt



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Date Issued: **July 01, 2020**

Listing Expires **June 30, 2021**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**

Fire Engineering Division