

# **Project Manual**

January 17, 2020

**Kelseyville Elementary School  
HVAC & Electrical Upgrades  
5065 Konocti Road  
Kelseyville, CA 95451**

**Kelseyville Unified School District  
4410 Konocti Road  
Kelseyville, CA 95451**

**persinger architects**  
and associates

6940 Burnett Street  
Sebastopol, CA 95472  
Phone: 707.829-0700  
Fax: 707.829-0706

**Architect's Project Number:**

**603.18.25**

SEALS PAGE:  
KELSEYVILLE ELEMENTARY SCHOOL  
HVAC & ELECTRICAL UPGRADES

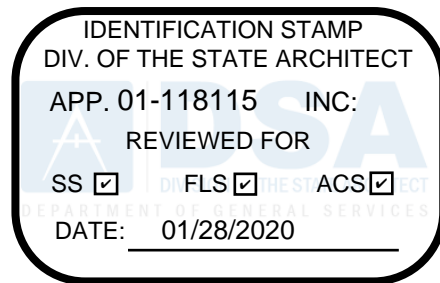
**Architect:**

Persinger Architects & Associates



**Mechanical/Plumbing Engineer**

15000 Inc.



**Electrical Engineer**

Sonoma Electrical Engineering, Inc.



**BIDDING AND CONTRACT DOCUMENTS FOR:**  
**KELSEYVILLE ELEMENTARY SCHOOL HVAC & ELECTRICAL UPGRADES**  
**KELSEYVILLE UNIFIED SCHOOL DISTRICT**

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## NOTICE INVITING BIDS

1. Notice is hereby given that the Governing Board ("Board") of the Kelseyville Unified School District ("District"), of the County of [Lake](#), State of California, will receive up to, but not later than, [TBD](#) and will then publicly open and read aloud at the Kelseyville Unified School District Business Office, sealed bids for the [Kelseyville Elementary School HVAC & Electrical Upgrades](#) ("Project"). Such bids shall be received at the office of the [Kelseyville Unified School District, 4410 Konocti Road, Kelseyville, CA 95451](#)
2. Each bid shall be completed on the Bid Proposal Form included in the Contract Documents, and must conform and be fully responsive to this invitation, the plans and specifications and all other Contract Documents. Copies of the Contract Documents are available for examination at the office of the [Project Architect, Persinger Architects, County of Sonoma, California](#), and may be obtained by contacting them at [707.829.0700](#).
3. Each bid shall be accompanied by cash, a cashier's or certified check, or a bidder's bond executed by a surety licensed to do business in the State of California as a surety, made payable to the District, in an amount not less than ten percent (10%) of the maximum amount of the bid. The check or bid bond shall be given as a guarantee that the bidder to whom the contract is awarded will execute the Contract Documents and will provide the required payment and performance bonds and insurance certificates within ten (10) days after the notification of the award of the contract.
4. The successful bidder shall comply with the provisions of the Labor Code pertaining to payment of the generally prevailing rate of wages and apprenticeships or other training programs. The Department of Industrial Relations has made available the general prevailing rate of per diem wages in the locality in which the work is to be performed for each craft, classification or type of worker needed to execute the contract, including employer payments for health and welfare, pension, vacation, apprenticeship and similar purposes. Copies of these prevailing rates are available to any interested party upon request and are online at <http://www.dir.ca.gov/DLSR>. The Contractor and all Subcontractors shall pay not less than the specified rates to all workers employed by them in the execution of the Contract. It is the Contractor's responsibility to determine any rate change.
5. The schedule of per diem wages is based upon a working day of eight hours. The rate for holiday and overtime work shall be at least time and one half.
6. The substitution of appropriate securities in lieu of retention amounts from progress payments in accordance with Public Contract Code §22300 is permitted.
7. Pursuant to Public Contract Code §4104, each bid shall include the name and location of the place of business of each subcontractor who shall perform work or service or fabricate or install work for the contractor in excess of one-half of one percent (1/2 of 1%) of the bid

price. The bid shall describe the type of the work to be performed by each listed subcontractor.

8. No bid may be withdrawn for a period of sixty (60) days after the date set for the opening for bids except as provided by Public Contract Code §§5100 *et seq.* The District reserves the right to reject any and all bids and to waive any informalities or irregularities in the bidding.
9. Minority, women, and disabled veteran contractors are encouraged to submit bids. This bid is \_\_\_ / is not X subject to Disabled Veteran Business Enterprise requirements.
10. The project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations. In accordance with SB 854, all bidders, contractors and subcontractors working at the site shall be duly registered with the Department of Industrial Relations at time of bid opening and at all relevant times. Proof of registration shall be provided as to all such contractors prior to the commencement of any work.
11. Each bidder shall possess at the time the bid is awarded the following classification(s) of California State Contractor's license: [A or B](#).
12. A mandatory bidders' conference will be held at [Kelseyville Elementary School \(5065 Konocti Road, Kelseyville, CA 95451\)](#) on [TBD](#) for the purpose of acquainting all prospective bidders with the Contract Documents and the Project site. Failure to attend the conference may result in the disqualification of the bid of the non-attending bidder.

Kelseyville Unified School District

By: Dave McQueen  
Superintendent

DATED:  
[Publication Dates: TBD](#)

## INSTRUCTIONS TO BIDDERS

Each bid submitted to the Kelseyville Unified School District (“District”) for the [Kelseyville Elementary School HVAC & Electrical Upgrades](#) (“Project”) shall be in accordance with the following instructions and requirements, which are part of the Contract Documents for this Project.

1. Deadline For Receipt of Bids. Each bid shall be sealed and submitted to the District Superintendent or designee no later than [TBD](#). The District suggests that bids be hand delivered in order to ensure their timely receipt. Any bids received after the time stated, regardless of the reason, shall be returned, unopened, to the bidder.
2. Bidders’ Conference. A [mandatory](#) bidders’ conference will be held at [Kelseyville Elementary School \(5065 Konocti Road, Kelseyville, CA 95451\)](#) on [TBD](#) for the purpose of acquainting all prospective bidders with the Contract Documents and the Project site. Failure to attend the conference may result in the disqualification of the bid of the non-attending bidder.
3. Requests for Information. A bidder’s failure to request clarification or interpretation of an apparent error, inconsistency or ambiguity in the Contract Documents waives that bidder’s right to thereafter claim entitlement to additional compensation based upon an ambiguity, inconsistency, or error, which should have been discovered by a reasonably prudent Contractor, subject to the limitations of Public Contract Code §1104. Any questions relative to the bid shall be in writing and directed to the District Superintendent or designee at the address specified for receipt of bid proposals. These requests shall be submitted to the District at least five working days prior to the date the bid is due.
4. Bid Proposal Forms. All bid proposals shall be made on the form provided by the District. All items on the form shall be filled out in ink. Numbers should be stated in figures, and the signatures of all individuals must be in long hand. The completed form should be without interlineations, alterations, or erasures
5. Execution of Forms. Each bid shall give the full business address of the bidder and must be signed by the bidder or bidder’s authorized representative with his or her usual signature. Bids by partnerships must furnish the full names of all partners and must be signed in the partnership name by a general partner with authority to bind the partnership in such matters. Bids by corporations must be signed with the legal name of the corporation, followed by the signature and designation of the president, secretary, or other person authorized to bind the corporation in this matter. The name of each person signing shall also be typed or printed below the signature. When requested by the District, satisfactory evidence of the authority of the officer signing on behalf of the corporation or partnership shall be furnished. A bidder's failure to properly sign required forms may result in rejection of the bid. All bids must include the bidder's contractor license number(s) and expiration date(s).

6. Bid Security. Bid proposals shall be accompanied by a certified or cashier's check or bid bond for an amount not less than ten percent (10%) of the bid amount, payable to the District. A bid bond shall be secured from an admitted surety company, licensed in the State of California, and satisfactory to the District. The bid security shall be given as a guarantee that the bidder will enter into the Contract if awarded the work, and in the case of refusal or failure to enter into the Contract within ten (10) calendar days after notification of the award of the Contract or failure to provide the payment and performance bonds and proof of insurance as required by the Contract Documents, the District shall have the right to award the Contract to another bidder and declare the bid security forfeited. The District reserves the right to pursue all other remedies in law or equity relating to such a breach including, but not limited to, seeking recovery of damages for breach of contract. Failure to provide bid security, or bid security in the proper amount, shall result in rejection of the bid.
7. Withdrawal of Bid Proposals. Bid proposals may be withdrawn by the bidders prior to the time fixed for the opening of bids, but may not be withdrawn for a period of sixty (60) days after the opening of bids, except as permitted pursuant to Public Contract Code §5103.
8. Addenda or Bulletins. The District reserves the right to issue addenda or bulletins prior to the opening of the bids subject to the limitations of Public Contract Code §4104.5. Any addenda or bulletins issued prior to bid time shall be considered a part of the Contract Documents.
9. Bonds. The successful bidder shall be required to submit payment and performance bonds as specified in and using the bond forms included with the Contract Documents. All required bonds shall be based on the maximum total contract price as awarded, including additive alternates, if applicable.
10. Rejection of Bids and Award of Contract. The District reserves the right to waive any irregularities in the bid and reserves the right to reject any and all bids. The Contract will be awarded, if at all, within sixty (60) calendar days after the opening of bids to the lowest responsible and responsive bidder, subject to Governing Board approval. The time for awarding the Contract may be extended by the District with the consent of the lowest responsible, responsive bidder.
11. Execution of Contract. The successful bidder shall, within ten (10) calendar days of the Notice of Award of the Contract, sign and deliver to the District the executed contract along with the bonds and certificates of insurance required by the Contract Documents. In the event the successful bidder fails or refuses to execute the Contract or fails to provide the bonds and certificates as required, the District may declare the bidder's bid deposit or bond forfeited as liquidated damages, and may award the work to the next lowest responsible, responsive bidder, or may reject all bids and, in its sole discretion, call for new bids. In all cases, the District reserves the right, without any liability, to cancel the award of Contract at any time prior to the full execution of the Contract.

12. Drawings and Specifications. All drawings, specifications and other documents used or prepared during the project shall be the exclusive property of the District.
13. Evidence of Responsibility. Upon the request of the District, a bidder shall submit promptly to the District satisfactory evidence showing the bidder's financial resources, the bidder's experience in the type of work being required by the District, the bidder's availability to perform the Contract and any other required evidence of the bidder's qualifications and responsibility to perform the Contract. The District may consider such evidence before making its decision to award the Contract. Failure to submit requested evidence may result in rejection of the bid.
14. Taxes. Applicable taxes shall be included in the bid prices.
15. Bid Exceptions. Bid exceptions are not allowed. If the Bidder has a comment regarding the bid documents or the scope of work, the Bidder shall submit those comments to the District for evaluation at least five working days prior to the opening of the bids. No oral or telephonic modification of any bid submitted will be considered and a sealed written modification may be considered only if received prior to the opening of bids. E-mailed or faxed bids or modifications will not be accepted.
16. Discounts. Any discounts which the bidder desires to provide the District must be stated clearly on the bid form itself so that the District can calculate the net cost of the bid proposal. Offers of discounts or additional services not delineated on the bid form will not be considered by the District in the determination of the lowest responsible responsive bidder.
17. Quantities. The quantities shown on the plans and specifications are approximate. The District reserves the right to increase or decrease quantities as desired.
18. Prices. Bidders must quote prices F.O.B. unless otherwise noted. Prices should be stated in the units specified and bidders should quote each item separately.
19. Samples. On request, samples of the products being bid shall be furnished to the District.
20. Special Brand Names/Substitutions. In describing any item, the use of a manufacturer or special brand does not restrict bidding to that manufacturer or special brand, but is intended only to indicate quality and type of item desired, except as provided in §3400 of the Public Contract Code. Substitute products will be considered either prior to or after the award of the Contract in accordance with §3400 and as set forth in either the Supplemental Conditions or the Specifications. All data substantiating the proposed substitute as an "equal" item shall be submitted with the written request for substitution. The District reserves the right to make all final decisions on product and vendor selection.
21. Container Costs and Delivery. All costs for containers shall be borne by the bidder. All products shall conform to the provisions set forth in the federal, county, state and city laws

for their production, handling, processing and labeling. Packages shall be so constructed to ensure safe transportation to the point of delivery.

22. Bid Negotiations. A bid response to any specific item of the bid using terms such as “negotiable,” “will negotiate,” or similar phrases, will be considered non-responsive.
23. Prevailing Law. In the event of any conflict or ambiguity between these instructions and state or federal law or regulations, the latter shall prevail. All equipment to be supplied or services to be performed under the bid proposal shall conform to all applicable requirements of local, state and federal law, including, but not limited to, Labor Code §§1771, 1778 and 1779.
24. Allowances. An “allowance” means an amount included in the bid proposal for work that may or may not be included in the Project, depending on conditions that will become known only after the Project is underway.
25. Subcontractors. Pursuant to the Subletting and Subcontracting Fair Practices Act, Public Contract Code §§4100-4114, every bidder shall, on the enclosed Subcontractor List Form, set forth:
  - a. The name and location of the place of business of each Subcontractor who will perform work or labor or render service to the bidder in or about the work or fabricate and install work in an amount in excess of one-half (1/2) of the one percent (1%) of the bidder's total bid.
  - b. If the bidder fails to specify a Subcontractor for any portion of the work to be performed under the Contract in excess of one-half (1/2) of one percent (1%) of the bidder's total bid, bidder agrees that bidder is fully qualified to and shall perform that portion of the work. The successful bidder shall not, without the written consent of the District or compliance with Public Contract Code §§4100 - 4114, either:
    - 1) Substitute any person as Subcontractor in place of the Subcontractor designated in the original bid;
    - 2) Permit any subcontract to be voluntarily assigned or transferred or allow the work to be performed by anyone other than the original Subcontractor listed in the bid; or
    - 3) Sublet or subcontract any portion of the work in excess of one-half (1/2) of one percent (1%) of the total bid as to which the bidder's original bid did not designate a Subcontractor.
26. Examination of Contract Documents and Work Site. Before submitting a bid proposal, all bidders shall carefully examine the Contract Documents, including the plans and



specifications, shall visit the site of the proposed work, and shall fully inform themselves of all conditions in and about the work site, as well as applicable federal, state and local laws and regulations that may affect the work. No bidder shall visit the site without prior authorization of the District. Bidders shall contact the District Superintendent or designee for coordination of site visits.

27. Form and Approval of Contract. The Contract Documents must be approved by the Governing Board of the District and its legal counsel. The bidder selected by the District shall execute the contract provided by the District.
28. Licenses and Permits. Each bidder shall at all times possess all appropriate and required licenses or other permits to perform the work as identified in the Contract Documents. Upon request, each bidder shall furnish the District with evidence demonstrating possession of the required licenses or permits.
29. Denial of Right to Bid. Contractors or Subcontractors who have violated state law governing public works shall be denied the right to bid on this public works contract pursuant to Labor Code §1777.7.
30. Bidders Interested in More Than One Bid. No person, firm, or corporation shall make, or file, or be interested in more than one bid. However, a person, firm, or corporation that has submitted a subproposal to a bidder, or that has quoted prices of materials to a bidder, is not thereby disqualified from submitting a sub-proposal or quoting prices to other bidders or from submitting a prime proposal.
31. Contractor's State License Board. Contractors and Subcontractors are required by law to be licensed and regulated by the California Contractors' License Board.
32. Fingerprinting. *(Applies to K-12 school districts only.)* By law it is the District's responsibility to determine whether a contractor must provide fingerprint certification. Pursuant to Education Code §45125.2, the District considers the totality of the circumstances in order to determine if fingerprinting of employees of a contractor working on a school site is required. Factors to be considered include the length of time the contractor's employees are on school grounds, whether students are in proximity to the location where the contractor's employees are working, and whether the contractor's employees are working alone or with others.
33. Disabled Veterans Participation Goals. *(Applies to K-12 districts only.)* In accordance with Education Code §17076.11, this District has a participation goal for disabled veteran business enterprises ("DVBE") of at least 3 percent per year of the overall dollar amount of funds allocated to the District by the State Allocation Board pursuant to the Leroy F. Greene School Facilities Act of 1998 for construction or modernization and expended each year by the District. Prior to, and as a condition precedent for final payment under the Contract for the project, the Contractor shall provide appropriate documentation to the District identifying the amount paid to DBVE in conjunction with the contract, so that the District

can assess its success at meeting this goal. The Office of Small Business and DVBE Certification (OSDC), (916) 375-4940, [www.pd.dgs.ca.gov/smbus/default.htm](http://www.pd.dgs.ca.gov/smbus/default.htm), is an information resource to assist bidders in locating Disabled Veteran Business Enterprises. (Please note: while the OSDC may be used as a resource, the DVBE Program administered by OSDC applies to state contracts, not local agency (school district) contracts.)

34. Labor Compliance Program. The project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations. In accordance with SB 854, all bidders, contractors and subcontractors working at the site shall be duly registered with the Department of Industrial Relations at time of bid opening and at all relevant times. Proof of registration shall be provided as to all such contractors prior to the commencement of any work.
35. Additive and Deductive Items: Method of Determining Lowest Bid. Pursuant to Public Contract Code §20103.8, if the bid solicitation includes additive and/or deductive items, the checked [X] method shall be used to determine the lowest bid: *[check one]*

  X   (a) The lowest bid shall be the lowest bid price on the base contract without consideration of the prices on the additive or deductive items.

       (b) The lowest bid shall be the lowest total of the bid prices on the base contract and those additive or deductive items that were specifically identified in the bid solicitation or Bid Proposal Form as being used for the purpose of determining the lowest bid price.

       (c) The lowest bid shall be the lowest total of the bid prices on the base contract and those additive or deductive items taken in order from a specifically identified list of those items that, when in the solicitation, and added to, or subtracted from, the base contract, are less than, or equal to, a funding amount publicly disclosed by the District before the first bid is opened.

       (d) The lowest bid shall be determined in a manner that prevents any information that would identify any of the bidders or the proposed Subcontractors or suppliers from being revealed to the public entity before the ranking of all bidders from lowest to highest has been determined.

If no method is checked, sub-paragraph (a) shall be used to determine the lowest bid.

Notwithstanding the method used by the District to determine the lowest responsible bidder, the District retains the right to add to or deduct from the Contract any of the items included in the bid solicitation.

36. Bid Protest. Any bid protest must be in writing and received by the District Office before 5:00 p.m. no later than three (3) working days following bid opening and shall comply with the following requirements:

- a. The bid protest must contain a complete statement of the basis for the protest and all supporting documentation.
- b. The party filing the protest must have actually submitted a bid for the Project. A Subcontractor of a bidder submitting a bid for the Project may not submit a bid protest. A bidder may not rely on the bid protest submitted by another bidder, but must timely pursue its own protest.
- c. The protest must refer to the specific portion or portions of the Contract Documents upon which the protest is based.
- d. The protest must include the name, address and telephone number of the person representing the protesting bidder.
- e. The bidder filing the protest must concurrently transmit a copy of the bid protest and all supporting documentation to all other bidders with a direct financial interest which may be affected by the outcome of the protest, including all other bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.
- f. The bidder whose bid has been protested may submit a written response to the bid protest. Such response shall be submitted to the District before 5 p.m. no later than two (2) working days after the deadline for submission of the bid protest or receipt of the bid protest, whichever is sooner, and shall include all supporting documentation. Such response shall also be transmitted concurrently to the protesting bidder and to all other bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.
- g. The procedure and time limits set forth in this section are mandatory and are the bidder's sole and exclusive remedy in the event of bid protest. The bidder's 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.
- h. If the District determines that a protest is frivolous, the protesting bidder may be determined to be non-responsible and that bidder may be determined to be ineligible for future contract awards by the District.
- i. A "working day" for purposes of this section means a weekday during which the District's office is open and conducting business, regardless of whether or not school is in session.

## BID PROPOSAL FORM

Governing Board  
Kelseyville Unified School District

Dear Members of the Governing Board:

The undersigned, doing business under the name of \_\_\_\_\_, having carefully examined the location of the proposed work, the local conditions of the place where the work is to be done, the Notice Inviting Bids, the General Conditions, the Instructions to Bidders, the Plans and Specifications, and all other Contract Documents for the proposed **Kelseyville Elementary School HVAC & Electrical Upgrades** ("Project"), and having accurately completed the Bidder's Questionnaire, proposes to perform all work and activities in accordance with the Contract Documents, including all of its component parts, and to furnish all required labor, materials, equipment, transportation and services required for the construction of the Project in strict conformity with the Contract Documents, including the Plans and Specifications, as follows:

BASE BID:

For the sum of

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_).

ADDITIVE/DEDUCTIVE ALTERNATE *[if applicable]*:

Additive/Deductive Alternate #1 \_\_\_\_\_  
Add/Subtract \_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

Additive/Deductive Alternate #2 \_\_\_\_\_  
Add/Subtract \_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

Additive/Deductive Alternate #3 \_\_\_\_\_  
Add/Subtract \_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

The undersigned has checked carefully all the above figures and understands that the District is not responsible for any errors or omissions on the part of the undersigned in making this bid.

Enclosed find certified or cashier's check no. \_\_\_\_\_ of the \_\_\_\_\_ Bank for \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) or Bidder's Bond of the \_\_\_\_\_ surety company in an amount of not less than ten percent (10%) of the entire bid. The undersigned further agrees, on the acceptance of this proposal, to execute the Contract and provide the required bonds

and insurance and that in case of default in executing these documents within the time fixed by the Contract Documents, the proceeds of the check or bond accompanying this bid shall be forfeited and shall become the property of the District.

Contractor agrees to commence the work within the time specified in the Notice to Proceed. It is understood that this bid is based upon completing the work within the number of calendar days specified in the Contract Documents.

**ADDENDA:**

Receipt of the following addenda is hereby acknowledged:

Addendum # _____	Dated: _____	Addendum # _____	Dated: _____
Addendum # _____	Dated: _____	Addendum # _____	Dated: _____
Addendum # _____	Dated: _____	Addendum # _____	Dated: _____

Respectfully submitted,

Company: \_\_\_\_\_

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

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

*(Please Print Or Type)*

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

Title: \_\_\_\_\_

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

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

Contractor's License No: \_\_\_\_\_ Expiration Date \_\_\_\_\_

Required Attachments:

Subcontractor List Form  
Non-Collusion Declaration  
Bid Bond (or Cashier's or Certified Check)  
Bidders' Questionnaire

## SUBCONTRACTOR LIST FORM

Each bidder shall list below the name and location of place of business for each Subcontractor who will perform a portion of the Contract work in an amount in excess of 1/2 of 1 percent of the total contract price. The nature of the work to be subcontracted shall also be described.

[illegible]

## WORKERS' COMPENSATION CERTIFICATE

Labor Code §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 in one or more insurers duly authorized to write compensation insurance in this State.
- (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 §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 and will require all Subcontractors to do the same.

---

Contractor

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

*In accordance with Article 5 (commencing at §1860), Chapter 1, Part 7, Division 2 of the Labor Code, the above certificate must be signed and filed with the awarding body prior to performing any work under this Contract.*

## NONCOLLUSION DECLARATION

*To be executed by the bidder and submitted with the bid.*

\_\_\_\_\_, declares that he or she is \_\_\_\_\_ of \_\_\_\_\_, the party making the foregoing bid, and affirms that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that 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, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true and correct; and, further, that 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, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

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

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



## BID BOND

We, the Contractor, \_\_\_\_\_ as principal ("Principal"), and \_\_\_\_\_, as surety ("Surety"), are firmly bound unto the [Kelseyville Unified School District](#) ("District") in the penal sum of ten percent (10%) of the total amount of the bid of the Principal submitted to the District for the work described below for the payment of which sum in lawful money of the United States, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by this agreement.

Whereas, the Principal has submitted the accompanying bid ("Bid") dated \_\_\_\_\_, for the following project ("Project"): [Kelseyville Elementary School HVAC & Electrical Upgrades](#).

Now, therefore, if the Principal does not withdraw its Bid within the period specified, and if the Principal is awarded the Contract and within the period specified fails to enter into a written contract with District, in accordance with the Bid as accepted, or fails to provide the proof of required insurance, the performance bond and/or the payment bond by an admitted surety within the time required, or in the event of unauthorized withdrawal of the Bid, if the Principal pays the District the difference between the amount specified in the Bid and the amount for which District may otherwise procure the required work and/or supplies, if the latter amount is in excess of the former, together with all related costs incurred by District, then the above obligation shall be void and of no effect. Otherwise, the Principal and Surety shall pay to the District the penal sum described above as liquidated damages.

Surety, for value received, hereby agrees that no change, extension of time, alteration or addition to the term 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.

In witness whereof the above-bound parties have executed this instrument under their several seals this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_, the name and corporate seal of each corporate Party being hereunder affixed and these presents duly signed by its undersigned representative, pursuant to the authority of its governing body.

(Corporate Seal)

\_\_\_\_\_  
Principal/Contractor

By \_\_\_\_\_

Title: \_\_\_\_\_

(Corporate Seal)

---

Surety

Attach Attorney-In-Fact Certificate

By 

---

---

Title

*To be signed by Principal and Surety and Acknowledgment and Notary Seal to be attached.*

## BIDDER'S QUESTIONNAIRE

for

### Kelseyville Elementary School HVAC & Electrical Upgrades

TO THE BIDDER:

In making its award, the Governing Board will take into consideration the Bidder's experience, financial responsibility and capability. The following questionnaire is a part of the bid. Any bid received without this completed questionnaire may be rejected as nonresponsive. The Board will use, but will not be limited to, the information provided herein for evaluating the qualifications and responsibility of the bidder and the bidder's organization to carry out satisfactorily the terms of the Contract Document. The questionnaire must be filled out accurately and completely and submitted with the bid. Any errors, omissions or misrepresentation of information may be considered as a basis for the rejection of the bid and may be grounds for the termination of any contract executed as a result of the bid.

A. Description of Bidder's Organization

1. Firm Name \_\_\_\_\_
2. Address \_\_\_\_\_
3. Telephone Number \_\_\_\_\_
4. Type of Organization
  - a. Corporation? Yes \_\_\_\_ No \_\_\_\_

If yes, list the officers and positions, and the State in which incorporated.

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If the Bidder corporation is a subsidiary, give name and address of parent corporation.

- b. Partnership? Yes \_\_\_\_ No \_\_\_\_

If yes, list partner names and addresses

General Partners:

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Limited Partners:

---

---

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c. Individual Proprietorship? Yes \_\_\_\_ No \_\_\_\_

If yes, list name and address of proprietor:

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B. Nature of Operations

1. How long have you been engaged in the contracting business under your present business name? \_\_\_\_\_
2. How many years of experience does your business have in construction work similar to that called for under this bid? \_\_\_\_\_
3. Have you now contracts, or have you ever contracted, to provide construction for any school district, community college district or county office of education in the State of California? Yes \_\_\_\_ No \_\_\_\_

a. If "yes," on a separate attached sheet, provide the following information for all construction projects you have had with school districts, community college districts and county offices of education during the last four (4) years:

1. Year contract awarded
2. Type of work
3. Contract completion time called for/actual completion time

4. Contract price
  5. For whom performed, including person to call for a reference and telephone number
  6. Location of work
  7. Number of stop notices filed
  8. For each contract, list any lawsuits filed relating to that contract in which you were a defendant or plaintiff
  9. Amount of liquidated damages assessed.
- b. On a separate attached sheet, provide the following information for all construction contracts of a similar nature as called for in this bid that you have had with entities other than school districts, community college districts and county offices of education during the last four (4) years:
1. Year contract awarded
  2. Type of work
  3. Contract completion time called for/actual completion time
  4. Contract price
  5. For whom performed, including person to call for reference and phone number
  6. Location of work
  7. Number of stop notices filed
  8. For each contract list any lawsuits filed relating to that contract in which you were a defendant or plaintiff
  9. Amount of liquidated damages assessed.
- c. For each construction contract that you have failed to complete within the contract time in the last four years please state the reasons for the untimely performance.'

C. Financial and Credit Data

1. If your bid is considered for award, and if requested by the District, will you supply the following data? Yes \_\_\_\_ No \_\_\_\_
  - a. Names and addresses of any banks where you regularly do business.
  - b. The names and addresses of any banks, finance companies, dealers, suppliers, or others where you have notes or loans.
  - c. Give credit references, including at least three trade or industry suppliers with whom you regularly deal.
2. Will you submit on request a balance sheet for the past three (3) years? Yes \_\_\_\_ No \_\_\_\_

3. Where have you engaged in the construction business, or any other type of business, in the last five years?

<u>Name of Business</u>	<u>Location</u>	<u>Type of Business</u>	<u>Years in Business</u>
-------------------------	-----------------	-------------------------	--------------------------

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

If any of the business endeavors referred to above are no longer operating, or you are no longer associated with them, please give brief details:

_____
_____
_____

4. The following surety companies may be contacted as references as to the financial responsibility and general reliability of the bidder:

<u>Surety Name</u>	<u>Contact Person</u>	<u>Phone Number</u>
--------------------	-----------------------	---------------------

_____	_____	_____
_____	_____	_____
_____	_____	_____

I certify under penalty of perjury that the foregoing is true and correct. Executed at \_\_\_\_\_, California, on \_\_\_\_\_, 20\_\_.

Signature of Bidder \_\_\_\_\_

Name (*print*) \_\_\_\_\_

## CONTRACT

This Contract ("Contract") is made by and between the [Kelseyville Unified School District](#) ("District"), and \_\_\_\_\_ ("Contractor").

District and Contractor hereby agree as follows:

1. Description of Work

The Contractor agrees to furnish all labor, materials, equipment, tools, supervision, appurtenances, and services, including transportation and utilities, required to perform and satisfactorily complete all work required for the following project ("Project") in full conformance with the Contract Documents:

[Kelseyville Elementary School HVAC & Electrical Upgrades](#)

2. Contract Documents

The Contract Documents consist of the executed Contract and all Addenda, all approved change orders, the completed Bid Form, the required Bonds and the Insurance forms, the Notice Inviting Bids, the Instructions to Bidders, the Notice of Award, the Notice to Proceed, the General Conditions and any supplemental conditions, the Technical Specifications, the Drawings, the completed Bidder's Questionnaire.

3. Compensation

As full compensation for the Contractor's complete and satisfactory performance of the work and activities described in the Contract Documents, the District agrees to pay Contractor, and Contractor agrees to accept the sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_), which shall be paid to the Contractor according to the Contract Documents.

4. Prevailing Wages

This Project is subject to prevailing wage requirements and Contractor and its Subcontractors are required to pay all workers employed for the performance of this Contract no less than the applicable prevailing wage rate for each such worker. Contractor acknowledges that the project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations in accordance with SB 854.

5. Time for Completion

The starting date of the Contract shall be the day listed by the District in the Notice to Proceed and the Contractor shall fully complete all the work before the expiration of [60 calendar days](#) from the starting date. Time is of the essence in the performance of this Contract.

6. Liquidated Damages

Liquidated damages for the Contractor's failure to complete the Contract within the time fixed for completion are established in the amount of \$1,000.00 per calendar day.

IN WITNESS WHEREOF, the parties agree to the terms of this Contract on the day and year written below.

\_\_\_\_\_  
District

\_\_\_\_\_  
Contractor

Resolution No. \_\_\_\_\_

\_\_\_\_\_  
Contractor License No.  
and Expiration Date

\_\_\_\_\_  
Date

By: \_\_\_\_\_  
Individual Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

For: \_\_\_\_\_  
Corporation or Partnership

If Corporation, Seal Below.



## GENERAL CONDITIONS

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1. DEFINITIONS

Addendum: A written change or revision to the Contract Documents issued to the prospective bidders prior to the time of receiving bids.

Alternate: The sum to be added to or deducted from the base Bid if the change in scope of work as described in Alternates is accepted by the District.

Approved: Approved by the District or the District's authorized representative unless otherwise indicated in the Contract Documents.

Architect: The person or firm holding a valid license to practice architecture or engineering which has been designated (if any designated) to provide architectural or engineering design services on this Project. When Architect is referred to within the Contract Documents and no architect or engineer has in fact been designated, then the matter shall be referred to the District Superintendent or designee.

As Directed: As directed by the District or its Architect, unless otherwise indicated in the Contract Documents.

As Selected: As selected by the District or its Architect, unless otherwise indicated in the Contract Documents.

Bid: The properly completed and signed proposal to perform the construction work for the Project as described in the Contract Documents.

Construction Manager: The individual or entity named as such by the District. If no Construction Manager is designated for the Project, all references to the Construction Manager in these Contract Documents shall mean the District and/or its designee.

Contract: The legally binding agreement between the District and the Contractor wherein the Contractor agrees to furnish the labor, materials, equipment, and appurtenances required to perform the work described in the Contract Documents and the District agrees to pay the Contractor for such work.

Contract Documents: The Contract Documents are described in the Contract for this Project.

Contractor: The person or entity holding a valid license in the State of California required for performing this Project and who has contracted with the District to perform the construction work described in the Contract Documents. The term Contractor shall be construed to mean all of the officers, employees, Subcontractors, suppliers, or other persons engaged by the Contractor for the work of this Project.

District and/or Owner: The District, its Governing Board, authorized officers and employees, and authorized representatives.

DSA: The State of California Division of the State Architect which has the authority to review, approve and inspect the design, alteration and construction of school buildings.

Final Completion: Final Completion is achieved when the Contractor has fully completed all Contract Document requirements, including, but not limited to, all final punch list items, to the District's satisfaction.

Inspector: The person engaged by the District to conduct the inspections required by the Education Code and Title 24.

Furnish: Purchase and deliver to the site of installation.

Governing Board: The Governing Board of the District.

Indicated or As Shown: Shown on drawings and/or as specified.

Install: Fix in place, for materials; and fix in place and connect, for equipment.

Modification: An authorized change to the Contract Documents which may or may not include a change in contract price and/or time.

Project: The total construction work and activities described in these Contract Documents.

Secure: Obtain.

Subcontractor: A person, firm, or corporation, duly licensed by the State of California, who has a contract with the Contractor to furnish labor, materials and equipment, and/or to install materials and equipment for work in this Contract.

## 2. ARCHITECT

The Architect is responsible for the overall design of the Project. The working drawings, technical Specifications, sketches and other information necessary to define the work covered by these Contract Documents have been prepared by the Architect. The Architect shall visit, inspect and observe the construction to determine general compliance with the Contract Documents, and interpret the drawings and Specifications consistent with their intent. The Architect shall evaluate the samples and other submittals required in the technical Specifications, and maintain an up-to-date log of all such items processed. The Architect will consult with the District, Contractor, and any state, county or city agency having jurisdiction over the work whenever necessary to further the best interests of the Project.

### 3. CONTRACT DOCUMENTS

#### a. Contents and Precedence

The Contract Documents consist of the executed Contract and all Addenda, all approved change orders, the completed Bid Form, the required Bonds and the Insurance forms, the Notice Inviting Bids, the Instructions to Bidders, the Notice of Award, the Notice to Proceed, the General Conditions, any supplemental Conditions, the Technical Specifications, the Drawings and the completed Bidder's Questionnaire. The Contract Documents are complementary and anything required by one shall be as binding as if required by all. In case of conflicts within the Contract Documents, the order of precedence of interpretation shall be as listed above, with the executed Contract and any change order thereto having priority, and subsequent Addenda having priority over prior Addenda only to the extent modified by the subsequent Addenda. In case of conflict within the drawings, larger scale drawings shall govern smaller scale drawings, and written dimensions shall govern over scaled dimensions.

#### b. Ambiguities, Errors, and Inconsistencies

If, in the opinion of the Contractor, the construction details indicated on the drawings or otherwise specified are in conflict with accepted industry standards for quality construction and therefore might interfere with its full guarantee of the work involved, the Contractor shall promptly bring this information to the attention of the Architect for appropriate action before submittal of the bid. Contractor's failure to request clarification or interpretation of an apparent ambiguity, error or inconsistency waives that Contractor's right to thereafter claim any entitlement to additional compensation based upon an ambiguity, inconsistency, or error, which should have been discovered by a reasonably prudent Contractor, subject to the limitations of Public Contract Code §1104. During the Project, should any discrepancy appear or any misunderstanding arise as to the import of anything contained in the Contract Documents, the matter shall be promptly referred to the Architect, who will issue instructions or corrections.

#### c. Lines and Planes

All lines and planes appearing on Contract drawings to be horizontal or vertical and not explicitly indicated otherwise shall be constructed true and plumb. All lines and planes appearing on Contract drawings to intersect at right angles and not explicitly indicated otherwise shall be constructed at true right angles. Where details are indicated covering specific conditions, such details also apply to all similar conditions not specifically indicated.

#### d. Standards

The specification standards of the various sections of the Specifications shall be the procedural, performance, and material standards of the applicable association publications identified and shall be the required level of installation, materials, workmanship, and performance for the applicable work. Except where a specific date of issue is mentioned hereinafter, references to specification standards shall mean the edition, including amendments and supplements, in effect on the date of the Notice Inviting Bids. Where no standard is identified and a manufacturer is specified, the manufacturer's specifications are the standards. All standards shall be subordinate to the requirements of the applicable codes and regulations.

e. Reference to the Singular

Wherever in the Specifications an article, device or piece of equipment is referred to in the singular number, such reference shall include as many such items as are shown on drawings or required to complete the installation.

4. INTENT OF DRAWINGS AND SPECIFICATIONS

- a. Drawings and Specifications are to be read as an integrated document. The Contractor shall promptly report to the Architect any ambiguities, discrepancies, or errors which come to the Contractor's attention.
- b. Figured dimensions shall be followed in preference to scaled dimensions, and the Contractor shall make all additional measurements necessary for the work and shall be responsible for their accuracy. Before ordering any material or doing any work, the Contractor shall verify all measurements at the Project site and shall be responsible for the correctness of same.
- c. It is the intent of the drawings and Specifications to show and describe complete installations. Items shown but not specified, or specified but not shown, shall be included unless specifically omitted.
  - 1) The Specifications shall be deemed to include and require everything necessary and reasonably incidental to the completion of all work described and indicated on the drawings, whether particularly mentioned or shown, or not.

5. TRADE DIVISIONS

Segregation of the Specifications into the designated trade divisions is only for the purpose of facilitating descriptions and shall not be considered as limiting the work of any subcontract or trade. Subject to other necessary provisions set forth in the Specifications, the terms and conditions of such limitations or inclusions shall lie solely between the Contractor and its Subcontractors. "Scope" as indicated in each section of the Specifications shall serve only as a general guide to what is included in that section. Neither the stated description nor the division of the plans and Specifications to various sections, which is done solely for convenience, shall be

deemed to limit the work required, divide or indicate it by labor jurisdiction or trade practice, or set up any bidding barriers to the various sub-contractors or suppliers.

- a. The Contractor shall be responsible for the proper execution of all work required by the Contract Documents and for allocating such portions as the Contractor sees fit to the various Subcontractors, subject to applicable law. The Contractor is cautioned that the various individual sections may not contain all work that the Contractor may wish to allocate to a particular Subcontractor or everything bearing on the work of a particular trade, some of which may appear in other portions of the plans or Specifications.
- b. If the Contractor elects to enter into any subcontract for any section of the work the Contractor assumes all responsibility for ascertaining that the Subcontractor for the work is competent, licensed, solvent, thoroughly acquainted with all conditions and legal requirements of the work, has included all materials and appurtenances in connection therewith in the subcontract, and has performed its work in strict compliance with the Contract Documents.
- c. It shall be the responsibility of the Contractor to notify each prospective Subcontractor at the time of request for bids of all portions of the Contract Documents, including the General Conditions, Supplementary Conditions and any parts of sections of Specifications or plans that the Contractor intends to include as part of the subcontract.

## 6. MASTER MANDATORY PROVISIONS

- a. Any material, item, or piece of equipment mentioned, listed or indicated without definition of quality, shall be consistent with the quality of adjacent or related materials, items, or pieces of equipment on the Project.
- b. Any method of installation, finish, or workmanship of an operation called for, without definition of standard of workmanship, shall be followed or performed and finished in accordance with best practices and consistent with adjacent or related installations on the Project.
- c. Any necessary material, item, piece of equipment or operation not called for but reasonably implied as necessary for proper completion of the work shall be furnished, installed or performed and finished; and shall be consistent with adjacent or related materials, items, or pieces of equipment on the Project, and in accordance with best practices.
- d. Names or numbered products are to be used according to the manufacturers' directions or recommendations unless otherwise specified.

## 7. CONTRACTOR



- a. The Contractor shall perform all the work and activities required by the Contract Documents and furnish all labor, materials, equipment, tools and appurtenances necessary to perform the work and complete it to the District's satisfaction within the time specified. The Contractor shall at all times perform the work of this Contract in a competent and workmanlike manner and, if not specifically stated, accomplish the work according to the best standards of construction practice. The Contractor in no way is relieved of any responsibility by the activities of the architect, engineer, inspector or DSA in the performance of such duties.
- b. The Contractor shall employ a full-time competent superintendent and necessary assistants who shall have complete authority to act for the Contractor on all matters pertaining to the work. The superintendent shall be satisfactory to the District and, if not satisfactory, shall be replaced by the Contractor with one that is acceptable. Also, the superintendent shall not be changed without the written consent of the District unless the superintendent ceases to be employed by the Contractor.
- c. Contractor shall make the layout of lines and elevations and shall be responsible for the accuracy of both the Contractor's and the Subcontractors' work resulting therefrom. All dimensions affecting proper fabrication and installation of all Contract work must be verified by the Contractor prior to fabrication and installation by taking field measurements of the true conditions. The Contractor shall take, and assist Subcontractors in taking, all field dimensions required in performance of the work, and shall verify all dimensions and conditions on the site. If there are any discrepancies between dimensions in drawings and existing conditions which will affect the work, the Contractor shall promptly bring such discrepancies to the attention of the Architect for adjustment before proceeding with the work. Contractor shall be responsible for the proper fitting of all work and for the coordination of all trades, Subcontractors and persons engaged upon this Contract.
- d. Contractor shall do all cutting, fitting, or patching of Contractor's work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors as shown, or reasonably implied by, the drawings and Specifications for the completed work. Any cost incurred by the District due to defective or ill-timed work shall be borne by the Contractor.

8. RESPONSIBILITY OF CONTRACTOR

- a. Contractor shall be held strictly responsible for the proper performance of all work covered by the Contract Documents, including all work performed by Subcontractors. All work performed under this Contract shall comply in every respect to the rules and regulations of all agencies having jurisdiction over the Project or any part thereof.
- b. Contractor shall submit Verified Reports as defined in §§4-336 and 4-343 (c), Group 1, Chapter 4, Part I, Title 24, California Code of Regulations ("CCR"). The duties of the Contractor are as defined in §4-343, Group 1, Chapter 4, Part I, Title 24, of the CCR.

Contractor shall keep and make available a copy of Title 24 of the CCR at the job site at all times.

- c. Where, because of short supply, any item of fabricated materials and/or equipment, indicated on drawings or specified is unobtainable and it becomes necessary, with the consent of the Architect, to substitute equivalent items differing in details or design, the Contractor shall promptly submit complete drawings and details indicating the necessary modifications of the work. This provision shall be governed by the terms of the General Conditions regarding Submittals: Shop Drawings, Cuts and Samples.
- d. With respect to work performed at and near a school site, Contractor shall at all times take all appropriate measures to ensure the security and safety of students and staff, including, but not limited to, ensuring that all of Contractor's employees, Subcontractors, and suppliers entering school property strictly adhere to all applicable District policies and procedures, e.g., sign-in requirements, visitor badges, and access limitations.

9. SUBCONTRACTORS

- a. Nothing contained in the Contract Documents shall create any contractual relationship between any Subcontractor and the District. The District shall be deemed to be the third party beneficiary of the contract between the Contractor and each Subcontractor. If the Contractor does not specify a Subcontractor for any portion of the work to be performed under this Contract, as required by law, Contractor shall perform that portion of the work with its own forces. The Contractor shall not substitute any other person or firm as a Subcontractor for those listed in the bid submitted by the Contractor, without the written approval of the District and in conformance with the requirements of the Public Contract Code. The District reserves the right of approval of all Subcontractors proposed for use on this Project, and to this end, may require financial, performance, and such additional information as is needed to secure this approval. If a Subcontractor is not approved, the Contractor shall promptly submit another firm of the same trade for approval.
- b. The Contractor shall insert appropriate provisions in all subcontracts pertaining to work on this Project requiring the Subcontractors to be bound by all applicable terms of the Contract Documents. The Contractor shall be as fully responsible for the acts and omissions of the Subcontractors, and of persons either directly or indirectly employed by them, as the Contractor is for the acts and omissions of persons directly employed by the Contractor.

10. PERFORMANCE AND PAYMENT BONDS

- a. As directed in the Notice of Award, the Contractor shall file with the District the following bonds, using the bond forms provided with these Contract Documents:
  - 1) A corporate surety bond, in a sum not less than 100 percent of the amount of the Contract, to guarantee the faithful performance of the Contract.

- 2) A corporate surety bond, in a sum not less than 100 percent of the amount of the Contract, to guarantee the payment of wages for services engaged and of bills contracted for materials, supplies, and equipment used in the performance of the Contract.
- b. Corporate sureties on these bonds and on bonds accompanying bids must be admitted sureties as defined by law, legally authorized to engage in the business of furnishing surety bonds in the State of California. All sureties and bond forms must be satisfactory to the District. Failure to submit the required bonds within the time specified by the Notice of Award, using the forms provided by the District, may result in cancellation of the award of Contract and forfeiture of the Bid Bond.
- c. The amount of the Contract, as used to determine the amounts of the bonds, shall be the total amount fixed in the Contractor's proposal for the performance of the required work.
- d. During the period covered by the Contract, if any of the sureties upon the bonds shall become insolvent or unable, in the opinion of the District, to pay promptly the amount of such bonds to the extent to which surety might be liable, the Contractor, within thirty (30) days after notice given by the District to the Contractor, shall provide supplemental bonds or otherwise substitute another and sufficient surety approved by the District in place of the surety becoming insolvent or unable to pay. If the Contractor fails within such thirty (30) day period to substitute another and sufficient surety, the Contractor shall, if the District so elects, be deemed to be in default in the performance of its obligations hereunder and upon the bid bond, and the District, in addition to any and all other remedies, may terminate the Contract or bring any proper suit or other proceedings against the Contractor and the sureties or any of them, or may deduct from any monies then due or which thereafter may become due to the Contractor under the Contract, the amount for which the surety, insolvent or unable to pay, shall have been liable on the bonds, and the monies so deducted shall be held by the District as collateral security for the performance of the conditions of the bonds.

## 11. INSURANCE

- a. Contractor shall obtain insurance from a company or companies acceptable to District. All required insurance must be written by an admitted company licensed to do business in the State of California at the time the policy is issued. All required insurance shall be equal to or exceed an A VIII rating as listed in Best's Insurance Guide's latest edition. On a case-by-case basis, the District may accept insurance written by a company listed on the State of California Department of Insurance List of Eligible Surplus Lines ("LESLI List") with a rating of A VIII or above as listed in Best's Insurance Guides' latest edition. Required documentation of such insurance shall be furnished to the District within the time stated in the Notice of Award. Contractor shall not commence work nor shall it allow its employees or Subcontractors or anyone to commence work until all insurance required

hereunder has been submitted and approved by the District and a notice to proceed has been issued.

- b. Contractor shall take out and maintain at all times during the life of this Contract, up to the date of acceptance of the work by the District, the following policies of insurance:

- 1) General Liability Insurance: Personal injury and replacement value property damage insurance for all activities of the Contractor and its Subcontractors arising out of or in connection with this Contract, written on a comprehensive general liability form including contractor's protected coverage, blanket contractual, completed operations, vehicle coverage and employer's non-ownership liability coverage, in an amount no less than either:

a. \$1,000,000.00 combined single limit personal injury and property damage for each occurrence and \$2,000,000.00 annual aggregate with a \$2,000,000 umbrella/excess; or

b. \$2,000,000.00 annual combined single limit.

- 2) Builders Risk Insurance:

       Contractor is not required to procure and maintain builders' risk insurance (all-risk coverage).

  X   Contractor shall procure and maintain builders' risk insurance (all-risk coverage) on a one hundred percent completed value basis on the insurable portion of the project for the benefit of the District, and the Contractor and subcontractor as their interest may appear.

- 3) Automobile Liability Insurance: Covering bodily injury and property damage in an amount no less than \$1,000,000 combined single limit for each occurrence. Such insurance shall include coverage for owned, hired, and non-owned vehicles and be included on the umbrella/excess policy.

- c. The certificate(s) for both the General Liability Policy(ies) and the Automobile Liability Policy specified above must state that the insurance is under an occurrence based, and not claims made, policy(ies) and shall be endorsed with the following specific language:

“The Kelseyville Unified School District is named as additional insured for all liability arising out of the operations by or on behalf of the named insured, and this policy protects the additional insured, its officers, agents and employees against liability for bodily injuries, deaths or property damage or destruction arising in any respect directly or indirectly in the performance of the Contract.”

- d. The certificate(s) for the both the General Liability Policy and the Automobile Liability Policy, as well the Builders' Risk Policy if required above, shall be endorsed with the following specific language:
- 1) The inclusion of more than one insured shall not operate to impair the rights of one insured against another insured and the coverages afforded shall apply as though separate policies have been issued to each insured.
  - 2) The insurance provided herein is primary and no insurance held or owned by the District shall be called upon to contribute to a loss.
  - 3) Coverage provided by this policy shall not be reduced or canceled without thirty (30) days written notice given to the Owner by certified mail.
  - 4) This policy does not exclude explosion, collapse, underground excavation hazard, or removal of lateral support.
  - 5) The certificates must state that the insurance is under an occurrence based, and not a claims-made, or "modified occurrence," policy (policies).
- e. Within ten (10) days following issuance of the Notice of Award of the Contract, the following documentation of insurance shall be submitted to District for approval prior to issuance of the Notice to Proceed: Certificates of insurance showing the limits of insurance provided, certified copies of all policies, and signed copies of the specified endorsements for each policy. At the time of making application for an extension of time, the Contractor shall submit evidence that the insurance policies will be in effect during the requested additional period of time.
- f. If the Contractor fails to maintain such insurance, the District may take out such insurance to cover any damages of the above mentioned classes for which the District might be held liable on account of the Contractor's failure to pay such damages, and deduct and retain the amount of the premiums from any sums due the Contractor under the Contract.
- g. Workers' Compensation Insurance:
- 1) Within ten (10) calendar days following issuance of the Notice of Award of the Contract, the Contractor shall furnish to the District satisfactory proof that the Contractor and all Subcontractors it intends to employ have procured, for the period covered by the Contract, full Workers' Compensation insurance and employer's liability with limits of at least \$1,000,000 with an insurance carrier satisfactory to the District for all persons whom the Contractor may employ in carrying out the work contemplated under this Contract in accordance with the Workers' Compensation Insurance and Safety Act, approved May 26, 1913, and all acts amendatory or supplemental thereto (the "Act"). Such insurance shall be maintained in full force and effect during the period covered by the Contract. In

the event the Contractor is self-insured, Contractor shall furnish a Certificate of Permission to Self-Insure, signed by the Department of Industrial Relations Administration of Self-Insurance, Sacramento, California.

- 2) If the Contractor fails to maintain such insurance, the District may take out worker's compensation insurance to cover any compensation which the District might be liable to pay under the provisions of the Act, by reason of any employee of the Contractor being injured or killed, and deduct and retain the amount of the premiums for such insurance from any sums due the Contractor under the Contract, or otherwise recover that amount from the Contractor or the Surety.
- 3) If an injury occurs to any employee of the Contractor for which the employee, or the employee's dependents in the event of the employee's death, is entitled to compensation under the provisions of the Act, or for which compensation is claimed from the District, the District may retain from the sums due the Contractor under this Contract an amount sufficient to cover such compensation, as fixed by the Act, until such compensation is paid, or until it is determined that no compensation is due, and if the District is compelled to pay such compensation, it will deduct and retain from such sums the amount so paid, or otherwise recover this sum from the Contractor or its Surety.
- 4) The policies represented by the certificates shall be endorsed with a Waiver of Subrogation and must contain the provision (and the certificates must so state) that the insurance cannot be canceled until thirty (30) days after written notice of intended cancellation has been given to the District by certified mail.

## 12. CODES AND REGULATIONS

- a. The Contractor shall be knowledgeable regarding and shall comply with applicable portions of California Code of Regulations Title 24, the applicable Building Code, and all other codes, ordinances, regulations or orders of properly constituted authority having jurisdiction over the work of this Project. The Contractor shall examine the Contract Documents for compliance with these codes and regulations and shall promptly notify the Architect of any discrepancies.
- b. All work and materials shall be in full accordance with the latest rules and regulations of the Safety Orders of the Division of Industrial Safety and the applicable State laws and/or regulations. Nothing in the Project plans or Specifications is to be construed to permit work not conforming to the applicable Codes. Buildings and/or all other construction covered by this Contract shall meet all the regulations for access by the physically handicapped as administered by the Division of the State Architect and as may be required by federal or state law.

- c. If the work under this Contract is for the construction of a school building as defined by the Education Code, then the following provisions shall apply to the Contract:
  - 1) All work shall be executed in accordance with the current requirements of the Education Code and California Code of Regulations: Title 24 and Title 19. No deviations from the DSA approved plans and Specifications will be permitted except upon a Change Order or Addenda, signed by the District and Architect and approved by the Division of the State Architect and the State Fire Marshal, if applicable.
  - 2) The Division of the State Architect shall be notified 48 hours in advance of the first pour of concrete.

13. PERMITS AND TAXES

- a. The Contractor shall obtain and pay for all permits, fees and licenses that are required in order to perform the work under this Contract. The District shall pay connection charges and meter costs for new permanent utilities required by these Contract Documents. The Contractor shall notify the District sufficiently in advance to submit requests for service to the appropriate utility companies so as to insure connections or installation of utility services in accordance with the Project schedule.
- b. The Contractor shall pay for all taxes on materials and equipment. The District is exempt from Federal Excise Tax. Contractor shall not pay Federal Excise Tax on any item in this Contract.

14. PATENTS AND ROYALTIES

All fees or claims for patents, royalties or licenses on materials, equipment or processes used in the performance of work on this Project shall be included in the amount of the Bid. The Contractor shall indemnify, defend, and hold harmless the District, its Governing Board, the Architect, and their officers and employees, from all claims or liability, including costs and expenses, which may arise from the use on this Project of any patented or copyrighted materials, equipment, or processes.

15. SAFETY AND FIRE PREVENTION

- a. The Contractor, Subcontractors and all of their agents and employees shall fully comply with all of the provisions and requirements of CAL/OSHA, Title 8, California Code of Regulations and all other safety codes applicable to the Project. The Contractor shall take thorough precautions at all times for the protection of persons and property, and shall be liable for all damages to persons or property, either on or off the site, which occur as a result of Contractor's prosecution of the work. The Contractor shall obtain permits for, install and maintain in safe condition barricades, walkways, fences, railings, and whatever

other safeguards that may be necessary to protect persons and property from damage as a result of the construction under this Contract.

- b. Contractor is required to ensure Material Safety Data Sheets ("MSDS") are available in a readily accessible place at the work site for any material requiring a MSDS pursuant to the federal "Hazard Communication" standard or employee "right to know" laws. Contractor is also required to ensure proper labeling on materials brought on the job site such that any person working with the material or within the general area of the material is informed of the hazards of the material and follows proper handling and protection procedures. A copy of the MSDS shall also be promptly submitted directly to the District.
- c. Contractor shall not endanger any work by cutting, excavating, or otherwise altering the work and shall not cut or alter the work of any other contractor except with the written consent of the Architect, nor overload any new or existing structures by the placing or storage of materials, equipment, or other items thereon, and, if necessary, shall provide calculations proving the safety in so doing.
- d. If it is necessary to work at night, or where daylight is obscured, the Contractor shall provide and maintain lighting of an adequate level to properly prosecute the work, to permit the thorough inspection of same, and to ensure the safety to workers and others.
- e. Contractor shall take extraordinary care to prevent fires and keep all flammable materials and oily rags in tightly closed metal containers. Contractor shall exercise particular care when welding or cutting, and with regard to the disposition of waste materials, the nature and quantity of which might create or increase a fire hazard.

16. HAZARDOUS MATERIALS

Unless otherwise specified, this Contract does not include the removal, handling, or disturbance of any hazardous substances or materials encountered in the new construction or on the Project grounds. If such substances or materials are encountered, work shall cease in that area and the District shall be promptly notified to take appropriate action for removal or otherwise abating the condition in accordance with current regulations applicable to the District.

a. General

- 1) No asbestos, asbestos-containing products or other hazardous materials shall be used in this construction or in any tools, devices, clothing or equipment used to further this construction.
- 2) Asbestos and/or asbestos containing products shall be defined as all items containing but not limited to chrysotile, crocidolite, amosite, anthophyllite, tremolite or actinolite.



- 3) Any or all material containing greater than one tenth of one percent (>.1%) asbestos shall be defined as asbestos-containing material.
- 4) Any disputes involving the question of whether or not material contains asbestos shall be settled by electron microscopy; the cost of any such tests shall be paid by the Contractor.
- 5) All work or materials found to contain asbestos or work or material installed with asbestos containing equipment will be immediately rejected and this work shall be removed by the Contractor at no additional cost to the District.

b. Decontamination and Removal of hazardous material from prior work

- 1) Decontamination and removal of work found to contain asbestos or work installed with asbestos containing equipment shall be done only under the supervision of a qualified consultant, knowledgeable in the field of asbestos abatement and accredited by the Environmental Protection Agency ("EPA").
- 2) The asbestos removal contractor shall be an EPA-accredited contractor qualified in the removal of asbestos subject to the approval of the District.
- 3) The asbestos consultant shall be chosen and approved by the District which shall have sole discretion and final determination in this matter.
- 4) The work will not be accepted until asbestos contamination is reduced to levels deemed acceptable by the asbestos consultant.

c. Hold Harmless

- 1) Interface of work under this Contract with work containing asbestos shall be executed by the Contractor at Contractor's risk and at Contractor's discretion with full knowledge of the currently accepted standards, hazards, risks and liabilities associated with asbestos work and asbestos containing products. By execution of this Contract the Contractor acknowledges the above and agrees to hold harmless, as set forth in the indemnity provisions of this Contract, the Owner, its employees, agents and assigns for all asbestos liability which may be associated with this work and agrees to instruct Contractor's employees and agents with respect to the above-mentioned standards, hazards, risks and liabilities.
- 2) The Contractor shall, prior to commencement of this work, provide a duly signed and notarized affidavit that Contractor has instructed Contractor's employees and agents with respect to the above mentioned standards, hazards, risks and liabilities and the contents and requirements of this portion of the Contract Documents.

d. Certification

The Contractor agrees that materials containing asbestos or other hazardous materials as defined in Federal and State law shall not be used in construction.

17. TEMPORARY FACILITIES

- a. The Contractor shall obtain permits for, install and maintain in safe condition all scaffolds, hoisting equipment, barricades, walkways, or other temporary structures that may be required to accomplish the work. Such structures shall be adequate for the intended use and capable of safely accepting all loads that may be imposed upon them. They shall be installed and maintained in accordance with all applicable codes and regulations.
- b. The Contractor shall provide and maintain temporary heat from an approved source whenever in the course of the work it may become necessary for curing, drying or warming spaces as may be required for the proper installation of materials or finishes. The Contractor shall provide and maintain any and all facilities that may be required for dewatering in order that work may proceed on the Project. If it is necessary for dewatering to occur continually, the Contractor shall have on hand whatever spare parts or equipment that may be required to avoid interruption of service or work.
- c. The Contractor shall promptly remove all such temporary facilities when they are no longer needed for the work or on completion of the Project. The Contractor shall repair any damage to premises or property which resulted from the construction, use, or removal of temporary facilities and shall restore the premises and property to their original condition.
- d. See the Supplemental General Conditions and/or specifications for requirements concerning temporary sanitary facilities and utilities.

18. SIGNS

No signs may be displayed on or about the District's property (except those which may be required by law) without the District's prior written approval of size, content and location. Any signs required by the District will be designated in the Supplemental General Conditions.

19. TIME

- a. The Contractor shall commence the work on the date indicated in the Notice to Proceed. Time is of the essence regarding the Contract work, and the Contractor shall prosecute the work diligently and regularly at such a rate of progress as to ensure completion of this Project within, or sooner than, the time specified.
- b. The Contractors and Subcontractors shall investigate and become aware of the amount of time required for the delivery of all equipment and materials required to perform the work under this Contract, and no extension of time shall be granted due to failure to order the

equipment and materials sufficiently before their incorporation into the work so as to avoid delay to the Project.

- c. The Contractor and Subcontractors shall provide and maintain enough manpower, materials and equipment to ensure a rate of construction progress that will complete the Project within or sooner than the time specified and according to the schedule of work. If, in the District's opinion, the Contractor and/or Subcontractors are not prosecuting the work at a sufficient rate of progress to meet the Project schedule, the District may direct the Contractor to provide additional manpower, materials or equipment, or to work additional hours, holidays or weekends without additional cost to the District until the work is progressing in a manner satisfactory to the District. Failure to prosecute the work in a timely manner according to the Project schedule is considered a breach of Contract and shall be cause for termination of the Contract.

## 20. CONSTRUCTION SCHEDULE

- a. Within fifteen (15) calendar days after the award of the Contract, the Contractor shall prepare and submit to the Architect and District an as-planned construction schedule showing in detail how the Contractor plans to prosecute the work within the time set for Final Completion. The schedule shall include the work of all trades necessary for construction of the Project, and shall be sufficiently complete and comprehensive to enable progress to be monitored on a day-by-day basis. The information for each activity shall include at a minimum the activity description, duration, start date and completion date.
- b. The Contractor shall take care in the preparation of the schedule to ensure that it represents an accurate and efficient plan for accomplishing the work. If the Project is more than one week behind schedule, it must be promptly revised showing how the Contractor plans to complete the work, but in no case shall it show a completion date later than that required by the Contract, unless a time extension has been granted. The current schedule shall be kept posted in the Contractor's project office on site.
- c. The Contractor shall be responsible for the coordination of all work necessary and pertaining to the construction whether actually a part of this Contract or attendant thereto. The Contractor shall notify the District and various utility companies, as far as possible in advance of their required work, in order that work schedules may be developed for all concerned, which will permit the most effective and timely accomplishment of the entire Project.

## 21. DELAYS AND TIME EXTENSIONS

- a. The Contractor may be granted a time extension if the Contractor encounters an unavoidable delay of the work due to causes completely beyond the Contractor's control and which the Contractor could not have avoided by the exercise of reasonable care, prudence, foresight and diligence. Causes for which a claim for extension of time may be

made include: acts of the public enemy, acts of another contractor in the performance of another contract with the District, priority of a governmental agency for materials or equipment, fire, flood, violent wind storm, epidemic, quarantine restriction, strike, freight embargo, or weather of an unusually severe nature. The Contractor will not be granted time extensions for weather conditions which are normal for the location of the Project, according to the U. S. Weather Bureau Records.

- b. A request for extension of time and compensation related thereto shall be made in writing to the Architect and District within ten (10) calendar days of the date the delay is encountered, or shall be deemed waived. The request shall include a detailed description of the reasons for the delay and corrective measures by the Contractor. The request shall be accompanied by evidence that the insurance policies required by the Contract shall be in effect during the requested additional period of time. In order for the Architect to consider a request for time extension, the Contractor must prove that the reasons stated for the delay actually caused a delay in portions of the work which will result in completion beyond the date specified in the Contract. The Contractor may also be granted a time extension for a significant change in the scope of work which request for extension of time shall be included in a Contract modification proposal.
- c. No damages or compensation or any kind shall be paid to a Contractor because of delays in the progress of work, whether such delays be avoidable or unavoidable, that are not the responsibility of District. District's liability to Contractor for delays for which District is responsible shall be limited to an extension of time unless such delays were unreasonable under the circumstances involved and were not within the contemplation of the parties when the Contract was awarded. The Contractor shall provide to the District the actual, substantiated costs to Contractor for which the Contractor may claim damages from District. Such costs, if any, shall be directly related to the Project, and shall not include costs that would be borne by the Contractor in the regular course of business, including, but not limited to, office overhead and ongoing insurance costs. Delay damages shall not include Contractor or Subcontractor markup for overhead and profit, but only actual, documented, and direct actual costs. The District shall not be liable for any damages which the Contractor could have avoided by any reasonable means including, but not limited to, the more judicious handling of forces or equipment.
- d. The granting of an extension of time because of unavoidable delays shall in no way operate as a waiver on the part of the District of the right to collect liquidated damages for other delays or of any other rights to which the District is entitled.

## 22. LIQUIDATED DAMAGES

- a. The parties understand and agree that the goodwill, educational process, and other business of District will be damaged if the Project is not completed within the time limits required. The parties have further agreed that the exact amount of damages for failure to complete the Work within the time specified is, in some cases, extremely difficult, impractical, or impossible to determine. As to those damages that are difficult,

impractical, or impossible to determine, Should the Contractor fail to achieve Final Completion of this Contract within the time fixed for Final Completion, together with extensions granted by the District for unavoidable delays, Contractor shall become liable to the District in the amount specified in the Contract per calendar day for each day the Contract remains incomplete beyond the time for Final Completion, as liquidated damages and not as a penalty. Contractor shall not be charged with liquidated damages when the delay in completion of the work beyond the time for Final Completion is due to acts of the District.

- b. Any money due or to become due the Contractor may be retained to cover liquidated and other delay damages. Should such money not be sufficient to cover those damages, the District shall have the right to recover the balance from the Contractor or Contractor's sureties.
- c. Should the District authorize suspension of the work for any cause, the time work is suspended will be added to the time for completion. Suspension of the work by the District shall not be a waiver of the right to claim liquidated or other delay damages as set forth in this section.

23. DISTRICT'S RIGHT TO STOP WORK; TERMINATION OR SUSPENSION OF THE CONTRACT

a. District's Right to Stop Work:

In addition to or as an alternative to any and all other remedies available to the District, if the Contractor fails to correct work which is not performed in accordance with the Contract Documents, or if the Contractor persistently fails to perform the work in accordance with the Contract Documents, the District may by written order direct the Contractor to stop the work, or any portion thereof, until the cause for such order has been eliminated to the satisfaction of the District. However, the right of the District to stop the work shall not give rise to a duty on the part of the District to exercise this right for the benefit of the Contractor or any other person or entity, and the failure of the District to do so shall not be raised as a defense to the Contractor's failure to perform the work in accordance with the Contract Documents.

b. Termination for Cause:

- 1) If the Contractor refuses or fails to furnish sufficient materials, work force, equipment, and appurtenances to properly prosecute the work in a timely manner, or if Contractor refuses or fails to comply with any provisions of the Contract Documents, or if Contractor should file a bankruptcy petition or make a general assignment for the benefit of Contractor's creditors or if a receiver should be appointed on account of Contractor's insolvency, then the District may give the Contractor and Contractor's Surety written notice of intention to terminate the Contract. Unless within seven (7) calendar days after the serving of such notice

upon the Contractor and Contractor's Surety such violation shall cease and arrangements for correction of such conditions shall be made satisfactory to the District, the Contract shall cease and terminate. In the event of such termination, the District shall immediately serve written notice thereof upon the Contractor and Contractor's Surety.

- 2) In the event of termination for cause, in addition to all remedies available to the District, the Contractor's Surety shall have the right to take over and perform the Contract; provided, however, that if the Surety does not commence performance within five (5) calendar days from the date of the issuance of such notice of termination, the District may take over the work and prosecute the same to completion by letting another Contract, or by any other method that the District deems advisable. The Contractor and Contractor's Surety shall be liable for any excess cost incurred by the District thereby, and in any such event the District may take possession of such materials, equipment, and other property belonging to the Contractor as may be on the site and use same in completing the work.

c. Termination or Suspension for Convenience:

The District reserves the right, in its sole discretion, to terminate or suspend all or part of the Contract for convenience following three (3) days written notice to the Contractor. In the event of termination or suspension for convenience, Contractor shall have no claims against the District, except:

- 1) The actual cost of labor, materials and services provided pursuant to the Contract, and which have not yet been paid for, as documented by timesheets, invoices, receipts and the like; and
- 2) Five percent (5%) of the total cost of the work performed as of the date of notice of termination or suspension or five percent (5%) of the value of the work yet to be completed, whichever is less. The parties agree that this amount shall constitute full and fair compensation for all Contractor's lost profits and other damages resulting from the termination or suspension for convenience.

24. ASSIGNMENT OF CONTRACT

The Contractor may not assign or delegate all or any portion of this Contract without the written consent of the District and no such consent shall be given which would relieve the Contractor or its Surety of their responsibilities under the Contract. The Contractor may assign, without liability to the District, monies due the Contractor under the Contract to banks, trust companies or other financial institutions provided written notice thereof is promptly delivered to the District. Assignment of monies earned by the Contractor shall be subject to the same retention as other payments made to Contractor, and shall also be subject to setoffs and back charges as provided by this Contract.

25. COORDINATION WITH OTHER CONTRACTS

- a. The District reserves the right to do other work or award other contracts in connection with this Project. By entering into this Contract, Contractor acknowledges that there may be other contractors on or adjacent to the Project site whose work must be coordinated with that of its own. Contractor expressly warrants and agrees that it will cooperate with other contractors and will do nothing to delay, hinder, or interfere with the work of other contractors, or that of the District, its Architect and Construction Manager. Contractor also expressly agrees that in the event its work is hindered, delayed, interfered with, or otherwise affected by a separate contractor, its sole remedy will be a direct action against the separate contractor. To the extent allowed by law, the Contractor expressly waives any remedy against the District, its Architect and Construction Manager on account of delay, hindrance, interference or other such events caused by a separate contractor.
- b. If any part of Contractor's work depends upon the work of a separate contractor, Contractor shall inspect such other work and promptly report in writing to the District and Architect any defects in such other work that render it unsuitable to receive the work of Contractor. Failure of the Contractor to so inspect and report shall constitute an acceptance of the other contractor's work, except as to defects which the Contractor could not have detected through the reasonable inspection of the other contractor's work prior to the execution of Contractor's work.
- c. If Contractor is aware of a current or potential conflict between Contractor's work and the work of another contractor on the site, and is unable to informally resolve the conflict directly with the other contractor, Contractor shall promptly provide written notice to the District, with a copy to the Architect and the other contractor, specifying the nature of the conflict, the date upon which the conflict arose, and the steps taken to attempt to resolve the conflict. The District may issue written instructions to address the conflict.
- d. If, through Contractor's negligence, any other contractor or subcontractor shall suffer loss or damage to the work, Contractor shall make a reasonable effort to settle with such other contractor and subcontractor by agreement or arbitration. If such other contractor or subcontractor shall assert any claim against the District or Architect, on account of any damage alleged to have been so sustained, the District or Architect shall notify the Contractor, who shall defend such proceedings at Contractor's own expense and save harmless and indemnify the District and the Architect from any such claim.

26. SUBMITTALS: SHOP DRAWINGS, CUTS AND SAMPLES

- a. Five (5) copies of shop drawings, brochures and cuts and samples in quantities specified by the Architect shall be submitted to the Architect for all items for which they are required by the plans and Specifications. Prior to transmittal, the Contractor shall examine all submittals for accuracy and completeness in order to verify their suitability for the work and compliance with the Contract Documents and shall sign and date each submittal.

Submittals shall be made sufficiently before the items are required for the work so as to cause no delay and shall be in accordance with the Project construction schedule.

- b. In addition to information furnished as common practice, submittals shall contain the Project name and location, Contractor's name and address, Subcontractor's or supplier's name and address, date of submittal and any revisions, and reference to appropriate specification section, and/or drawing and detail numbers. The Contractor and/or the Subcontractors shall verify in the field all dimensions and relationships to adjacent work necessary to ensure the proper fit of the items submitted. If necessary, the Contractor shall make any corrections required and resubmit with all due haste in the same number as initially required.
- c. Review of submittals, shop drawings, cuts or samples by the District or Architect shall not relieve the Contractor from complying with the requirements of the Contract Documents.
- d. Any materials or equipment installed without approval shall be at the Contractor's own risk, and Contractor may be required to remove any such materials or equipment and install the specified items at Contractor's own cost, including repairs to adjacent work.

## 27. PAYMENTS

### a. Cost Breakdown:

Prior to submitting Contractor's first request for payment, the Contractor shall prepare and submit to the Architect and District a cost breakdown (schedule of values) showing the major work items for each trade or operation required in construction of the Project. The work items shall be sufficiently detailed to enable the Architect to accurately evaluate the completion percentages requested by the Contractor. The cost for each work item shall include overhead and profit. The total of all work item costs shall equal the amount of the Contract.

### b. Scope of Payment:

Payment to the Contractor at the unit price or other price fixed in the Contract for performing the work required under any item or at the lump sum price fixed in the Contract for performing all the work required under the Contract shall be full compensation for furnishing all labor, materials, equipment and tools necessary to the work, and for performing and completing, in accordance with the Specifications, all work required under the item or under the Contract, and for all expense incurred by the Contractor for any purpose in connection with the performance and completion of the work.

### c. Progress Payments:



The Contractor will, on or about the last day of each month, make an estimate of the value of the work completed by Contractor in the performance of the Contract. These estimates shall be subject to the review and approval of the Architect. The first such estimate will be of the value of the work completed after the Contractor commenced the performance of the Contract, and every subsequent estimate, except the final estimate, will be of the value of the work completed since the immediately preceding estimate. Such estimates will be based on labor, materials and equipment incorporated into the work, and items of materials and equipment delivered to the Project. The Contractor shall be responsible for the security and protection of such materials and equipment delivered to the Project and not incorporated in the work. Within thirty (30) calendar days after the approval of each estimate for progress payment, the District will pay to the Contractor an amount equal to ninety (90) percent of the approved estimate, unless a different retention percentage is stated in the Notice Inviting Bids, in which case that percentage applies. Payments may at any time be withheld if in the judgment of the District the work is not proceeding in accordance with the Contract Documents, the Contractor is not complying with the requirements of the Contract, stop notices have been timely filed, the estimate contains an error, or the District has incurred costs or requests reasonable financial assurances regarding defective work by the Contractor.

d. Final Payment:

Within thirty (30) days after all required work is fully completed in accordance with the Contract Documents, the Contractor shall submit a final invoice for the total value of the work completed in accordance with the Contract, which shall be subject to review and approval by the District. As required by law, District shall pay Contractor the unpaid balance of the Contract price of the work, or the whole Contract price of the work if no progress payment has been made, determined in accordance with the terms of the Contract, less such sums as may be lawfully retained under any provision of the Contract, including, but not limited to, amounts retained as liquidated damages, for stop notices, for third-party claims for which the Contractor is required to indemnify the District, for defective work and costs incurred by the District in connection therewith, or for other such claims and damages attributable to the Contractor ("Final Payment"). Prior progress estimates and payments are subject to correction in the Final Payment. Tender of the Final Payment shall constitute denial by the District of any unresolved claim. Contractor's acceptance of the Final Payment shall operate as a full and final release to the District and its agents from any and all unasserted claims Contractor has, or may have, related to this Contract.

e. Payments Do Not Imply Acceptance of Work:

The granting of any progress payment or payments by the District or the receipt thereof by the Contractor shall not constitute acceptance of the work or of any portion thereof, and shall in no way lessen the liability of the Contractor to replace unsatisfactory work or material, whether or not the unsatisfactory character of such work or material was apparent or detected at the time such payment was made.

f. Retention of Sums Charged Against Contractor:

It is mutually understood and agreed that when under any provision of this Contract the District shall charge any sums of money against the Contractor, the amount of such charge shall be deducted and retained by the District from the amount of the next succeeding progress estimate, or from any other monies due or that may become due the Contractor on account of the Contract. If on completion or termination of the Contract such monies due the Contractor are found insufficient to cover the District's charges against the Contractor, the District shall have the right to recover the balance from the Contractor or the Contractor's Sureties.

g. Release:

The Contractor and each assignee under an assignment in effect at the time of Final Payment shall, if required by the District, execute and deliver at the time of Final Payment and as a condition precedent to Final Payment, a release in form and substance satisfactory to and containing such exemptions as may be found appropriate by the District, discharging the District, its officers, agents and employees of and from liabilities, obligations and claims arising under this Contract.

h. Payment to Subcontractors and Suppliers:

The Contractor shall pay each Subcontractor and supplier promptly on receipt of each progress payment from the District for the materials, labor and equipment delivered to the site or incorporated in the work by each Subcontractor during the period for which the progress payment is made, less any retention as provided above.

i. Stop Notice Costs:

The District reserves the right to charge the Contractor or Surety, or to withhold from release of retention, all costs incurred by the District, including attorney's fees, for processing and defending stop notice claims.

28. MODIFICATIONS OF CONTRACT

a. Changes In The Work:

- 1) The District, before the date of acceptance of the work, may, without notice to the Sureties, order changes in the work ("Modifications"), may order extra materials and extra work in connection with the performance of the Contract, and the Contractor shall promptly comply with such orders. All Modifications must be approved by DSA and the State Fire Marshall, if applicable, as required by law.
- 2) If changes ordered in design, workmanship or materials are of such a nature as to increase or decrease the cost of any part of the work, the price fixed in the Contract

shall be increased or decreased by such amount as represents the reasonable and proper allowance for the increase or decrease in the cost of the work in accordance with the provisions of this Article, and any other applicable terms of the Contract, including, but not limited to, the Contractor's schedule of values and the price for allowances, if any. Except as provided by law, the total cost of all Modifications shall not exceed ten (10) percent of the original Contract price.

- 3) In the case of a disputed work item, the District may direct the Contractor to perform the disputed work at no additional cost to the District on the grounds that the work is adequately indicated in the Contract Documents, and therefore already included in the Contract price. If the Contractor maintains that the disputed work represents a modification to the Contract, Contractor may submit a claim in accordance with Article 50, Resolution of Construction Claims. Notwithstanding any dispute regarding the requirements of the Contract Documents, Contractor shall promptly and fully comply with the District's directive. Contractor's failure to do so shall be deemed a material breach of this Contract, and in addition to all other remedies, District may, at its sole discretion, hire another contractor and/or use its own forces to complete the disputed work at Contractor's sole expense, and may deduct the cost of such work from the Contract price.

b. Cost Breakdown:

When the Modification is proposed, the Contractor shall furnish a complete breakdown of actual costs of both credits and extras, itemizing materials, labor, taxes, overhead and profit. Subcontract work shall be so indicated. All costs must be fully documented. The following limitations shall apply:

- 1) Limitations Where Contract Price Changes are Involved:
  - (a) Overhead and Profit for the Contractor. The Contractor's overhead and profit on the cost of subcontracts shall be a sum not exceeding ten percent (10%) of such costs. The Contractor's overhead and profit on the costs of work performed by the Contractor shall be a sum not exceeding fifteen percent (15%) of such costs. Overhead and profit shall not be applied to the cost of taxes and insurance by Contractor or Subcontractors or to credits. No processing or similar fees may be charged by the Contractor in connection with the Modification. "Overhead and profit" shall include all plant, equipment rental and repair, project management, field coordination, job site project supervision and indirect labor and materials.
  - (b) Bond Premiums. The actual rate of bond premiums as paid on the total cost (including taxes) will be allowed, but with no markup for profit and overhead.

- (c) Taxes. State and city sales taxes should be indicated. Federal excise tax shall not be included. (District will issue an exemption on request.)

2) Change Order Certification:

All change orders and requests for proposed change orders shall be deemed to include the following certification by the Contractor:

"The undersigned Contractor approves the foregoing as to the changes in work, if any, and as to the Contract price specified for each item and as to the extension of time allowed, if any, for completion of the Project as stated herein, and agrees to furnish all labor, materials, and service and to perform all work necessary to complete any additional work specified for the consideration stated herein. Submission of claims which have no basis in fact or which Contractor knows are false are made at the sole risk of the Contractor and may be a violation of the False Claims Act, as set forth in Government Code §§12650 *et seq.* It is understood that the changes to the Contract Documents set forth herein shall only be effective upon approval 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, both direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Any costs, expenses, damages, or time extensions not included herein are deemed waived."

c. Unit Prices, Schedule of Values, or Allowances:

Where Unit Prices, a Schedule of Values, and/or Allowances are required by the Contract Documents, that pricing shall govern in computing any additions to or deductions from the Contract price on account of any added or omitted work. Unit Prices listed in the original bid include all costs and no addition of any description will be allowed.

d. Time and Materials:

If it is impractical, because of the nature of the work, or for any other reason, to fix an increase in price in advance, the Change Order may fix a maximum price which shall not under any circumstances be exceeded, and subject to such limitation, such alteration, modification or extra shall be paid for at the actual necessary cost as determined by the sum of the following items (1) to (5) inclusive:

- 1) Labor, including premium on compensation insurance and charge for Social Security taxes, and other taxes pertaining to labor.
- 2) Material, including sales taxes and other taxes pertaining to materials.

- 3) Plant and equipment rental, to be agreed upon in writing before the work is begun. No charge for the cost of repairs to plant or equipment will be allowed.
- 4) Overhead and profit computed at fifteen percent (15%) of the total of Items (1) to (3) inclusive.
- 5) The proportionate cost of premiums on bonds computed at one and one-half percent (1-1/2%) of the total of items (1) to (4) inclusive.

If the Time and Materials work is done by a Subcontractor, the amount shall be determined as set forth above under items (1) to (5) inclusive. The Contractor's overhead and profit on the costs of subcontracts (exclusive of taxes and insurance) shall not exceed ten percent (10%) of such costs.

The District reserves the right to furnish such materials as it may deem expedient, and no allowance will be made for profit thereon. The above-described methods of determining the payment for work and materials shall not apply to the performance of any work or the furnishing of any material which, in the judgment of the District, may properly be classified under items for which prices are established in the Contract.

e. Oral Modifications:

No oral statements of any person shall in any manner or degree modify or otherwise affect the terms of the Contract.

29. INDEMNITY

Contractor shall defend with counsel acceptable to the District, indemnify and hold harmless to the full extent permitted by law, the District and its Board of Trustees, officers, agents, Architect, construction manager, employees and volunteers from and against any and all liability, loss, damage, claims, expenses, fines, judgments and costs (including, without limitation, attorney's fees and costs and fees of litigation) (collectively, "Liability") of every nature arising out of or in connection with Contractor's performance of the Project or its failure to comply with any of its obligations contained in these Contract Documents, except such Liability caused by the active negligence, sole negligence or willful misconduct of the District. Such indemnification shall extend to all claims, demands, or liabilities occurring after completion of the project as well as during the progress of the work. Pursuant to Public Contract Code §9201, District shall timely notify Contractor of receipt of any third-party claim relating to this Project.

30. WARRANTY OF TITLE

Contractor warrants that title to all work, materials or equipment included in a request for payment shall pass and transfer to the District whether or not they are installed or incorporated in the Project, free from any claims, liens or encumbrances, when such payment is made to the Contractor. Contractor further warrants that no such work, materials or equipment have been

purchased for work under the Contract subject to an agreement by which an interest therein or an encumbrance thereon is retained by the seller or supplier.

31. USE OF COMPLETED PARTS OF THE WORK BEFORE ACCEPTANCE

Whenever the work or any part thereof is in a condition suitable for use, and the best interest of the District requires such use, as determined by the District, the District may take possession of, connect to, open for public use, or use the work or a part thereof. When so used, maintenance and repairs due to ordinary wear and tear or vandalism will be made at District's expense. The use by the District of the work or part thereof as contemplated in this section shall in no case be construed as constituting acceptance of the work or any part thereof, including, but not limited to, the right to assess liquidated damages. Such use shall neither relieve the Contractor of any of Contractor's responsibilities under the Contract nor act as a waiver by the District of any of the conditions thereof. Contractor shall continue to maintain all insurance, including Builder's Risk insurance, on the entire Project, and diligently pursue full completion of the work.

32. GUARANTEE AND WARRANTY

- a. By signing this Contract, Contractor agrees to the following guarantee and warranty:

**Guarantee & Warranty**

Contractor hereby guarantees and warrants its work on the Project for a period of two (2) years from the date of the filing of the Notice of Completion as follows.

Contractor shall promptly repair or replace to the satisfaction of the District any or all work that appears defective in workmanship, equipment and/or materials for whatever reason, ordinary wear and tear and unusual abuse or neglect excepted, together with any other work which may be damaged or displaced in so doing.

Contractor agrees to promptly correct and remedy any failure by the Contractor to conform its work, activities and services to the requirements of the Contract Documents.

In the event of the Contractor's failure to comply with the above-mentioned obligations within the ten (10) calendar days of notice, or sooner if required by an emergency, Contractor hereby authorizes the District to have the defects or deficiencies repaired, remedied, corrected and made good at Contractor's expense, and Contractor shall pay the costs and charges therefore upon demand. The Surety agrees to be responsible for these costs and charges as well.

33. PROTECTION OF WORK AND PROPERTY

- a. The Contractor shall be responsible for each operation and all work on the Project, both permanent and temporary. The Contractor shall protect the work and materials from damage due to negligence, the action of the elements, the carelessness of third parties, vandalism, or any other cause whatsoever, until the final completion and acceptance of the Project. Should improper work by the Contractor be covered by another contractor and damage or defects result, the whole work affected shall be made good by the Contractor to the satisfaction of the Architect and District without expense to the District. The Contractor shall take reasonable care to avoid damage to existing facilities or utilities, whether on the Project or adjacent to it, and Contractor shall be liable for any damage thereto or interruption of service due to Contractor's operations. If the Contractor encounters any facilities or utilities not shown on the drawings or not reasonably inferable therefrom, Contractor shall promptly notify the Architect about them, and shall do no further work which may cause damage to same. If it is determined that some action needs to be taken regarding facilities not shown, the Contractor will be given directives on what action to take, and any additional cost to the Contractor incurred thereby will be handled by Change Order.
- b. The property limits of the area of the Project are indicated on the drawings. Except for work specifically shown or noted, Contractor shall confine Contractor's operations within the indicated property limits. The Contractor shall provide, install, and maintain all shoring, bracing and underpinning necessary to support adjacent property, streets, buildings and structures, that may be affected by building operations for this work; shall serve or cause to be served all legal notices to adjoining property owners that may be necessary for their protection; and shall protect from damage all adjacent buildings, fences, landscaping, and repair or replace any such property damaged in the course of work under the Contract.

34. USE OF ROADWAYS AND WALKWAYS

The Contractor shall not unnecessarily interfere with use of any roadway, walkway or other facility for vehicular or pedestrian traffic by any party entitled to use it. Wherever such interference becomes necessary for the proper and convenient performance of the work and no satisfactory detour route exists, the Contractor shall, before beginning the interference, provide a satisfactory detour, temporary bridge, or other proper facility for traffic to pass around or over the interference and shall maintain it in satisfactory condition as long as the interference continues, all without extra payment unless otherwise expressly stipulated in the Contract Documents.

35. MATERIALS

- a. Unless explicitly stated otherwise, all specified equipment and material comprising the work of this Contract, as being provided or furnished or installed, shall imply the inclusion of all components, hardware and accessories, required for complete installation and

satisfactory operation as intended by the manufacturer. Wherever the method of installation of any material is not explicitly specified, the installation shall be as recommended by manufacturer.

- b. Wherever in the Contract Documents it is provided that the Contractor shall furnish materials or equipment for which no detailed specifications are set forth, such materials or equipment shall be new and of the best grade for the purpose for which they will be used when incorporated in the work. Materials specified by reference to a number or symbol of a specific standard, such as A.S.M., Federal Specification, State Standard, Trade Association, or similar standards, shall comply with requirements in the latest revision thereof and any amendment or supplement in effect on the date of the notice inviting bids.
- c. None of the materials to be provided furnished or installed on this project shall contain asbestos or any other "hazardous substance" as that term is defined by federal or state law.

### 36. SUBSTITUTIONS

- a. Wherever in the drawings or Specifications a material or product is called for by trade or brand names or manufacturer and model number, alternative items of equal quality and purpose may be proposed for use by the Contractor. The burden of proof of equality is on the Contractor, and Contractor shall furnish all information and supplies necessary for the Architect to make a thorough evaluation of the proposed substitution. The Architect's decision about the equality of the proposed substitution is final, and if the proposed substitution is not approved, the Contractor shall install the item called for. Proposed substitutions and any changes in adjacent work caused by them shall be made by the Contractor at no additional cost to the District.
- b. Proposed substitutions shall be submitted sufficiently before actual need to allow time for thorough evaluation. Substitutions shall not be proposed for the reason that submittals were not made early enough to avoid delay. Architect's review of substitutions shall not relieve the Contractor from complying with the requirements of the drawings and Specifications.
- c. In the event Contractor makes substitutions in materials, equipment, or designs, with or without the District's approval, other than those authorized herein, the Contractor shall then assume full responsibility for the effects of such substitutions on the entire Project, including the design, and shall reimburse the District for any charges resulting from such substitutions, including any charges for modifications in the work of other trades, and including any charges for additional design and review, plus reasonable and customary mark-ups.

### 37. TESTING

- a. Materials, equipment, or other work requiring tests may be specified in the Contract Documents, and they shall be adequately identified and delivered to the site in ample time



before intended use to allow for testing. If such materials, equipment or other work should be covered without required testing and approval, they shall be uncovered at the Contractor's expense, including any repairs or replacement resulting therefrom. The Contractor shall notify the District and Architect when and where such materials, equipment or other work are ready for testing, and Contractor shall bear the cost of making them available for testing. The Contractor shall notify the District and Architect sufficiently before the need for testing so as to cause no delay in the work and, in any case, at least forty-eight (48) hours prior to the need for testing.

- b. The cost of initial tests called for will be paid by the District and will be performed by independent testing consultants retained by the District, but if so specified by the District, the amount paid or a portion thereof may be collected from the Contractor. All other tests and inspections specified or otherwise required to substantiate compliance with specified requirements for quality of material or performance of operation shall be paid for by the District, but if so specified by the District, the amount paid may be collected from the Contractor. If retesting or additional testing is necessary because of substandard initial test results, the costs thereof shall be paid by the District, but if so specified by the District, the amount paid may be collected from the Contractor, including any repairs or replacement resulting therefrom.

### 38. INSPECTION

- a. All materials, equipment and workmanship used in the work of the Project shall be subject to inspection or testing at all times and locations during construction and/or manufacture. The District's and Architect's authorized representatives and representatives of other agencies having authority over the work shall have access to the work for the above purposes at all reasonable times and locations. Any material or work found to be unsatisfactory or not according to the Contract Documents shall be replaced with the correct material or work and the defective items promptly removed, all at the Contractor's expense, when directed to do so by any of the above-named persons having authority over the work. The cost of review time and analysis by the Architect or other District consultants necessitated by incomplete or defective work by the Contractor shall be charged to the Contractor.
- b. Inspection and testing by the District or its representatives shall not relieve the Contractor from complying with the requirements of the Contract Documents. The Contractor is responsible for its own quality control.
- c. Whenever required by the District or Architect, the Contractor shall furnish all tools, labor and materials necessary to make an examination of work in place by uncovering the same. Should such work be found unsatisfactory, the cost of examination and reconstruction shall be paid by the Contractor. Should such work be found satisfactory, the cost of examination and reconstruction of the work shall be paid by Change Order unless the Contractor improperly covered the work before it could be inspected or tested. If the Contractor considers it necessary or desirable to work on Saturday, Sunday or a holiday,

Contractor shall seek written approval from the District at least forty-eight (48) hours before the commencement of such work.

39. CLEANUP

- a. The Contractor shall maintain the premises and area of the work in a neat and clean condition. No burning of rubbish on site shall be allowed. The Contractor shall control dust on the site by sprinkling at whatever intervals are necessary to keep it laid down and shall take measures to prevent dust and debris from being accidentally transported outside the area of the work.
- b. Final cleaning, such as sweeping, dusting, vacuuming, dry and wet mopping, polishing, sealing, waxing and other finish operations normally required on newly installed work shall be taken to indicate the finished conditions of the various new and existing surfaces at the time of acceptance. Prior to the time of acceptance, all marks, stains, fingerprints, dust, dirt, splattered paint and blemishes resulting from the various operations shall be removed throughout the Project. Stair treads and risers shall be wet-mopped. Glass shall be left clean and polished both inside and outside. Plumbing fixtures and light fixtures shall be washed clean. Hardware and other unpainted metals shall be cleaned and all building papers and other temporary protections shall be removed throughout the building, or portion of the building where Contractor was involved, all to the satisfaction of the Architect and District. The exterior of the buildings, playfields, exterior improvements, and planting spaces and other work areas shall be similarly clean and in good order.

40. CONSTRUCTION WASTE MANAGEMENT REQUIREMENTS

a. Scope

- 1) This Article includes requirements for the diversion by the Contractor of construction and demolition debris from landfills. The Contractor shall develop and implement a Waste Management Plan as specified herein. The Contractor shall take a pro-active, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in the effort.
- 2) The District has established that this Project shall generate the least amount of waste practicable and that processes shall be utilized that ensure the generation of as little waste as possible due to over-packaging, error, poor planning, breakage, mishandling, contamination or other factors.
- 3) As much of the waste materials as economically feasible shall be reused, salvaged or recycled. Waste disposal in landfills shall be minimized.
- 4) The Contractor is encouraged to use waste hauling companies that separate recyclable materials. The Contractor shall work with its waste haulers in

providing other recycling methods as appropriate.

- 5) The Contractor is responsible for implementation of any special programs involving rebates or similar incentives related to the recycling of waste. Revenues or other savings obtained for salvage or recycling accrue to the Contractor.

b. References

- 1) "Builders' Guide to Reuse and Recycling, A Directory for Construction and Demolition Materials."
- 2) "Construction Site Recycling, a Guide for Building Contractors ". For a copy of the guide call 1-888-442-2666 or go to [www.recycleworks.org](http://www.recycleworks.org).
- 3) "Where to Recycle Construction and Demolition Debris." For a copy of the guide call 1-888-442-2666 or go to [www.recycleworks.org](http://www.recycleworks.org).

c. Definitions

- 1) General: Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work.
- 2) Divert" means to use material for any lawful purpose other than disposal in a landfill or transfer facility for disposal
- 3) "Recycling Service" means an off-site service that provides processing of material and diversion from a landfill.
- 4) "Hauler" means the entity that transports construction and demolition debris to either a landfill or a recycling service.

d. Compliance with regulatory requirements:

- 1) The Contractor shall perform all handling, storage, transportation and disposal of construction debris in compliance with all applicable Federal, State, regional, and local statutes, laws, regulations, rules, ordinance, codes and standards.
- 2) Nothing stated on the drawings, in this Article 40 or in any other provision of the Contract Documents shall be construed as allowing work that is not in strict compliance with all applicable Federal, State, regional, and local statutes, laws, regulations, rules, ordinances, codes and standards.

e. Performance Requirement

- 1) The Contractor shall divert a minimum of 50 percent (50%) of the total Project construction and demolition waste from landfills.

f. Quality Control

1) General:

- i) The Contractor shall not permit materials designated for diversion to become contaminated or to contaminate the site or surrounding areas.

2) Training and Coordination:

- i) The Contractor shall designate an on-site party [or parties] who will be responsible for instructing workers and subcontractors, and overseeing and documenting the results of the Waste Management Plan for the Project.
- ii) The Contractor shall furnish copies of the Waste Management Plan to all on-site supervisors, each subcontractor, and the District's representative.
- iii) The Contractor shall include construction waste management as an item on the agenda of all progress meetings.

3) The Waste Management Plan:

- i) The Contractor shall prepare a Waste Management Plan for diverting the specified percentage of construction debris from landfills, including written and graphic information indicating how the waste will be diverted.
- ii) Include in the plan both on-site recycling of construction debris and off-site diversion from landfills.
- iii) Identify the means and methods for collecting and separating each type of debris deemed reusable or recyclable.
- iv) List the off-site recycling service and hauler of each designated debris item who has agreed to accept and divert that item from the landfill in the proposed quantities anticipated. List the service and hauler company name, address, telephone number, and persons contacted.
- v) List the name of individuals on the Contractor's staff responsible for waste prevention and management.

- vi) List the actions that will be taken to reduce solid waste generation, including coordination with subcontractors to ensure awareness and participation.
- vii) Describe the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of wastes.
- viii) Characterize the waste to be generated, including estimated types and quantities. Name the landfills and/or incinerator to be used.
- ix) List the specific waste materials that will be salvaged for resale, salvaged and reused on the Project, salvaged and stored for reuse on a future project, or recycled. Recycling facilities that will be used shall be identified by name, location, and phone number.
- x) Identify the materials that cannot be recycled or reused with an explanation or justification, to be approved by the Architect.

The Contractor shall submit the Plan to the Architect within 10 calendar days after receipt of the Notice to Proceed, or prior to any waste removal, whichever occurs first. The Contractor shall promptly revise and resubmit the Plan as required by the Architect. Review of the Contractor's Waste Management Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting Project diversion requirements.

g. Plan Implementation

- 1) The Contractor shall implement the approved Waste Management Plan.
- 2) The Contractor shall maintain a log of each load and of each category of waste that is diverted from the landfill. The Contractor shall separately log the debris sent to a Class III landfill and materials sent to recycling facilities.
- 3) The Contractor shall include in the log the type of load, load weight, name of the hauling service, recycling service or landfill, and the date accepted by the recycling service or by the landfill.
- 4) The Contractor shall retain and make available all weight tickets and copies of receipts and invoices relating to the implementation of the Plan.
- 5) The District reserves the right to audit the log at any time.

h. Material Handling

- 1) Designate a specific area or areas on site to facilitate the separation of materials for potential reuse, salvage, recycling, and return. Clearly mark bins for each category of waste.
- 2) Keep waste bins and pile areas neat and clean. Do not contaminate non-recyclable waste with materials designated for reuse or recycling.

i. Contractor's Responsibilities

- 1) Provide on-site instruction of the appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.
- 2) Separate, store, protect, and handle at the site identified recyclable and salvageable waste products in a manner that maximizes recyclability and salvagability of identified materials. Provide the necessary containers, bins and storage areas to facilitate effective waste management. Provide barriers and enclosures around recyclable material storage areas which are non hazardous and recyclable or reusable and which shall be located away from construction traffic. Provide adequate space for pick-up and delivery. Use cleaning materials that are non hazardous and biodegradable.

41. INSTRUCTIONS AND MANUALS

Three copies of the maintenance instructions, application/installation instructions and service manuals called for in the Specifications shall be provided by the Contractor. These shall be complete as to drawings, details, parts lists, performance data and other information that may be required for the District to easily maintain and service the materials and equipment installed under this Contract. All manufacturer's application/installation instructions shall be given to the Architect at least ten (10) days prior to first material application or installation of the item. The maintenance instructions and manuals, along with any specified guarantees, shall be delivered to the Architect for review prior to submitting to District, and the Contractor or appropriate Subcontractors shall instruct District's personnel in the operation and maintenance of the equipment prior to final acceptance of the Project.

42. AS-BUILT DRAWINGS

The Contractor and all Subcontractors shall maintain on the work site a separate complete set of contract drawings which will be used solely for the purpose of recording changes made in any portion of the work during the course of construction, regardless of the reason for the change. As changes occur, there will be included or marked on this record set on a daily basis if necessary to keep them up to date at all times. Actual locations to scale shall be identified on the drawings for all runs of mechanical and electrical work, including all site utilities installed underground, in walls, floors, and furred spaces, or otherwise concealed. Deviations from the drawings shall be shown in detail. All main runs, whether piping, conduit, duct work, drain lines, etc., shall be

located in addition by dimension and elevation. Progress payments may be delayed or withheld until such time as the record set is brought up to date to the satisfaction of the Architect. The Contractor shall verify that all changes in the work are included in the "AS-BUILT" drawings and deliver the complete set thereof to the Architect for review and approval within thirty (30) calendar days after District's notice of completion. District's acceptance and approval of the "AS-BUILT" drawings are a necessary condition precedent to the release of the final retention.

43. SUBSTITUTION OF SECURITIES

- a. Pursuant to Public Contract Code §22300, Contractor may request in writing that it be allowed at its own expense to substitute securities for moneys withheld by District to ensure performance under this Contract. Only securities listed in Government Code §16430 and bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by Contractor and District shall qualify under this Article. Securities equivalent to the amount withheld shall be deposited with the District or with a state or federally chartered bank in California as the escrow agent. Upon satisfactory completion of the Contract and on written authorization by the District, the securities shall be returned to Contractor. Contractor shall be the beneficial owner of the securities and shall receive any interest thereon. The Contractor may alternatively request District to make payment of retentions earned directly to the escrow agent at the expense of the Contractor.
- b. At the expense of the Contractor, the Contractor may direct the investment of the payments into securities and the Contractor shall receive the interest earned on the investments upon the same terms provided for above for securities deposited by Contractor. Upon satisfactory completion of the Contract, Contractor shall receive from the escrow agent all securities, interest, and payments received by the escrow agent from the District. The Contractor shall pay to each Subcontractor, not later than 20 days of receipt of payment, the respective amount of interest earned, net of costs attributed to retention withheld from each Subcontractor, on the amount of retention.
- c. Any escrow agreement entered into pursuant to this Article shall comply with Public Contract Code §22300 and shall be subject to approval by District's counsel.

44. NO DISCRIMINATION

It is the policy of the District that, in connection with all work performed under this public works contract, there shall be no discrimination against any prospective or active employee or any other person engaged in the work because of actual or perceived race, color, ancestry, national origin, ethnic group identification, religion, sex, gender, sexual orientation, age, physical or mental disability, or marital status. The Contractor agrees to comply with applicable Federal and California laws including, but not limited to, the California Fair Employment Practice Act, beginning with Government Code §12900, Government Code §11135, and Labor Code §§ 1735, 1777.5, 1777.6 and 3077.5. In addition, the Contractor agrees to require like compliance by all Subcontractors and suppliers.

45. LABOR STANDARDS

a. Work Hours:

In accordance with Labor Code §1810, eight (8) hours of labor shall constitute a legal day's work under this Contract. Contractor and any Subcontractor shall pay workers overtime pay as required by Labor Code §1815. The Contractor shall pay each worker, laborer, mechanic or persons performing work under this Contract at a rate not less than the prevailing wage for each craft or classification covering the work actually performed.

b. Penalty:

Contractor shall forfeit to District as a penalty the sum of twenty-five dollars (\$25.00) for each worker employed in the execution of this Contract by Contractor or any Subcontractor for each calendar day during which the worker is required or permitted to work more than eight (8) hours in any one (1) calendar day or more than forty (40) hours per calendar week in violation of Article 3, Division 2, Part 7, Chapter 1 of the California Labor Code.

c. Employment of Apprentices:

Contractor shall comply with Labor Code §§1773.3, 1777.5 and 1777.6, and 3077 *et. seq.*, each of which is incorporated by reference into this Contract. These sections require that contractors and subcontractors employ apprentices in apprenticeable occupations in a ratio of not less than one (1) hour of apprentice work for every five (5) hours of labor performed by a journeyman, unless an exception is granted and that Contractors and Subcontractors shall not discriminate against otherwise qualified employees as apprentices on any public works solely on the ground of actual or perceived race, religion, color, national origin, ethnic group identification, sex, gender, sexual orientation, age, or physical or mental disability. Only apprentices who are in training under written apprenticeship occupations shall be employed. The responsibility for compliance with these provisions for all apprenticeable occupations rests with Contractor.

d. The Contractor shall be knowledgeable of and comply with Labor Code §§1727, 1773.5, 1775, 1777, 1777.5, 1810, 1813, 1860, including all amendments thereto; each of these sections is incorporated by reference into this Contract.

46. GENERAL RATE OF PER DIEM WAGES

a. On File:

As required by Labor Code §1773.2, the District has available copies of the general prevailing rate of per diem wages for workers employed on public work as determined by the Director of the Department of Industrial Relations, which shall be available to any interested party on request. Contractor shall post a copy of the document at each job site.



b. Prevailing Wage Rate:

The Contractor and each Subcontractor shall pay each worker performing work under this Contract at a rate not less than the prevailing wage as defined in Labor Code §1771 and 1774 and §16000(a) of Title 8, California Code of Regulations.

c. Penalty:

In accordance with §1775 of the Labor Code, the Contractor shall forfeit to the District as penalty, the sum of \$200 for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rates, as determined by the Director of the California Department of Industrial Relations, for any work done under this Contract by Contractor or by any Subcontractor. Contractor shall also pay each worker the difference between the stipulated prevailing wages rates and the amount actually paid to such worker.

47. RECORD KEEPING

a. The Contractor agrees to comply with the provisions of §§1776 and 1812 of the Labor Code. The Contractor and each Subcontractor shall keep or cause to be kept an accurate record showing the names, addresses, social security numbers, work classifications, straight time and overtime hours worked each day and week of all workers employed by Contractor in connection with the execution of this Contract or any subcontract thereunder and showing the actual per diem wages paid to each of such workers. These records shall be certified and shall be open at all reasonable hours to the inspection of the District awarding the Contract, its officers and agents, and to the Chief of the Division of Labor Statistics and Law Enforcement of the State Department of Industrial Law Enforcement of the State Department of Industrial Relations, and his or her other deputies and agents.

b. In addition, copies of the above records shall be available as follows:

- 1) A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request;
- 2) A certified copy of all payroll records shall be made available for inspection or furnished upon request to the District, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations;
- 3) A certified copy of all payroll records shall be made available upon request by the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through either the District, the Division of Apprenticeship Standards, or the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested payroll records have not been previously provided, the requesting party shall, prior to being provided the records, reimburse

the costs of the 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 the Contractor.

- c. The Contractor shall file a certified copy of the records with the entity requesting the records within ten days after receipt of a written request. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the District, 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 the Contractor awarded the Contract or performing the Contract shall not be marked or obliterated.
- d. The Contractor shall inform the Owner of the location of the records, including the street address, city and county, and shall, within five working days, provide a notice of a change of location and address.
- e. In the event of noncompliance with the requirements of this section, the Contractor shall have ten days in which to comply subsequent to receipt of written notice specifying in what respects the Contractor must comply with this section. Should noncompliance still be evident after the ten day period, the Contractor shall, as a penalty to the District, forfeit \$100 for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.
- f. Responsibility for compliance with this provision shall be with the Contractor.

48. PROJECT COMPLETION

- a. When all of the work to be performed under this Contract has been fully completed, the Contractor shall notify the Architect and District, in writing, setting a date for inspection. The Contractor and Subcontractor representatives shall attend the inspection. As a result of this inspection, the Architect will prepare a list of items ("punch list") that are incomplete or not installed according to the Contract Documents. Failure to include items on this list does not relieve the Contractor from fulfilling all requirements of the Contract Documents.
- b. The Architect will promptly deliver the punch list to the Contractor and it will include a period of time by which the Contractor shall complete all items listed thereon. On completion of all items on the punch list, verified by a final inspection, and all other Contract requirements, so that Final Completion has been achieved to the District's satisfaction, the District will file a Notice of Completion with the County Recorder. Payment of retention from the Contract, less any sums withheld pursuant to the terms of this Contract or applicable law, shall not be made sooner than thirty-five (35) calendar days after the date of filing of Notice of Completion.

- c. District reserves the right to occupy buildings and/or portions of the site at any time before Completion, and occupancy shall not constitute final acceptance of any part of the Work covered by the Contract Documents, nor shall such occupancy extend the date specified for completion of the Work. Beneficial occupancy of building(s) does not commence any warranty period or entitle Contractor to any additional compensation due to such occupancy, or affect in any way or amount Contractor's obligation to pay liquidated damages for failure to complete the Project on time.

49. TRENCHING OR OTHER EXCAVATIONS

a. Excavations or Trenches Deeper than Four Feet:

If the Project involves digging trenches or other excavations that extend deeper than four feet, the following provisions shall be a part of this Contract:

- 1) The Contractor shall promptly, and before the following conditions are disturbed, provide written notice to the District if the Contractor finds any of the following conditions:
  - (a) Material that the Contractor believes may be a hazardous waste, as defined in §25117 of the Health and Safety Code, which is required to be removed to a Class I, Class II, or Class III disposal site in accordance with the provisions of existing law.
  - (b) Subsurface or latent physical conditions at the site which are different from those indicated or expected.
  - (c) Unknown physical conditions at the site of any unusual nature or which are materially different from those ordinarily encountered and generally recognized as inherent in work which the Contractor generally performs.
- 2) In the event that the Contractor notifies the District that Contractor has found any of the conditions specified in subparagraphs (a), (b) or (c), above, the District shall promptly investigate the condition(s). If the District finds that the conditions are materially different or that a hazardous waste is present at the site which will affect the Contractor's cost of, or the time required for, performance of the Contract, the District shall issue a change order in accordance with the procedures set forth in this Contract.
- 3) In the event that a dispute arises between the District and the Contractor regarding any of the matters specified in Paragraph (2), above, the Contractor shall proceed with all work to be performed under the Contract and the Contractor shall not be excused from completing the Project as provided in the Contract. In performing the work pursuant to this Paragraph, the Contractor retains all rights provided by

Article 50 which pertains to the resolution of disputes between the contracting parties.

b. 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 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 or delays arising from Contractor's failure to make appropriate notification shall be at the sole risk and expense of the Contractor and shall not be considered for an extension of the Contract time.

c. Existing Utility Lines:

- 1) Pursuant to Government Code §4215, the 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 liquidated damages for delay in completion of the Project caused by the failure of the District or the owner of a utility to provide for removal or relocation of such utility facilities.
- 2) Locations of existing utilities provided by the District shall not be considered exact, but approximate within reasonable margin and shall not relieve Contractor of responsibilities to exercise reasonable care nor costs of repair due to Contractor's failure to do so. The District shall compensate Contractor for the costs of locating and 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.
- 3) No provision herein shall be construed to preclude assessment against Contractor for any other delays in completion of the Project. Nothing in this section shall be deemed to require the District to indicate the presence of existing service laterals, appurtenances, or other utility lines, with the exception of main or trunklines, whenever the presence of such utilities on the site of the construction Project can be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the site of the construction.
- 4) If Contractor, while performing work under this Contract, discovers utility facilities not identified by the District in the Project 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.

d. Prompt 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 conditions. 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 incurred as a result of the conditions.

e. Trenches Five Feet and Deeper:

Pursuant to Labor Code §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 showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches.

50. RESOLUTION OF CONSTRUCTION CLAIMS

- a. Public work claims of \$375,000 or less between the Contractor and the District are subject to the provisions of Article 1.5 (commencing with §20104) of Chapter 1 of Part 2 of the Public Contract Code ("Article 1.5 claim"). For purposes of Article 1.5, "public work" has the same meaning as set forth in §§3100 and 3106 of the Civil Code; "claims" means a separate demand by Contractor for a time extension or payment of money or damages arising from work done by or on behalf of Contractor pursuant to the Contract and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to or the amount of the payment which is disputed by the District.
- b. All claims shall be submitted on or before the date of the Final Payment and shall include all documents necessary to substantiate the claim. District shall respond in writing within 45 days of receipt of claim if the claim is less than or equal to \$50,000 ("\$50,000 claim") or within 60 days if the claim is over \$50,000 but less than or equal to \$375,000 ("50,000 - \$375,000 claim"). In either case, District may request in writing within 30 days of receipt of claim any additional documentation supporting the claim or relating to any defenses to the claim which the District may have against the Contractor. Any additional information shall be requested and provided upon mutual agreement of the District and the Contractor. District's written response to the claim shall be submitted to Contractor within 15 days after receipt of the further documentation for \$50,000 claims or within 30 days after receipt of the further documentation for \$50,000 - \$375,000 claims or within a period of

time no greater than that taken by the Contractor in producing the additional information, whichever is greater.

- c. Within 15 days of receipt of the District's response, if Contractor disputes the District's written response, or within 15 days of the District's failure to respond within the time prescribed, the Contractor shall provide written notification to District demanding an informal conference to meet and confer ("conference") to be scheduled by District within 30 days. Following the conference, if any claim or portion remains in dispute, the Contractor may file a claim as provided in Chapter 1 (commencing with §900) and Chapter 2 (commencing with §910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the period of time within which a claim must be filed is tolled from the time the claimant submits a written claim pursuant to this section until the time that claim is denied as a result of the conference process, including any period of time utilized by the meet and confer process.
- d. Pursuant to Public Contract Code §20104.2(f), this section does not apply to tort claims and does not change the period for filing claims or actions specified by Chapter 1 (commencing with §900) and Chapter 2 (commencing with §910) of Part 3 of Division 3.6 of Title 1 of the Government Code.
- e. If a civil action is filed, within 60 days, but no earlier than 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 that both parties select a disinterested third person mediator within 15 days, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days of the commencement of the mediation unless time is extended upon a good cause showing to the court or by stipulation of the parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.
- f. If the matter remains in dispute, the case shall be submitted to judicial arbitration as set forth in Public Contract Code §§20104.4 (b)(1) through (b)(3).
- g. For any claim in excess of \$375,000, the Contractor and the District shall follow the same process as for an Article 1.5 claim. The District will forward a response within 60 days of submittal of any such claim. Judicial arbitration is not required for claims in excess of \$375,000.

Claims shall also be processed consistent with Public Contract Code section 9204, which provides processing timelines and procedures, and requires that undisputed claims be promptly paid in accordance with this code provision.

- h. In addition, for all unresolved claims that the Contractor wishes to pursue, the Contractor shall file a timely claim pursuant to the Government Claims Act and shall otherwise comply with the procedures set forth in that Act prior to commencing any litigation

against the District. The accrual date for any such claim is the date the dispute or controversy first arose regarding the issues raised in the claim.

- i. "The date of Final Payment," as used in this Article 50, means the date the public entity is required to release retention proceeds in accordance with Public Contract Code §7107 regardless of whether any payment is made to the Contractor at that time.
- j. The claims required by this Article are jurisdictional and conditions precedent to the commencement of any further legal proceedings. Strict compliance with all filing deadlines is mandatory.

51. DISABLED VETERANS PARTICIPATION GOALS *(Applies to K-12 districts only.)*

In accordance with Education Code §17076.11, this District has a participation goal for disabled veteran business enterprises ("DVBE") of at least 3 percent (3%) per year of the overall dollar amount of funds allocated to the District by the State Allocation Board pursuant to the Leroy F. Greene School Facilities Act of 1998 for construction or modernization and expended each year by the District. Prior to, and as a condition precedent for final payment under any contract for such project, the Contractor shall provide appropriate documentation to the District identifying the amount paid to DBVE in conjunction with the Contract, so that the District can assess its success at meeting this goal.

52. RETENTION OF DVBE RECORDS *(Applies to K-12 districts only.)*

The Contractor agrees that, for all contracts subject to DVBE participation goals, the State and the District have the right to review, obtain and copy all records pertaining to performance of the contract in accordance with DVBE requirements. The Contractor agrees to provide the State or the District with any relevant information requested and shall permit the State or District access to its premises upon reasonable notice for purposes of interviewing employees and inspecting records. The Contractor agrees to maintain such records for a period of three years after final payment under the Contract.

53. FINGERPRINTING

*(Applies to K-12 districts only.)*

District Determination of Fingerprinting Requirement Application

The District has considered the totality of the circumstances concerning the Project and has determined that the Contractor and Contractor's employees (which includes Subcontractor employees):

  X   are subject to the requirements of Education Code §45125.2 and Paragraph (a) below, is applicable.

\_\_\_\_\_ are not subject to the requirements of Education Code §45125.2, and Paragraph (b) below, is applicable.

- a. Contracts for Construction, Reconstruction, Rehabilitation or Repair of a School Facility Involving More than Limited Contact with Students (§45125.2)

By execution of the Contract, the Contractor acknowledges that Contractor is entering into a contract for the construction, reconstruction, rehabilitation, or repair of a school facility where the Contractor and/or Contractor's employees will have more than limited contact with students and the services to be provided do not constitute an emergency or exceptional situation. In accordance with Education Code §45125.2 the Contractor shall, at Contractor's own expense, (1) install a physical barrier to limit contact with students by Contractor and/or Contractor's employees, and/or (2) provide for the continuous supervision and monitoring of the Contractor and/or Contractor's employees by an employee of the Contractor who has received fingerprint clearance from the California Department of Justice, and/or (3) provide for the surveillance of the Contractor and Contractor's employees by a District employee.

- b. Contracts for Construction, Reconstruction, Rehabilitation or Repair of a School Facility Involving Only Limited Contact With Students (§45125.2)

By execution of the Contract, the Contractor acknowledges that Contractor is entering into a contract for the construction, reconstruction, rehabilitation or repair of a school facility involving only limited contact with students. Accordingly, the parties agree that the following conditions apply to any work performed by the Contractor and Contractor's employees on a school site: (1) Contractor and Contractor's employees shall check in with the school office each day immediately upon arriving at the school site; (2) Contractor and Contractor's employees shall inform school office staff of their proposed activities and location at the school site; (3) Once at such location, Contractor and Contractor's employees shall not change locations without contacting the school office; (4) Contractor and Contractor's employees shall not use student restroom facilities; and (5) If Contractor and/or Contractor's employees find themselves alone with a student, Contractor and Contractor's employees shall immediately contact the school office and request that a member of the school staff be assigned to the work location.

#### 54. LABOR COMPLIANCE PROGRAM

The project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations. In accordance with SB 854, all bidders, contractors and subcontractors working at the site shall be duly registered with the Department of Industrial Relations at time of bid opening and at all relevant times. Proof of registration shall be provided as to all such contractors prior to the commencement of any work. Contractor shall coordinate with the Architect to ensure that DIR is advised of the award of the construction contract in a timely manner by filing form PWC-100 with DIR within five days of award of the contract.



55. Blank.

56. DRUG-FREE WORKPLACE CERTIFICATION

Contractor certifies all of the following:

- 1) Contractor is aware of the provisions and requirements of California Government Code §§ 8350 et seq., the Drug Free Workplace Act of 1990.
- 2) Contractor is authorized to certify, and does certify, that a drug free workplace will be provided by doing all of the following:
  - a) Publishing a statement notifying all employees that the unlawful manufacture, distribution, dispensation, possession or use of a controlled substance is prohibited in Contractor's workplace and specifying actions which will be taken against employees for a violation of the prohibition;
  - b) Establishing a drug-free awareness program to inform employees about all of the following:
    - (i) The dangers of drug abuse in the workplace;
    - (ii) Contractor's policy of maintaining a drug-free workplace;
    - (iii) The availability of drug counseling, rehabilitation and employee-assistance programs; and
    - (iv) The penalties that may be imposed upon employees for drug abuse violations;
  - c) Requiring that each employee engaged in the performance of Work on the Project be given a copy of the statement required by subdivision (a), above, and that as a condition of employment by Contractor in connection with the Work on the Project, the employee agrees to abide by the terms of the statement.
- 3) Contractor understands that if the District determines that Contractor has either: (a) made a false certification herein, or (b) violated this certification by failing to carry out and to implement the requirements of Government Code §§ 8350 et seq., the Contract is subject to termination, suspension of payments, or both. Contractor further understands that, should Contractor violate the terms of the Drug-Free Workplace Act of 1990, Contractor may be subject to debarment in accordance with the provisions of Government Code §§ 8350, et seq.

57. PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted, and this Contract shall be read and enforced as though it were included, and if

through mistake or otherwise any provision is not inserted or is not correctly inserted, upon application of either party the Contract shall be amended to make the insertion or correction. All references to statutes and regulations shall include all amendments, replacements, and enactments on the subject which are in effect as of the date of this Contract.

58. GENERAL PROVISIONS

a. Assignment and Successors:

Neither party may transfer or assign its rights or obligations under the Contract Documents, in part or in whole, without the other party's prior written consent. The Contract Documents are binding on the heirs, successors, and permitted assigns of the parties hereto.

b. Third Party Beneficiaries:

There are no intended third party beneficiaries to the Contract.

c. Choice of Law and Venue

The Contract Documents shall be governed by California law, and venue shall be in the Superior Court of the county in which the project is located, and no other place.

d. Severability

If any provision of the Contract Documents is determined to be illegal, invalid, or unenforceable, in part or in whole, the remaining provisions, or portions of the Contract Documents shall remain in full force and effect.

e. Entire Agreement

The Contract Documents constitute the final, complete, and exclusive statement of the terms of the agreement between the parties regarding the subject matter of the Contract Documents and supersedes all prior written or oral understandings or agreements of the parties.

f. Waiver

No waiver of a breach, failure of any condition, or any right or remedy contained in or granted by the provisions of the Contract Documents shall be effective unless it is in writing and signed by the party waiving the breach, failure, right, or remedy. No waiver of any breach, failure, right, or remedy shall be deemed a waiver of any other breach, failure, right, or remedy, whether or not similar, nor shall any waiver constitute a continuing waiver unless the writing so specifies.

g. Headings

The headings in the Contract Documents are included for convenience only and shall neither affect the construction or interpretation of any provision in the Contract Documents nor affect any of the rights or obligations of the parties to the Contract.

--END--

## NOTICE OF AWARD

To:

Project Description: [Kelseyville Elementary School HVAC & Electrical Upgrades](#)

The District has considered the bid submitted by you for the above described work in response to its Notice Inviting Bids for the Project.

You are hereby notified that your bid has been accepted in the amount of: \_\_\_\_\_ (\$ \_\_\_\_\_).

You are required to execute the Contract and furnish the required Performance Bond and Payment Bond using the bond forms provided in the Contract Documents and the required certificates of insurance within ten (10) calendar days from the date of issuance of this Notice.

If you fail to execute the Contract and to furnish the bonds and insurance within ten (10) calendar days from the date of issuance of this Notice, the District will be entitled to consider all your rights arising out of its acceptance of your bid as abandoned and your Bid Bond forfeited. The District will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice of Award to the District.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

By \_\_\_\_\_  
Authorized District Signature

Receipt of this above Notice of Award is hereby acknowledged by:

\_\_\_\_\_, this is the \_\_\_\_\_  
day of \_\_\_\_\_, 20\_\_.

By \_\_\_\_\_  
Title \_\_\_\_\_

## NOTICE TO PROCEED

To:

Date:

PROJECT: Kelseyville Elementary School HVAC & Electrical Upgrades

You are hereby notified to commence work in accordance with the Contract dated \_\_\_\_\_, 20\_\_, on or before \_\_\_\_\_, 20\_\_, and you shall complete the work 60 consecutive calendar days thereafter.

By:

\_\_\_\_\_  
Authorized District Signature

## PERFORMANCE BOND

WHEREAS, the Governing Board of the [Kelseyville Unified School District](#) ("District"), at its meeting on \_\_\_\_\_, 20\_\_\_\_, has awarded to \_\_\_\_\_ ("Principal"), the Contract for performance of the following project ("Project"): [Kelseyville Elementary School HVAC & Electrical Upgrades](#).

WHEREAS, the Principal is required under the terms of the Contract to furnish a bond to the District as obligee ensuring its full and faithful performance of the Contract Documents, which are fully incorporated herein by this reference,

NOW, THEREFORE, we, the Principal and \_\_\_\_\_, as Surety, hereby guarantee the Principal's full, faithful and complete performance of the Contract Document requirements in the penal sum of \_\_\_\_\_ dollars (\$\_\_\_\_\_) for the payment of which sum will and truly be made, we bind ourselves, our heirs, executors, administrators and successors, jointly, severally, and firmly by this agreement to perform or have performed all of the work and activities required to complete the Project pursuant to the Contract Documents and to pay to the District all damages the District incurs as a result of the Principal's failure to fully perform in accordance with the Contract Documents.

The condition of the obligation is such that if the Principal, its heirs, executors, administrators, successors or assigns shall in all things abide by, and well and truly keep and perform the covenants, conditions and agreements in the Contract Documents and any amendment thereof made as therein provided, on its or their parts to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall insure and indemnify and save harmless the District, its officers and agents, as therein stipulated, then this obligation shall become null and void. Otherwise, it shall be and remain in full force and effect.

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

Principal and Surety further agree to pay all costs incurred by the District in connection with enforcement of this bond, including, but not limited to the District's reasonable attorney's fees and costs incurred, with or without suit, in addition to any other sum required by this bond. Surety further agrees that death, dissolution, or bankruptcy of the Principal shall not relieve the Surety of its obligations hereunder.

In witness whereof, five (5) 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 on the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

*To be signed by  
Principal and Surety  
and acknowledgment  
and notarial seal to  
be attached.*

\_\_\_\_\_  
PRINCIPAL

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

TITLE \_\_\_\_\_

\_\_\_\_\_  
SURETY

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

TITLE \_\_\_\_\_

The above bond is accepted and approved this \_\_\_\_\_ day of \_\_\_\_\_, 2017.

By: \_\_\_\_\_  
Authorized District Signature

## PAYMENT BOND

WHEREAS, the  
[Kelseyville Unified School District](#) (“District”) and the Contractor, \_\_\_\_\_ (“Principal”) have entered into a contract (“Contract”) for the furnishing of all materials, labor, services, equipment, tools, supervision and transportation necessary, convenient and proper for the [Kelseyville Elementary School HVAC & Electrical Upgrades](#) (“Project”) which Contract dated \_\_\_\_\_, 2\_\_\_\_, and all of the Contract Documents made part thereof are fully incorporated herein by this reference; and

WHEREAS, Contractor/Principal is required by Division 4, Part 6, Title 3, Chapter 5 (commencing at Section 9550) of the California Civil Code to furnish a bond in connection with the contract;

NOW, THEREFORE, we, the Contractor/Principal and \_\_\_\_\_ as Surety, are held firmly bound unto Owner in the penal sum of \$ \_\_\_\_\_ Dollars (\$ \_\_\_\_\_), lawful money of the United States of America 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.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the Contractor/Principal, his/her or its heirs, executors, administrators, successors, or assigns, or a subcontractor, shall fail to pay any person or persons named in Civil Code Section 9100 or fail to pay for any materials or other supplies used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Code with respect to work or labor thereon of any kind, or shall fail to deduct, withhold, and pay over to the Employment Development Department any amounts required to be deducted, withheld, and paid over by Section 13020 of the Unemployment Insurance Code with respect to work and labor thereon of any kind, then said Surety will pay for the same, in or to an amount not exceeding the amount set forth above, and in case suit is brought upon this bond Surety will also pay such reasonable attorney's fees as shall be fixed by the court, awarded and taxed as provided in Division 4, Part 6, Title 3, Chapter 5 (commencing at Section 9550) of the California Civil Code.

This bond shall inure to the benefit of any of the persons named in Section 9100 of the California Civil Code so as to give a right of action to such person or their assigns in any suit brought upon this bond.

It is further stipulated and agreed that the Surety of this bond shall not be exonerated or released from the obligation of the bond by any change, extension of time for performance, addition, alteration, or modification in, to, or of any contract, plans, specifications, or agreement pertaining or relating to any scheme or work of improvement described above or pertaining or relating to the furnishing of labor, materials, or equipment therefor, nor by any change or modification of any terms of payment or extension of the time for any payment pertaining or relating to any scheme or work of improvement described above, nor by any rescission or attempted rescission of the contract, agreement, or bond, nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or under the bond, nor by any fraud practiced by any person other than the claimant seeking to recover on the bond, and that this bond be construed most strongly against the Surety and in favor of all persons for whose benefit such bond is



given, and under no circumstances shall Surety be released from liability to those for whose benefit such bond has been given, by reason of any breach of contract between the Owner and original contractor or on the part of any obligee named in such bond, but the sole conditions of recovery shall be that claimant is a person described in Section 8400 and 8402 of the California Civil Code and has not been paid the full amount of his/her or its claim and that Surety does hereby waive notice of any such change, extension of time, addition, alteration, or modification.

In witness whereof, this instrument has been duly executed by the Principal and Surety this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

*To be signed by  
Principal and Surety  
and acknowledgment  
and notarial seal to  
be attached.*

\_\_\_\_\_  
PRINCIPAL

By:

\_\_\_\_\_  
Title

\_\_\_\_\_  
SURETY

By:

\_\_\_\_\_  
Title

The above bond is accepted and approved this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

By: \_\_\_\_\_  
Authorized District Signature

## SECTION 01100 – SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Summary
  - 2. Work covered by the Contract Documents.
  - 3. Work by District
  - 4. Use of premises

#### 1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: **Kelseyville Elementary School HVAC & Electrical Upgrades**
- B. Project Location: **5065 Konocti Road, Kelseyville, CA 95451**
- C. Owner: **Kelseyville Unified School District**
- D. Construction Manager: **MBA Consulting**
- E. Architect: **Persinger Architects and Associates**
- F. Project Description – **Re-roof**
- G. The work to be performed by sub-contractor shall conform to the requirements of all Division 1 Specifications, as well as the General Conditions, Supplementary Conditions, Special Conditions, and other related documents, and includes the furnishing of all supervision, labor materials, tolls, equipment, plan and services necessary therefore and incidental thereto to complete the project. The work shall consist of, but not be limited to the following:
  - 1. **At classroom buildings 1, 2, and 3 contractor shall remove existing wood shingle roofing at mansards. Install new standing seam metal roofing. Include new 30lb felt and new flashing. Install per manufacturers guidelines.**
  - 2. **Contractor is responsible for removal and replacement of 23 rooftop packaged HVAC units and 6 wall mount HVAC units to match size and capacity. Removal and replacement of 2 rooftop exhaust fans. Removal and replacement of rooftop propane gas and condensate piping serving Classroom 1. Miscellaneous valves, appurtenances, and sheet metal work to connect to existing duct distribution networks and piping systems.**
  - 3. **Contractor shall include the following allowances:**
    - 1) **\$20,000 for unforeseen dry rot.**
    - 2) **\$40,000 for unforeseen electrical.**
    - 3) **\$40,000 for unforeseen mechanical.**
  - 4. **Contractor is responsible for protecting interior finishes, with plastic cover, and shall have spaces professionally cleaned upon completion of the project.**

**5. Contractor to remove and replace main service panel, sub panels, and install new dedicated circuit at all classrooms at classroom buildings 1, 2, and 3.**

**1.3 USE OF PREMISES**

- A. General: Contractor shall have limited use of premises for construction operations. The construction sites are on the sites of the [Kelseyville Elementary School](#).
- B. Use of Site: Limit use of premises to work in areas indicated on the drawings. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Limits: Confine construction operations to the Area of Work as defined in the construction documents.
  - 2. Driveways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: None

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01100**

## **SECTION 01290 - PAYMENT PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

#### **1.2 SCHEDULE OF VALUES**

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets Submittals Schedule and Contractor's Construction Schedule.
  - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days after Notice of Award.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the Schedule of Values:
    - a. Project name and location.
    - b. Name of Architect.
    - c. Contractor's name and address.
    - d. Date of submittal.
  - 2. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents.
  - 3. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  - 4. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - 5. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
  - 6. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

- a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
7. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

### 1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets forms provided by Owner, sample copy included at end of this Section, as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Sign form by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit three (3) signed copies of each Application for Payment to Architect. One copy shall include waivers of lien and similar attachments if required.
  1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
  1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  2. When an application shows completion of an item, submit final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of Values.
  3. Contractor's Construction Schedule (preliminary if not final).
  4. Submittals Schedule (preliminary if not final).
  5. Copies of building permits.
  6. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  7. Initial progress report.
  8. Report of preconstruction conference.
  9. Certificates of insurance and insurance policies.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  3. Updated final statement, accounting for final changes to the Contract Sum.
  4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  6. AIA Document G707, "Consent of Surety to Final Payment."
  7. DSA-6 Document: Final "Verified Report"
  8. Evidence that claims have been settled.
  9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01290**

## **SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Coordination Drawings.
  - 2. Project meetings.
- B. See Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

#### **1.2 COORDINATION**

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
  - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's Construction Schedule.
  - 2. Preparation of the Schedule of Values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Preinstallation conferences.
  - 7. Project closeout activities.
  - 8. Startup and adjustment of systems.

9. Project closeout activities.

### 1.3 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
  1. Attendees: Inform subcontractors or relevant individuals whose presence is required, of date and time of each meeting.
  2. Agenda: Prior to each weekly meeting submit new items for inclusion in agenda.
  3. The District's Project Manager, will agendize and conduct the pre-construction meeting and the weekly construction meetings, and prepare and distribute Meeting Minutes.
  4. Schedule and conduct subcontractor coordination meetings as needed to execute the work.
- B. Preconstruction Conference: Attend a preconstruction conference before starting construction, as scheduled by the District's Project Manager.
  1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Procedures for processing field decisions and Change Orders.
    - f. Procedures for requests for interpretations (RFIs).
    - g. Procedures for testing and inspecting.
    - h. Procedures for processing Applications for Payment.
    - i. Distribution of the Contract Documents.
    - j. Procedures for processing Submittals.
    - k. Preparation of Record Documents.
    - l. Use of the premises and existing building.
    - m. Work restrictions.
    - n. Owner's occupancy requirements.
    - o. Responsibility for temporary facilities and controls.
    - p. Construction waste management and recycling.
    - q. Parking availability.
    - r. Office, work, and storage areas.
    - s. Equipment deliveries and priorities.
    - t. First aid.
    - u. Security.
    - v. Progress cleaning.
    - w. Working hours.



C. Progress Meetings: The District's project manager will conduct progress meetings at weekly intervals.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
  - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - 1) Review schedule for next period.
  - b. Review present and future needs of each entity present, including the following:
    - 1) Interface requirements.
    - 2) Sequence of operations.
    - 3) Status of submittals.
    - 4) Deliveries.
    - 5) Off-site fabrication.
    - 6) Access.
    - 7) Site utilization.
    - 8) Temporary facilities and controls.
    - 9) Work hours.
    - 10) Hazards and risks.
    - 11) Progress cleaning.
    - 12) Quality and work standards.
    - 13) Status of correction of deficient items.
    - 14) Field observations.
    - 15) Requests for interpretations (RFIs).
    - 16) Status of proposal requests.
    - 17) Pending changes.
    - 18) Status of Change Orders.
    - 19) Pending claims and disputes.
    - 20) Documentation of information for payment requests.
3. Minutes: The District's project manager will record and distribute the meeting minutes.
4. Reporting: The District's project manager will distribute minutes of the meeting to each party present and to parties who should have been present.
  - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01310**

## **SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Contractor's Construction Schedule.
  - 2. Submittals Schedule.
  - 3. Daily construction reports (prepared and available upon request).
  - 4. Field condition reports.
  - 5. Submittal Log and RFI Log.
- B. See Division 1 Section "Payment Procedures" for submitting the Schedule of Values.

#### **1.2 DEFINITIONS**

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
  - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.
- B. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- C. Float: The measure of leeway in starting and completing an activity.
  - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
- D. Major Area: A story of construction, a separate building, or a similar significant construction element.

#### **1.3 SUBMITTALS**

- A. Submittals Schedule: Submit three copies of schedule within 15 days of Notice to Proceed. Arrange the following information in a tabular format:
  - 1. Scheduled date for first submittal.

2. Specification Section number and title.
  3. Submittal category (action or informational).
  4. Name of subcontractor.
  5. Description of the Work covered.
  6. Scheduled date for Architect's final release or approval.
- B. Contractor's Construction Schedule: Submit two copies of preliminary schedule within 7 days of Notice to Proceed, large enough to show entire schedule for entire construction period.
- C. Daily Construction Reports: Submit two copies at monthly intervals.
- D. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

#### 1.4 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from parties involved.
  2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

### PART 2 - PRODUCTS

#### 2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
  2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

#### 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice of Award to date of Final Completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
1. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
  2. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
  2. Work under More Than One Contract: Include a separate activity for each contract.
  3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
  4. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.
    - c. Uninterruptible services.
    - d. Partial occupancy before Substantial Completion.
    - e. Use of premises restrictions.
    - f. Provisions for future construction.
    - g. Seasonal variations.
    - h. Environmental control.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

## 2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 15 days of Notice to Proceed. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
1. Preparation: Indicate each significant construction activity separately.

## 2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
  2. Equipment at Project site.
  3. Material deliveries.
  4. High and low temperatures and general weather conditions.

5. Accidents.
6. Stoppages, delays, shortages, and losses.
7. Meter readings and similar recordings.
8. Orders and requests of authorities having jurisdiction.
9. Services connected and disconnected.
10. Equipment or system tests and startups.

- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation (RFI). Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule at each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
  2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

**END OF SECTION 01320**

## **SECTION 01330 - SUBMITTAL PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. See Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule.
- C. See Division 1 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
- D. See Division 1 Section "Closeout Procedures" for submitting warranties.
- E. See Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
- F. See Division 1 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.

#### **1.2 DEFINITIONS**

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

#### **1.3 SUBMITTAL PROCEDURES**

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
- D. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
  2. Provide a space on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  3. Include the following information on label for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name and address of Contractor.
    - e. Name and address of subcontractor.
    - f. Name and address of supplier.
    - g. Name of manufacturer.
    - h. Submittal number or other unique identifier, including revision identifier.
      - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).
- i. Number and title of appropriate Specification Section.
  - j. Drawing number and detail references, as appropriate.
  - k. Location(s) where product is to be installed, as appropriate.
  - l. Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- F. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.



- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Use only final submittals with mark indicating approval by Architect.

## PART 2 - PRODUCTS

### 2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Manufacturer's catalog cuts.
    - e. Wiring diagrams showing factory-installed wiring.
    - f. Printed performance curves.
    - g. Operational range diagrams.
    - h. Compliance with specified referenced standards.
    - i. Testing by recognized testing agency.
  - 4. Number of Copies: Submit 5 copies of Product Data, unless otherwise indicated. Architect will return 3 copies to contractor and 1 copy to Owner. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
  - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.
    - c. Fabrication and installation drawings.
    - d. Roughing-in and setting diagrams.
    - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    - f. Shopwork manufacturing instructions.
    - g. Templates and patterns.
    - h. Schedules.

- i. Notation of coordination requirements.
    - j. Notation of dimensions established by field measurement.
    - k. Relationship to adjoining construction clearly indicated.
    - l. Seal and signature of professional engineer if specified.
    - m. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
  - 2. Number of Copies: Submit three opaque (bond) copies of each submittal. Architect will return one copy.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  - 2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of appropriate Specification Section.
  - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
  - 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit 3 full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
  - 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.
- E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.
- F. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

- G. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."
- H. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."
- I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.
  - 1. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Architect will return two copies.

## 2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
  - 1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
  - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
  - 3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- M. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- N. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- O. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- P. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."
- Q. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- R. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.
- S. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

1. Architect will not review submittals that include MSDSs and will return them for resubmittal.

## **PART 3 - EXECUTION**

### **3.1 CONTRACTOR'S REVIEW**

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### **3.2 ARCHITECT'S ACTION**

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
  1. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- D. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

**END OF SECTION 01330**

## **SECTION 01700 - EXECUTION REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. General installation of products.
  - 4. Progress cleaning.
  - 5. Starting and adjusting.
  - 6. Protection of installed construction.
  - 7. Correction of the Work.
- B. See Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

#### **1.2 SUBMITTALS**

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

#### **1.3 QUALITY ASSURANCE**

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

### **PART 2 - PRODUCTS (Not Used)**

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
  - 1. Before construction, verify the location and points of connection of utility services.

- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on CSI Form 13.2A, "Request for Interpretation."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 3. Inform installers of lines and levels to which they must comply.
  - 4. Check the location, level and plumb, of every major element as the Work progresses.
  - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

### 3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.



- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
  2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

### 3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

### 3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

**END OF SECTION 01700**

## **SECTION 01770 - CLOSEOUT PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Warranties.
  - 3. Final cleaning.
  - 4. DSA final verification procedures

#### **1.2 SUBSTANTIAL COMPLETION**

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, and similar final record information.
  - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  - 8. Complete startup testing of systems.
  - 9. Submit test/adjust/balance records.
  - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  - 11. Advise Owner of changeover in heat and other utilities.
  - 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  - 13. Complete final cleaning requirements, including touchup painting.
  - 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection

or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

### 1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
6. Submit DSA-6 form final "Verified Report" marked 100% complete.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

### 1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.

1. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

### 1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.

- e. Remove snow and ice to provide safe access to building.
  - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
  - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
  - h. Sweep concrete floors broom clean in unoccupied spaces.
  - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
  - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - k. Remove labels that are not permanent.
  - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
  - m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - n. Replace parts subject to unusual operating conditions.
  - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  - r. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

#### **END OF SECTION 01770**

## SECTION 03212

### PAVEMENT MARKINGS AND SIGNS

#### PART 1 GENERAL

##### 1.01 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Section, apply to this Section.

##### 1.02 SUMMARY

- A. This Section includes, but is not limited to the following:
  - 1. Furnish materials and install painted traffic striping onsite.
  - 2. Furnish materials and install traffic signs and posts.
- B. Related Sections include, but are not limited to, the following:

##### 1.03 RELATED WORK

- A. Documents affecting work of this section include, but are not limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications. Contractor is responsible for coordinating all work.

##### 1.04 REFERENCES

- A. Reference Data:
  - 1. If the year of the adoption or latest revision is omitted from the designation, it shall mean the specification, manual or test designation in effect the date the Notice to Proceed with the Work is given.
- B. Caltrans Traffic Manual and Standard Specifications

#### PART 2 PRODUCTS

##### 2.01 STRIPING PAINT

- A. The paint to be used for striping shall be commercial quality paint specifically designed for traffic striping applications, and shall be applied in two coats. Thinner shall not be mixed with paint.

##### 2.02 SIGNS

- A. Traffic and regulatory signs shall conform to the requirements of the Caltrans Traffic Manual for the type of sign indicated on the plans. Disabled accessible parking signs shall also comply with the applicable sections of California Title 24 regulations and ~~ADAAG~~. Applicable sections are CBC **11B-502.6** ~~1133B.8.6.3~~, and ~~ADAAG standards 4.6.4~~ **11B-502.6**.
- B. Signs shall be mounted at standard heights on 2-inch square unistrut posts set in concrete.



## PART 3 EXECUTION

### 3.01 STRIPING

- A. No stall striping shall be started until all pavement work on the entire job has been completed, and the various finished surfaces are sufficiently cured to prevent undue tracking onto new striping.
- B. Paint shall dry "track free" in not less than thirty (30) minutes and not more than ninety (90) minutes.
- C. The air compressor used shall have a capacity of 60 cubic feet per minute.
- D. All stripes for parking spaces shall have a width of four inches. All widths shall be within 1/3-inch of the specified widths.
- E. The rate of application of paint:
  - 1. Solid single stripes: 17 to 18 gallons per mile.
- F. All lines and other shapes shall be clean and sharp as to dimensions and shall be painted in the locations shown on the plans. Ragged ends of segments, foginess along the sides, or objectionable dribbling along the unpainted portions of the stripe shall not be permitted.
- G. The finished product shall have an opaque, well painted appearance with no black or other discolorations showing through. Any smears shall be painted out with black paint to the satisfaction of the Owner's Representative.
- H. The Contractor shall take all reasonable precautions to protect the paint during drying time and may be required to paint out all objectionable tracking. Appropriate traffic control necessary to insure non-tracking as well as reasonable traffic flows shall be the Contractor's responsibility.
- I. Painted stripes shall receive two coats of paint.
- J. No work shall be done when the pavement is appreciably damp.

### 3.02 SIGNS

- A. Signs shall be installed in the locations shown on the plans, and in accordance with the referenced standards for height, setback from the curb, and embedment.
- B. Accessible parking signs shall be installed in accordance with the requirements of California Title 24 regulations and ~~ADAAG~~. Applicable sections are CBC **11B-502.6**, ~~1133B-8.6.3~~, and **11B-502.6**. ~~ADAAG standards 4.6.4~~. Refer to plans and details for required signage.

### 3.03 CLEAN UP

- A. Remove all debris and stains resulting from the work of this section.

END OF SECTION

## SECTION 07411

# UNA-CLAD™ UC-6 METAL PANEL ROOFING SYSTEM FIRESTONE BUILDING PRODUCTS, LLC

## PART 1 GENERAL

The project, Kelseyville Elementary School HVAC and Electrical Upgrades project located in Kelseyville, CA, includes the provision of a complete Firestone Building Products UNA-CLAD™ UC-6 Double-lock, Concealed Clip, Standing Seam Metal Panel Roofing System.

### 1.01 SUMMARY

- A. Furnish and install a double lock metal panel roofing system, including:
  - 1. Roofing manufacturer's requirements for the specified warranty.
  - 2. Preparation of roofing substrates.
  - 3. Wood nailers for roofing attachment.
  - 4. Insulation.
  - 5. Cover boards.
  - 6. Self adhering underlayment.
  - 7. Metal roof edging and copings.
  - 8. Flashings.
  - 9. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete roofing system.
- B. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.
- C. Comply with the published recommendations and instructions of the roofing system manufacturer, at <http://manual.fsbp.com>.
- D. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing system manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

### 1.03 REFERENCES

- A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.
  - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 2011.
  - 2. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
  - 3. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2008.
  - 4. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2013.
  - 5. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.
  - 6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

7. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; American Society for Testing and Materials; 2011.
8. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.
9. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; American Society for Testing and Materials; 2005 (Reapproved 2012)
10. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; American Society for Testing and Materials; 1995 (Reapproved 2011).
11. ASTM E1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems; American Society for Testing and Materials; 2011.
12. MBMA - Metal Roofing Systems Design Manual; Metal Building Manufacturers Association; 2012.
13. PS 1 - Construction and Industrial Plywood; 2009.
14. PS 20 - American Softwood Lumber Standard; 2010.
15. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
16. UL 2218 - Standard for Impact Resistance of Prepared Roof Covering Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

#### **1.04 SUBMITTALS**

- A. Product Data: Submit manufacturer's data sheets on each product to be installed and manufacturer's standard detail drawings applicable to this project.
  1. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.
- B. Samples: Submit following samples for approval:
  1. 12 inch (300 mm) long sample of roof panel.
  2. Roof attachment clips.
  3. Color chips for selection of finish color and sheen.
  4. After selection of finish color, provide two 3 by 5 inch (75 by 125 mm) metal samples finished in color selected.
- C. Shop Drawings: Provide drawings prepared especially for this project for all relevant conditions, including plans and elevations, sections and details, specified loads, flashings, roof edges, terminations, expansion joints, curbs, penetrations, and drainage. Specifically include interfaces with materials not supplied by metal roof panel manufacturer and identify each component and its finish.
- D. Pre-Installation Notice: Copy to show that manufacturer's required Pre-Installation Notice (PIN) has been accepted and approved by the manufacturer.
- E. Manufacturer's Installation Inspection Reports: Manufacturer may, at its option, inspect the installation at any time to appraise the installing contractor of their compliance with manufacturer's requirements. Typical inspections will include:
  1. Prior to the installation of the metal roofing panels to inspect the underlayments. The roofing contractor is responsible for assuring that the substrate is in suitable condition for the installation of the metal roofing components to the substrate.
  2. Intermediate inspections to ensure proper installation of the metal roofing panels (if required).
  3. At final completion of all metal roofing system work.
  4. Submit to Owner, for the project record, a copy of each report of inspection made.
- F. Executed Warranty, by authorized company official with final close-out.

### **1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Roofing installer shall have received training from metal panel manufacturer for installation of the specified roof panel system, and:
  - 1. Current Firestone Red Shield licensed installer status.
  - 2. Having and using only equipment authorized and inspected by metal panel manufacturer.
- B. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
  - 1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
  - 2. Notify Architect well in advance of meeting.

### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
- B. Exercise extreme care in unloading, storing, and installing metal panels to prevent bending, warping, twisting, and surface damage.
- C. Store products above ground on well-supported platforms that provide minimum of 1:48 slope. Store under waterproof covering or indoors and provide proper ventilation of metal components to prevent condensation build-up between metal components.

### **1.07 WARRANTY**

- A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.
- B. Manufacturer's warranty is in addition to, and not a limitation of, other rights the owner may have under the contract documents.
- C. Warranty: Firestone Red Shield Limited Warranty covering roof panels and associated metal components, roof sheathing/insulation manufactured by Firestone, and accessories, covering weathertightness, finish, materials, labor, and workmanship.
  - 1. Limit of Liability: No dollar limitation.
  - 2. Scope of Coverage: Repair leaks in the roofing system caused by:
    - a. Ordinary wear and tear of the elements.
    - b. Manufacturing defect in Firestone brand materials.
    - c. Defective workmanship used to install these materials.
    - d. Damage due to winds up to 55 mph.
  - 3. Not Covered:
    - a. Materials made by entities other than Firestone Building Products
    - b. Damage due to winds in excess of 55 mph.
    - c. Damage due hurricanes or tornadoes.
    - d. Hail.
    - e. Intentional damage.
    - f. Unintentional damage due to normal rooftop inspections, maintenance, or service.
- D. Painted Finish Warranty: Provide Firestone standard Red Shield non-prorated warranty covering durability of painted finish, to include film integrity, color change, fading, and chalking, unless otherwise indicated below.
  - 1. Warranty Period: 25 years commencing on date of substantial completion.
  - 2. Metallic Colors (as identified by Firestone): Not warranted against color change or fading.
  - 3. Firestone Standard Color "Regal Red": Warranted against color change or fading for a maximum period of ten (10) years.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturer - Metal Roof Panels and Associated Sheet Metal Components:  
Firestone Building Products LLC, Carmel, IN: [www.firestonebpco.com](http://www.firestonebpco.com) .
  - 1. Provide all components of system supplied or specified by same manufacturer.
  - 2. Roofing systems manufactured by others may be acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:
    - a. Specializing in manufacturing the roofing system to be provided.
    - b. Minimum ten years of experience manufacturing the roofing system to be provided.
    - c. Able to provide a no dollar limit, single source roof system warranty that is backed by corporate assets in excess of one billion dollars.
    - d. ISO 9002 certified.
    - e. Able to provide waterproofing membrane underlayment.
    - f. Able to provide polyisocyanurate insulation.
- B. Manufacturer of Insulation: Same manufacturer as metal roof panels.
- C. Substitutions: See Section 1 - Product Requirements.
  - 1. Submit evidence that the proposed substitution complies with the specified requirements.

### 2.02 ROOFING SYSTEM DESCRIPTION

- A. Roofing System: Standing seam metal roof panels and other components, together forming a watertight assembly having the following characteristics:
  - 1. Warranty: 20 year.
  - 2. Panel Seam Type: Self-locking; not requiring field seaming, concealed clip attachment to substrate.
  - 3. Panel Material: Steel, 24 gauge (0.64 mm) with fluoropolymer finish, over G90 hot-dipped galvanized coating.
  - 3. Color: To be selected from manufacturer's standard and premium colors.
  - 4. Design Loads: In accordance with ASCE 7, current edition.
    - a. Design Snow Load: Not less than 20 psf (960 kPa).
    - b. Maximum Deflection Under Snow Load: Not more than L/180 or as recommended by ASCE 7, whichever is less.
    - c. Wind Uplift Resistance: Class 90 rating, minimum, when tested in accordance with UL 580.
    - d. Wind Pull-Off Resistance: No failure of roof panel or fasteners when tested in accordance with ASTM E1592 for negative loading equal to negative design wind load; for assemblies not tested, capacity for gauge, span, or loading may be determined by interpolating between test values only.
  - 5. Impact Resistance: Minimum of Class 4, when tested in accordance with UL 2218.
  - 6. Thermal Effects: Design roof panels and their attachment to allow free movement in response to expansion and contraction forces resulting from temperature variation, as specified in the MBMA Metal Roofing Systems Design Manual.
  - 7. External Fire Resistance: Class A when tested in accordance with ASTM E108 or UL 790.
  - 8. Provide all necessary members and connections, whether indicated in the manufacturer's standard detail drawings or not.
  - 9. Accessories and Fasteners: Capable of resisting the specified design wind uplift forces and allowing for thermal movement of the roof panel system, not restricting free movement of the roof panel system resulting from thermal forces except at designed points of roof panel fixity.
- B. Roof System Components: In order from the top down:
  - 1. Metal roofing panels and trim.
  - 2. Underlayment: Self-adhering, high temperature underlayment over entire roof; material as specified.

## 2.03 ROOF PANELS AND SHEET METAL FABRICATIONS

- A. Roof Panels: Firestone UNA-CLAD UC-6 Standing Seam Roofing; roll formed roofing panels produced in a permanent factory environment with fixed-base roll-forming equipment.
  - 1. Seam Height: 2 inches (50.8 mm).
  - 2. Seam Spacing (Panel Width): 18 inches (475.2 mm) max
  - 2. Profile: Flat. Flat Ribs
  - 3. Texture: Smooth
  - 4. Clips: As tested and supplied by manufacturer.
  - 5. Provide factory applied integral seam sealant in leg of panel.
  - 6. Form roofing panels in longest practical lengths, true to shape, accurate in size, square, and free from distribution or manufacturing defects.
- B. Steel Sheet: ASTM A653/A653M, lock-forming quality, extra smooth, tension-leveled, galvanized/galvannealed steel, minimum spangle.
- B. Fluoropolymer Coating: 70 percent full strength Kynar 500/Hylar 5000.
  - 1. Exposed Surface: 1.0 mil (0.25 mm) plus/minus 0.1 mil (0.025 mm) total dry film thickness.
  - 2. Concealed Surface: 0.2 to 0.3 mils (0.05 to 0.08 mm) total dry film thickness.
  - 3. Color: To be selected from manufacturer's standard and premium colors.
- C. Sheet Metal Components Associated with Metal Roof Panels: Made by same manufacturer and compatible with roof panels; of not less than minimum thickness required by roof panel manufacturer.
  - 1. Fabricate trim, flashing, and accessories to roofing manufacturer's specified or approved profiles.
  - 2. Exposed metal components of same finish as panels.
  - 3. Color: Same as panels.
  - 4. Provide the following formed sheet metal components:
    - a. Eave.
    - b. Ridge.
    - c. Hip.

## 2.05 ACCESSORY MATERIALS

- A. Self-Adhered Underlayment: Rubberized sheet waterproof membrane complying with ASTM D 1970/D1970M, self-adhering.
  - 1. Resistance to Direct Exposure: At least 90 days.
  - 2. Minimum High Temperature Resistance: 230 degrees F (110 degrees C).
  - 3. Water Vapor Permeance: 0.1 perm (5.7 ng/(Pa s sq m)), maximum.
  - 4. Acceptable Product: Clad-Gard SA by Firestone
- B. Fasteners: In strict accordance with metal roof panel manufacturer's requirements; minimize exposed fasteners.
  - 1. Fasteners Exposed to Weather: Sealed or with sealed washers on exterior side of covering to waterproof fastener penetration; washer material compatible with screw head; minimum 3/8 inch (9.5 mm) diameter washer for structural connections; gasket portion of fasteners or washers made of EPDM, neoprene, or other equally durable elastomeric material.
  - 2. Fasteners Exposed to View: Head of color matching panel or component in which installed.
- C. Installation Clips: Manufacturer standard galvanized or stainless steel clips, as required by panel selection, for concealed securement of panels. Use only those approved for use by the roof system manufacturer.

## PART 3 INSTALLATION

### 3.01 GENERAL

- A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where

manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

- B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.
- C. Verify that shop drawings prepared by metal roof panel manufacturer have been approved and are available to installers; do not use drawings prepared by others for installation drawings.
- D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptance of project conditions and requirements.
- E. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
- F. Perform work using competent and properly equipped personnel.
- G. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.
- H. Install roofing only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).
- I. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
  - 1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
  - 2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
  - 3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
- J. Until ready for use, keep materials in their original containers as labeled by the manufacturer.
- K. Consult panel manufacturer's instructions, container labels, and Safety Data Sheets (SDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

### **3.02 EXAMINATION**

- A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.
- B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.
- C. Verify that the substructure installation is in accordance with the approved shop drawings and roof panel manufacturer's requirements, that the fasteners are correct for the substrate, and the substrate is installed to accommodate and support the appropriate clip spacing and attachment.
- D. Verify that installed work of other trades that such work is complete to a point where the roofing system installation may commence.
- E. Verify that roof openings, curbs, pipes, sleeves, ducts, vents, and other penetrations through roof substrate are complete and properly located.
- F. In event of discrepancy, notify Architect in writing; do not proceed with installation until discrepancies have been resolved.

### **3.03 INSULATION INSTALLATION**

- A. Install insulation over entire area to be roofed, mechanically fastened as required by roofing manufacturer.

- B. Provide wood nailers at all perimeters of insulation and at other locations where indicated on the drawings, of total height matching the total thickness of insulation being used.
  - 1. Install with 1/8 inch (3 mm) gap between each length and at each change of direction.
  - 2. Mechanically fasten to deck to resist force of 200 lbf per linear foot (35 kN/m).

### **3.05 UNDERLAYMENT INSTALLATION**

- A. Install underlayment in accordance with manufacturer's instructions.
- B. Install self-adhered underlayment over entire roofing surface.

### **3.06 ROOF PANEL INSTALLATION**

- A. Install the metal roof panel system in accordance with the manufacturer's instructions, installation drawings, and approved shop drawings, so that it is weathertight and allows for thermal movement.
- B. Locate space and fasten all clips in accordance with roof panel manufacturer's recommendations. For required fasteners, use proper torque settings to obtain controlled uniform compression for a positive seal without rupturing the sealing washers.
- C. Panels must be locked in the field by a mechanical seamer.
- D. Do not place utility penetrations through the panel seams.
- E. Do not allow panels or trim to come into contact with dissimilar materials (i.e. copper, lead, graphite, treated lumber, mortar, etc). Protect from water run-off from these materials.
- F. Perform field cutting of panels and related sheet metal components by means of hand or electric shears. At no time shall a hot/friction saw be used.
- G. Remove protective film immediately after installation.

### **3.07 FLASHING AND ACCESSORIES INSTALLATION**

- A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by roof panel manufacturer's recommendations and details.
- B. Install metal trim, accessories, and edgings in locations indicated on the drawings.
  - 1. Follow roofing manufacturer's instructions.
  - 2. Remove protective plastic surface film immediately before installation.
- C. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing system abuts to; extend flashing at least 8 inches high above system surface.
- D. Flashing at Penetrations: Flash all penetrations passing through the panel; make flashing seals directly to the penetration.
  - 1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical.
  - 2. Where pre-molded pipe flashings are not practical, provide flashing detail as recommended by metal panel manufacturer.

### **3.08 FIELD QUALITY CONTROL**

- A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).
- B. Perform all corrections necessary for issuance of warranty.

### **3.09 ADJUSTING AND CLEANING**

- A. Repair panels having minor damage.
- B. Remove panels damaged beyond repair and replace with new panels to match adjacent undamaged panels.
- C. Clean exposed panel surfaces promptly after installation in accordance with recommendations of panel and coating manufacturers.



- D. Clean all contaminants generated by roofing work from building and surrounding areas, including adhesives, sealants, and coatings.
- E. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.
- F. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

### **3.10 PROTECTION**

- A. Where construction traffic must continue over finished roof panels, provide durable protection and replace or repair damaged roofing to original condition.

**END OF SECTION**

## SECTION 07620

### SHEET METAL FLASHING AND GUTTERS /DOWNSPOUTS

#### 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 sheet metal flashing and metal roof panels.
- B. Related Sections include the following:
  - 1. Division 6 Section **"Rough Carpentry"** for wood nailers, curbs, and blocking.
  - 2. Division 7 Section Asphalt Roofing" for installing sheet metal flashing and trim integral with roofing.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and track to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. **Fabricate and install sheetmetal flashings, related counterflashing, gravelstop, and parapet cap,** capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
- C. **Fabricate and install new HVAC curbs and ducting.**
- D. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements from the following maximum change in temperature buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants and failure of connections.
  - 1. Temperature Change (Range) 120 deg, ambient; , material surfaces.
- E. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

##### 1.4 SUBMITTALS

- A. Provide submittals within 30 days of Notice of Award or 14 days after Notice to Proceed whichever comes sooner.

- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
  - 1. Identify material, thickness, weight, and finish for each item and location in Project.
  - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
  - 3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
  - 4. Details of expansion-joint covers, including showing direction of expansion and contraction.
- D. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes.
  - 1. Include similar Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  - 1. Sheet Metal Flashing: 12 inches long. Include fasteners, **clips**, closures, and other attachments.
  - 2. Trim: 12 inches long. Include fasteners and other exposed accessories.
  - 3. Accessories: Full-size Sample.
  - 4. Parapet cap sample

#### 1.05 QUALITY ASSURANCE

- F. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- G. Drawings and/or color photos: Provide drawings and/or color photos to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Provide sample of coping, gravelstop, counterflashing , gutters and downspouts.
  - 2. Color and style must be approved by owner in writing.
- H. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
  - 2. Review methods and procedures related to sheet metal flashing and trim.
  - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.

4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- I. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- J. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- K. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

#### 1.7 COORDINATION

- L. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

### 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.

#### 2.2 SHEET METALS

- A. Kynar coated 0.032 aluminum: for gravelstop, counterflashings, parapet caps.
  1. Finish: **Standard**. See for section 2.7 for specific finishes.
- B. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet.

#### 2.3 UNDERLAYMENT MATERIALS

- A. Peel-n-stick Sheet: Self adhering SBS modified bitumen sheet Product meets ASTM D 6163 Type 1 Grade S, by Tremco.

## 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
  - 1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
  - 2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
  - 3. Blind Fasteners: High-strength aluminum or stainless-steel rivets..
- C. Solder for Lead: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
- D. Burning Rod for Lead: Same composition as lead sheet.
- E. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- F. Elastomeric Sealant: ASTM C 920, elastomeric **polyurethane** polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- G. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
- H. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

## 2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricated items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
  - 1. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

- D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with **elastomeric** sealant concealed within joints.
- F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
  - 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

## 2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Gravelstop : Fabricate from the following material:
  - 1. Kynar coated 0.032 aluminum
- B. Counterflashing: Fabricate from the following material:
  - 1. Kynar coated 0.032 aluminum
- C. Roof-Penetration Flashing: Fabricate from the following material:
  - 1. Lead: 4 lb / sq ft, hard tempered.
- D. Metal flashings, and gutters shall be fabricated from the following:
  - 1. 1. Kynar coated 0.032 aluminum. Metal shall be coated with Kynar 500/ Hylar 5000. Color to chosen by Architect
- E. Downspouts: Kynar coated 0.032 aluminum.

## 2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
  - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
  - 1. Adhere TF flashing tape to sheet metal flashing and trim where flashing and trim will contact wood, ferrous metal, or cementitious construction.
  - 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of peel-n-stick and extend down face of wall a minimum of six [6] inches
  - 3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and **butyl** sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- F. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1 ¼ inches for nails and not less than 3/4 inch for wood screws with washers..
  - 1. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.
  - 2. Aluminum: Use aluminum or stainless-steel fasteners.
  - 3. Copper Use copper or stainless-steel fasteners.
  - 4. Stainless Steel: Use stainless-steel fasteners.
- G. Seal joints with **butyl** sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 degrees, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 degrees
  2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- H. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1 ½ inches except where pretinned surface would show in finished Work.
1. Pretinning is not required for **lead**
  2. Stainless-Steel Soldering: Pretin edges of uncoated sheets to be soldered using solder recommended for stainless steel and phosphoric acid flux. Promptly wash off acid flux residue from metal after soldering.
  3. Where surfaces to be soldered are lead coated, do not tin edges, but wire brush lead coating before soldering.
  4. Lead-Coated Copper Soldering: Wire brush edges of sheets before soldering.
  5. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.

### 3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Pipe Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for **butyl** sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with **butyl** sealant.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
  2. Seal with **elastomeric** sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.
- E. Stucco stop/counterflashing:
1. Clean area of all debris and loose materials prior to installing new flashing.



2. Furnish and install new cant, backer sheet and baseflashings as specified.
3. Furnish and install new Fry [or equal] stucco stop/counterflashing pre manufactured flashing.
4. Over prepared surface, install metal termination flashing and secure.
5. Furnish and install related counterflashing metal and secure.
6. Properly prepare area of wall to be patched and tied into existing wall and new flashing.
7. Comply with industry standards for installation of stucco repair materials. Temperatures must be in the required range to apply materials
8. It is strongly recommended that the application and installation of the stucco repair and tie in should be performed by a licensed and qualified applicator in the stucco, masonry industry.
9. Ensure repair is made in same profile with existing wall, colors are homogenous and match existing.
10. All work is performed under industry standards and Uniform building code requirements.

#### 3.4 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07620

SECTION 07920  
JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
  - 1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 2. Exterior joints in horizontal traffic surfaces.
  - 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 4. Interior joints in horizontal traffic surfaces.
- B. See Division 8 Section "Glazing" for glazing sealants.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

## 2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - 1. Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

## 2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Single-Component Neutral-Curing Silicone Sealant:
  - 1. Available Products:
    - a. Dow Corning Corporation; 799.
    - b. GE Silicones; UltraGlaze SSG4000.
    - c. GE Silicones; UltraGlaze SSG4000AC.
    - d. Polymeric Systems Inc.; PSI-631.
    - e. Schnee-Morehead, Inc.; SM5731 Poly-Glaze Plus.
    - f. Tremco; Proglaze SG.
    - g. Tremco; Spectrem 2.
    - h. Tremco; Tremsil 600.
    - i. Or Comparable Product
  - 2. Type and Grade: S (single component) and NS (nonsag).

3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).

F. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:

1. Available Products:
  - a. Pecora Corporation; 898.
  - b. Tremco; Tremsil 600 White.
  - c. Or Comparable Product
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).

## 2.4 LATEX JOINT SEALANTS

A. Latex Sealant: Comply with ASTM C 834, Type O P, Grade NF.

B. Available Products:

1. Bostik Findley; Chem-Calk 600.
2. Pecora Corporation; AC-20+.
3. Schnee-Morehead, Inc.; SM 8200.
4. Sonneborn, Division of ChemRex Inc.; Sonolac.
5. Tremco; Tremflex 834.
6. Or Comparable Product

## 2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Available Products:
  - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
  - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
  - c. Or Comparable Product

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Available Products:
  - a. Pecora Corporation; BA-98.
  - b. Tremco; Tremco Acoustical Sealant.
  - c. Or Comparable Product

## 2.6 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) O (open-cell material) B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

# PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
    - a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
  - 2. Remove laitance and form-release agents from concrete.

- a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

**END OF SECTION 07920**

SECTION 15000  
GENERAL REQUIREMENTS - PLUMBING

PART 1 – GENERAL

1.01 DESCRIPTION – This Section 15000 includes General Requirements for the work comprising the following sections:

- |    |               |  |
|----|---------------|--|
| A. | Section 15052 | Hangers and Supports                             |
| B. | Section 15055 | Identification for Plumbing Piping and Equipment |
| C. | Section 15111 | Plumbing Specialties                             |
| D. | Section 15411 | Gas Seismic Loops                                |
| E. | Section 15212 | Liquefied Petroleum Gas Piping                   |
| F. | Section 15213 | Condensate Drainage                              |

1.02 WORK INCLUDED

- A. Provide all materials, equipment, labor, fabrication, specialties, and items necessary and incidental to the installations.
- B. Work included shall also include transportation, storage, utilities and required licenses and permits.

1.03 RELATED WORK AND REQUIREMENTS

- A. The work of this Section shall require work in coordination with other Divisions outside of this Section as follows:
  - 1. Division 1 – General Requirements
  - 2. Division 2 – Demolition and Site Work
  - 3. Division 15 - Heating, Venting, Air Conditioning
  - 4. Division 16 - Electrical

1.04 QUALITY ASSURANCE

- A. Comply with Division 1 requirements regarding Quality Control and Assurance.
- B. Products Criteria:
  - 1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least

3 years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years.

2. Equipment Service: There shall be permanent service organizations, authorized and trained by manufacturers of the equipment supplied, located within 100 miles of the project. These organizations shall come to the site and provide acceptable service to restore operations within four hours of receipt of notification by phone, e-mail or fax in event of an emergency, such as the shut-down of equipment; or within 24 hours in a non-emergency. Names, mail and e-mail addresses and phone numbers of service organizations providing service under these conditions for (as applicable to the project): pumps, critical instrumentation, computer workstation and programming shall be submitted for project record and inserted into the operations and maintenance manual.
  3. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
  4. The products and execution of work specified in Division 22 shall conform to the referenced codes and standards as required by the specifications. Local codes and amendments enforced by the local code official shall be enforced, if required by local authorities such as the natural gas supplier. If the local codes are more stringent, then the local code shall apply. Any conflicts shall be brought to the attention of the Engineer of Record.
  5. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
  6. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
  7. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
  8. Asbestos products or equipment or materials containing asbestos shall not be used.
- C. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Engineer of Record prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.



D. Execution (Installation, Construction) Quality:

1. All items shall be applied and installed in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract drawings and specifications shall be referred to the Engineer of Record for resolution. Written hard copies or computer files of manufacturer's installation instructions shall be provided to the Engineer of Record at least two weeks prior to commencing installation of any item.
2. Complete layout drawings shall be required by Paragraph, SUBMITTALS. Construction work shall not start on any system until the layout drawings have been approved.

E. Plumbing Systems: CPC, California Plumbing Code, 2013.

1.05 SUBMITTALS

- A. Comply with Division 1 requirements regarding submittals and the requirements herein.
- B. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements.
- C. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.
- D. Prior to submitting layout drawings for approval, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.
- E. Upon request by Engineer of Record, lists of previous installations for selected items of equipment shall be provided. Contact persons who will serve as references, with telephone numbers and e-mail addresses shall be submitted with the references.
- F. Manufacturer's Literature and Data: Manufacturer's literature shall be submitted under the pertinent section rather than under this section.
  1. Electric motor data and variable speed drive data shall be submitted with the driven equipment.
  2. Equipment and materials identification.
  3. Fire stopping materials.
  4. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
  5. Wall, floor, and ceiling plates.

- G. Complete, consolidated and coordinated layout drawings shall be submitted for all new systems, and for existing systems that are in the same areas. The drawings shall include plan views, elevations and sections of all systems and shall be on a scale of not less than 3/8-inch equal to one foot. Clearly identify and dimension the proposed locations of the principal items of equipment. The drawings shall clearly show the proposed location and adequate clearance for all equipment, piping, pumps, valves and other items. All valves, trap primer valves, water hammer arrestors, strainers, and equipment requiring service shall be provided with an access door sized for the complete removal of plumbing device, component, or equipment. Equipment foundations shall not be installed for equipment or piping until layout drawings have been approved. Detailed layout drawings shall be provided for all piping systems. In addition, details of the following shall be provided.
1. Mechanical equipment rooms.
  2. Interstitial space.
  3. Hangers, inserts, supports, and bracing.
  4. Pipe sleeves.
  5. Equipment penetrations of floors, walls, ceilings, or roofs.
- H. Maintenance Data and Operating Instructions:
1. Maintenance and operating manuals in accordance with Division 01 for systems and equipment and as stated herein.
  2. Listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment shall be provided.
  3. The listing shall include belts for equipment: Belt manufacturer, model number, size and style, and distinguished whether of multiple belt sets.
- I. Clearly and neatly strike out of irrelevant information. Clearly and neatly tag and mark equipment, options and specialties and special features. Key tags to match tags on Drawings.
1. If substituting on Specified equipment provide comprehensive written comparison of characteristics between specified and substituted equipment. Doing a data "dump" of Operation and Maintenance manuals, and similar "total catalog dumps" shall not be an acceptable method of submission.
- J. Provide information in an easily readable and legible format presentation.
- K. Provide an index with corresponding labeled and tabbed dividers for sections, in a three ring hard cover binder or hard cover binding folder. Loose leaf sections, provided separately, shall not be acceptable. Front index shall include, at a minimum:
1. Full, formal, name and address, including zip code, for job.

2. Company name, address, phone and fax numbers of General Contractor, including phone land line number of job trailer and cellular phone number and name of job site Superintendent. Also provide contact name of office Project Manager.
  3. Name, address, phone and fax number of Plumbing Contractor, including phone land line of job trailer, if applicable, and cellular phone number and name of job site Superintendent. Also provide contact name of office Project Manager.
- L. Submit all items at the same time.
- M. Unless specified otherwise in Division 1 requirements submit 5 copies of data. Engineer will return 4 copies while retaining one for internal office use as a Project Record Document.
- N. Paper copies shall be the only acceptable submittal medium.
- O. Submittals shall be prepared and submitted in a timely fashion to allow adequate time for ordering of long lead time equipment and materials.

#### 1.06 DELIVERY, STORAGE AND HANDLING

A. Protection of Equipment:

1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
2. Damaged equipment shall be replaced with an identical unit as determined and directed by the Engineer of Record. Such replacement shall be at no additional cost to the Owner.
3. Interiors of new equipment and piping systems shall be protected against entry of foreign matter. Both inside and outside shall be cleaned before painting or placing equipment in operation.
4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

B. Cleanliness of Piping and Equipment Systems:

1. Care shall be exercised in the storage and handling of equipment and piping material to be incorporated in the work. Debris arising from cutting, threading and welding of piping shall be removed.
2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.

3. The interior of all tanks shall be cleaned prior to delivery and beneficial use by the Owner. All piping shall be tested in accordance with the specifications and the California Plumbing Code (CPC), latest edition. All filters, strainers, fixture faucets shall be flushed of debris prior to final acceptance.
4. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

#### 1.07 APPLICABLE PUBLICATIONS

- A. The publications listed below shall form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
  1. Boiler and Pressure Vessel Code (BPVC):
  2. SEC IX-2007 Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications.
- C. American Society for Testing and Materials (ASTM):
  1. A36/A36M-2008, Standard Specification for Carbon Structural Steel
  2. A575-96 (R 2007), Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades R (2002)
  3. E84-2005, Standard Test Method for Surface Burning Characteristics of Building Materials
  4. E119-2008a, Standard Test Methods for Fire Tests of Building Construction and Materials
- D. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, Inc:
  1. SP-58-02, Pipe Hangers and Supports-Materials, Design and Manufacture
  2. SP 69-2003 (R 2004), Pipe Hangers and Supports-Selection and Application
- E. National Electrical Manufacturers Association (NEMA):
  1. MG1-2003, Rev. 1-2007 Motors and Generators
- F. California Building Codes
  1. CBC - California Building Code
  2. CMC - California Mechanical Code
  3. CPC - California Plumbing Code
  4. CEC - California Electrical Code

- 5. CFC - California Fire Code
- 6. CEC - California Energy Commission (Title 24)

G. When the work calls for more stringent requirements than the above listings the Specifications and Drawings shall have precedence.

#### 1.08 SITE VISIT AND FAMILIARIZATION

- A. Visit the site and become familiar with the Drawings and Specifications. Examine the site and understand the conditions under which the Contract shall be performed.
- B. Refer to Division 1 for Pre-Bid Conference requirements.

#### 1.09 REVIEW OF CONSTRUCTION

- A. Work may be reviewed, without prior notice, at any time by representatives of Owner.
- B. Advise Owner and Owner Representative when work is ready for review at the following times:
  - 1. Prior to concealment of Work in walls and above ceilings and any other enclosable spaces. Conceal Work only after obtaining Owner and Architect consent.
- C. Maintain an on the job set of Specifications and Drawings for use by Owner and representatives.

#### 1.10 BID DOCUMENT DESCRIPTION

- A. Specifications describe quality of materials and equipment.
- B. Drawings describe the work in diagrammatic form. Drawings do not show exact detail and arrangements. Final requirements of the Work shall be determined by the Contractor after coordination with other trades.

#### 1.11 DEFINITIONS

- A. Definitions following may not match those in other sections. Definitions listed here govern this part of the Work and take precedence over those listed elsewhere.
  - 1. Concealed: Embedded in masonry or other construction, installed in furred spaces, within partitions or hung ceilings, in trenches, crawl spaces, or in enclosures.
  - 2. Connect: Complete hook-up of items with required services.
  - 3. Down: A vertical pipe or piece of work that does penetrate a floor.
  - 4. Drop: A vertical pipe or piece of work that does not penetrate a floor.

5.     Exposed:           Not installed underground or “concealed” as defined within this list.
6.     Provide:           To furnish, supply, install and connect up complete and ready safe and regular operation of particular work referred to unless specifically noted.
7.     Supply:           To purchase, procure, acquire and deliver complete with related accessories.
8.     Work:             Labor, materials, equipment, apparatus, controls, accessories and other items required for complete and proper operation.
9.     Install:           To erect, mount and connect complete with related accessories.
10.    Riser:             A vertical pipe or piece of work having a vertical length greater than one story height.
11.    Indicated, Shown or Noted: As indicated, shown or noted on Drawings and Specifications.
12.    Other Division(s): Specification Sections that do not include the HVAC Divisions.
13.    Motor Controllers: Manual or magnetic starters (with or without switches), individual pushbuttons or hand-off-automatic (HOA) switches controlling the operation of the motors.

## PART 2 – PRODUCTS

### 2.01 MATERIALS

- A.     Materials, equipment and supplies shall be new and latest types and models of manufacturers and shall bear identification markings, nameplates and labels.
- B.     Equipment specified by manufacturer’s number shall include all accessories, controls, etc., listed in catalog as standard with equipment. Provide optional or additional accessories as specified or scheduled incidental to the Work such as, but not limited to, caulking, gaskets, sealants, fasteners, etc.
- C.     Where no specific make of material or equipment is mentioned, any first class product of good reputable manufacturer may be used, provided it conforms to requirements of system and meets acceptance of Owner.
- D.     Equipment, material and supplies damaged during transportation, installation and operation is considered as totally damaged and shall be replaced with new. Variance from this is permitted only with approval of Owner.
- E.     Provide an authorized representative to constantly supervise work of this Division, check all materials prior to installation for conformance with Drawings, Specifications, reviewed Submittals and reviewed Coordination Drawings as referenced in Part 1.

- F. Electrical Work performed in the service of the plumbing and piping installation shall conform to Division 26 Electrical requirements. Provide weatherproof devices and installations for Work exposed to the elements.

## 2.02 FACTORY-ASSEMBLED PRODUCTS

- A. Standardization of components shall be maximized to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
  - 1. All components of an assembled unit need not be products of same manufacturer.
  - 2. Constituent parts that are alike shall be products of a single manufacturer.
  - 3. Components shall be compatible with each other and with the total assembly for intended service.
  - 4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment, which serve the same function, shall be the same make and model

## 2.03 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

## 2.04 EQUIPMENT AND MATERIALS IDENTIFICATION

- A. Interior (Indoor) Equipment: Engraved nameplates, with letters not less than 3/16-inch high of brass with black-filled letters, or rigid black plastic with white letters.
- B. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 3/16-inch high riveted or bolted to the equipment.
- C. Control Items: All temperature, pressure, and controllers shall be labeled and the component's function identified. Identify and label each item as they appear on the control diagrams.
- D. Valve Tags and Lists:

1. Plumbing: All valves shall be provided with valve tags and listed on a valve list (Fixture stops not included).
2. Valve tags: Engraved black filled numbers and letters not less than 1/2-inch high for number designation, and not less than 1/4-inch for service designation on 19 gage, 1-1/2 inches round brass disc, attached with brass "S" hook or brass chain.
3. Valve lists: Valve lists shall be created using a word processing program and printed on plastic coated cards. The plastic coated valve list card(s), sized 8-1/2 inches by 11 inches shall show valve tag number, valve function and area of control for each service or system. The valve list shall be in a punched 3-ring binder notebook. A copy of the valve list shall be mounted in picture frames for mounting to a wall.
4. A detailed plan for each floor of the building indicating the location and valve number for each valve shall be provided. Each valve location shall be identified with a color coded sticker or thumb tack in ceiling.

## 2.05 PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS

- A. Model numbers listed are by Cooper Industries.
- B. For Attachment to Wood Construction: Wood screws or lag bolts.
- C. Hanger Rods: Hot-rolled steel, ASTM A36 or A575 for allowable load listed in MSS SP-58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turn-buckles shall provide 1-1/2 inches minimum of adjustment and incorporate locknuts. All-thread rods are acceptable.
- D. Multiple (Trapeze) Hangers: Galvanized, cold formed, lipped steel channel horizontal member, not less than 1-5/8 inches by 1-5/8 inches, No. 12 gage, designed to accept special spring held, hardened steel nuts. Trapeze hangers are not permitted for steam supply and condensate piping.
  1. Allowable hanger load: Manufacturers rating less 200 pounds.
  2. Guide individual pipes on the horizontal member of every other trapeze hanger with 1/4-inch U-bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 1/2-inch galvanized steel bands, or insulated calcium silicate shield for insulated piping at each hanger.
- E. Pipe Hangers and Supports: (MSS SP-58), use hangers sized to encircle insulation on insulated piping. To protect insulation, provide Type 39 saddles for roller type supports or insulated calcium silicate shields. Provide Type 40 insulation shield or insulated calcium silicate shield at all other types of supports and hangers including those for insulated piping.
  1. General Types (MSS SP-58):
    - a. Standard clevis hanger: Type 1; provide locknut.



- b. Riser clamps: Type 8.
- c. Wall brackets: Types 31, 32 or 33.
- d. Roller supports: Type 41, 43, 44 and 46.
- e. Saddle support: Type 36, 37 or 38.
- f. Turnbuckle: Types 13 or 15.
- g. U-bolt clamp: Type 24.
- h. Copper Tube:
  - 1. Hangers, clamps and other support material in contact with tubing shall be painted with copper colored epoxy paint, plastic coated or taped with isolation tape to prevent electrolysis.
  - 2. For vertical runs use epoxy painted or plastic coated riser clamps.
  - 3. For supporting tube to strut: Provide epoxy painted pipe straps for copper tube or plastic inserted vibration isolation clamps.
  - 4. Insulated Lines: Provide pre-insulated calcium silicate shields sized for copper tube.
- i. Spring hangers are required on all plumbing system pumps one horsepower and greater.

2. Plumbing Piping (Other Than General Types):

- a. Horizontal piping: Type 1, 5, 7, 9, and 10.
- b. Chrome plated piping: Chrome plated supports.
- c. Hangers and supports in pipe chase: Prefabricated system ABS self-extinguishing material, not subject to electrolytic action, to hold piping, prevent vibration and compensate for all static and operational conditions.
- d. Blocking, stays and bracing: Angle iron or preformed metal channel shapes, 18 gage minimum.

F. Pre-insulated Calcium Silicate Shields:

- 1. Provide 360 degree water resistant high density 140 psi compressive strength calcium silicate shields encased in galvanized metal.
- 2. Pre-insulated calcium silicate shields to be installed at the point of support during erection.
- 3. Shield thickness shall match the pipe insulation.

4. The type of shield is selected by the temperature of the pipe, the load it must carry, and the type of support it will be used with.
  - a. Shields for supporting cold water shall have insulation that extends a minimum of one inch past the sheet metal.
  - b. The insulated calcium silicate shield shall support the maximum allowable water filled span as indicated in MSS-SP 69. To support the load, the shields shall have one or more of the following features: structural inserts 600 psi compressive strength, an extra bottom metal shield, or formed structural steel (ASTM A36) wear plates welded to the bottom sheet metal jacket.
5. Shields may be used on steel clevis hanger type supports, roller supports or flat surfaces.

## 2.06 PIPE PENETRATIONS

- A. Pipe penetration sleeves shall be installed for all piping other than rectangular blocked out floor openings for risers in mechanical bays.
- B. Pipe penetration sleeve materials shall comply with all fire stopping requirements for each penetration.
- C. To prevent accidental liquid spills from passing to a lower level, provide the following:
  1. For sleeves: Extend sleeve 1 inch above finished floor and provide sealant for watertight joint.
  2. For blocked out floor openings: Provide 1-1/2 inch angle set in silicone adhesive around opening.
  3. For drilled penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- D. Penetrations are not allowed through beams or ribs, but may be installed in concrete beam flanges. Any deviation from these requirements must receive prior approval of Structural Engineer of Record.
- E. Sheet metal, plastic, or moisture resistant fiber sleeves shall be provided for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.
- F. Cast iron or zinc coated pipe sleeves shall be provided for pipe passing through exterior walls below grade. The space between the sleeve and pipe shall be made watertight with a modular or link rubber seal. The link seal shall be applied at both ends of the sleeve.
- G. Galvanized steel or an alternate black iron pipe with asphalt coating sleeves shall be for pipe passing through concrete beam flanges, except where brass pipe sleeves are called

for. A galvanized steel Sleeve shall be provided for pipe passing through floor of mechanical rooms, laundry work rooms, and animal rooms above basement. Except in mechanical rooms, sleeves shall be connected with a floor plate.

- H. Brass Pipe Sleeves shall be provided for pipe passing through quarry tile, terrazzo or ceramic tile floors. The sleeve shall be connected with a floor plate.
- I. Sleeve clearance through floors, walls, partitions, and beam flanges shall be 1 inch greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation plus 1 inch in diameter. Interior openings shall be caulked tight with fire stopping material and sealant to prevent the spread of fire, smoke, and gases.

## 2.07 TOOLS AND LUBRICANTS

- A. Furnish, and turn over to the Owner, special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.
- C. Tool Containers: metal, permanently identified for intended service and mounted, or located, where directed by the Resident Engineer.
- D. Lubricants: A minimum of 1 quart of oil, and 1 pound of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

## 2.08 WALL, FLOOR AND CEILING PLATES

- A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.
- B. Thickness: Not less than 3/32-inch for floor plates. For wall and ceiling plates, not less than 0.025-inch for up to 3 inch pipe, 0.035-inch for larger pipe.
- C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Wall plates shall be used where insulation ends on exposed water supply pipe drop from overhead. A watertight joint shall be provided in spaces where brass or steel pipe sleeves are specified.

## 2.09 ASBESTOS

- A. Materials containing asbestos are not permitted.

## PART 3 – EXECUTION

### 3.01 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Location of piping, sleeves, inserts, hangers, and equipment, access provisions shall be coordinated with the work of all trades. Piping, sleeves, inserts, hangers, and equipment shall be located clear of windows, doors, openings, light outlets, and other services and utilities. Equipment layout drawings shall be prepared to coordinate proper location and personnel access of all facilities. The drawings shall be submitted for review.
- B. Manufacturer's published recommendations shall be followed for installation methods not otherwise specified.
- C. Operating Personnel Access and Observation Provisions: All equipment and systems shall be arranged to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, and control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Maintenance and operating space and access provisions that are shown on the drawings shall not be changed nor reduced.
- D. Structural systems necessary for pipe and equipment support shall be coordinated to permit proper installation.
- E. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.
- F. Cutting Holes:
  - 1. Holes through concrete and masonry shall be cut by rotary core drill. Pneumatic hammer, impact electric, and hand or manual hammer type drill will not be allowed, except as permitted by Structural Engineer of Record where working area space is limited.
  - 2. Holes shall be located to avoid interference with structural members such as beams or grade beams. Holes shall be laid out in advance and drilling done only after approval by Structural Engineer of Record. If the Contractor considers it necessary to drill through structural members, this matter shall be referred to Structural Engineer of Record for approval.
  - 3. Waterproof membrane shall not be penetrated. Pipe floor penetration block outs shall be provided outside the extents of the waterproof membrane.
- G. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other service are not shown but must be provided.
- H. Protection and Cleaning:
  - 1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the

Engineer of Record. Damaged or defective items in the opinion of the Engineer of Record, shall be replaced.

2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Pipe openings, equipment, and plumbing fixtures shall be tightly covered against dirt or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- I. Interconnection of Controls and Instruments: Electrical interconnection is generally not shown but shall be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, instruments and computer workstations. Comply with NFPA-70.
- J. Work in bathrooms, restrooms, housekeeping closets: All pipe penetrations behind escutcheons shall be sealed with plumber's putty.
- K. Switchgear Drip Protection: Every effort shall be made to eliminate the installation of pipe above electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints.
- L. Inaccessible Equipment:
  1. Where the Owner determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Owner.
  2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as electrical conduit, motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

### 3.02 TEMPORARY PIPING AND EQUIPMENT

- A. Continuity of operation of existing facilities may require temporary installation or relocation of equipment and piping. Temporary equipment or pipe installation or relocation shall be provided to maintain continuity of operation of existing facilities.
- B. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.
- C. Temporary facilities and piping shall be completely removed and any openings in structures sealed. Necessary blind flanges and caps shall be provided to seal open piping remaining in service.

### 3.03 PIPE AND EQUIPMENT SUPPORTS

- A. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Holes shall be drilled or burned in structural steel ONLY with the prior written approval of the Structural Engineer of Record.
- B. The use of chain pipe supports, wire or strap hangers; wood for blocking, stays and bracing, or hangers suspended from piping above shall not be permitted. Rusty products shall be replaced.
- C. Hanger rods shall be used that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. A minimum of 15 mm (1/2-inch) clearance between pipe or piping covering and adjacent work shall be provided.
- D. For horizontal and vertical plumbing pipe supports, refer to the California Plumbing Code (CPC), latest edition, and these specifications.
- E. Overhead Supports:
  - 1. The basic structural system of the building is designed to sustain the loads imposed by equipment and piping to be supported overhead.
  - 2. Provide steel structural members, in addition to those shown, of adequate capability to support the imposed loads, located in accordance with the final approved layout of equipment and piping.
  - 3. Tubing and capillary systems shall be supported in channel troughs.
- F. Floor Supports:
  - 1. Provide concrete bases, concrete anchor blocks and pedestals, and structural steel systems for support of equipment and piping. Concrete bases and structural systems shall be anchored and doweled to resist forces under operating and seismic conditions (if applicable) without excessive displacement or structural failure.
  - 2. Bases and supports shall not be located and installed until equipment mounted thereon has been approved. Bases shall be sized to match equipment mounted thereon plus 2 inch excess on all edges. Structural drawings shall be reviewed for additional requirements. Bases shall be neatly finished and smoothed, shall have chamfered edges at the top, and shall be suitable for painting.
  - 3. All equipment shall be shimmed, leveled, firmly anchored, and grouted with epoxy grout. Anchor bolts shall be placed in sleeves, anchored to the bases. Fill the annular space between sleeves and bolts with a grout material to permit alignment and realignment.

### 3.04 LUBRICATION

- A. All equipment and devices requiring lubrication shall be lubricated prior to initial operation. All devices and equipment shall be field checked for proper lubrication.
- B. All devices and equipment shall be equipped with required lubrication fittings. A minimum of one quart of oil and one pound of grease of manufacturer's recommended grade and type for each different application shall be provided. All materials shall be delivered to the Owner in unopened containers that are properly identified as to application.
- C. A separate grease gun with attachments for applicable fittings shall be provided for each type of grease applied.
- D. All lubrication points shall be accessible without disassembling equipment, except to remove access plates.
- E. All lubrication points shall be extended to one side of the equipment.

### 3.05 CLEANING AND PAINTING

- A. Prior to final inspection and acceptance of the plant and facilities for beneficial use by the Owner, the plant facilities, equipment and systems shall be thoroughly cleaned and painted.
- B. In addition, the following special conditions apply:
  - 1. Cleaning shall be thorough. Solvents, cleaning materials and methods recommended by the manufacturers shall be used for the specific tasks. All rust shall be removed prior to painting and from surfaces to remain unpainted. Scratches, scuffs, and abrasions shall be repaired prior to applying prime and finish coats.
  - 2. The following Material And Equipment shall NOT be painted::
    - a. Motors, controllers, control switches, and safety switches.
    - b. Control and interlock devices.
    - c. Regulators.
    - d. Pressure reducing valves.
    - e. Control valves and thermostatic elements.
    - f. Lubrication devices and grease fittings.
    - g. Copper, brass, aluminum, stainless steel and bronze surfaces.
    - h. Valve stems and rotating shafts.
    - i. Pressure gages and thermometers.

j. Glass.

k. Name plates.

3. Control and instrument panels shall be cleaned and damaged surfaces repaired. Touch-up painting shall be made with matching paint obtained from manufacturer or computer matched.
4. Pumps, motors, steel and cast iron bases, and coupling guards shall be cleaned, and shall be touched-up with the same color as utilized by the pump manufacturer
5. Temporary Facilities: Apply paint to surfaces that do not have existing finish coats.
6. The final result shall be a smooth, even-colored, even-textured factory finish on all items. The entire piece of equipment shall be repainted, if necessary, to achieve this.

### 3.06 IDENTIFICATION SIGNS

- A. Laminated plastic signs, with engraved lettering not less than 3/16-inch high, shall be provided that designates equipment function, for all equipment, switches, motor controllers, relays, meters, control devices, including automatic control valves. Nomenclature and identification symbols shall correspond to that used in maintenance manual, and in diagrams specified elsewhere. Attach by chain, adhesive, or screws.
- B. Factory Built Equipment: Metal plate, securely attached, with name and address of manufacturer, serial number, model number, size, performance shall be placed on factory built equipment.

### 3.07 STARTUP AND TEMPORARY OPERATION

- A. Startup of equipment shall be performed as described in the equipment specifications. Vibration within specified tolerance shall be verified prior to extended operation.

### 3.08 OPERATING AND PERFORMANCE TESTS

- A. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Owner.
- B. When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests such systems respectively during first actual seasonal use of respective systems following completion of work.

### 3.09 OPERATION AND MAINTENANCE MANUALS



- A. Provide four bound copies. The Operations and maintenance manuals shall be delivered to the Owner not less than 30 days prior to completion of a phase or final inspection.
- B. All new and temporary equipment and all elements of each assembly shall be included.
- C. Data sheet on each device listing model, size, capacity, pressure, speed, horsepower, impeller size, and other information shall be included.
- D. Manufacturer's installation, maintenance, repair, and operation instructions for each device shall be included. Assembly drawings and parts lists shall also be included. A summary of operating precautions and reasons for precautions shall be included in the Operations and Maintenance Manual.
- E. Lubrication instructions, type and quantity of lubricant shall be included.
- F. Schematic diagrams and wiring diagrams of all control systems corrected to include all field modifications shall be included.
- G. Set points of all interlock devices shall be listed.
- H. Trouble-shooting guide for the control system troubleshooting guide shall be inserted into the Operations and Maintenance Manual.
- I. The combustion control system sequence of operation corrected with submittal review comments shall be inserted into the Operations and Maintenance Manual.
- J. Emergency procedures.

#### 3.10 PROTECTION OF WORK

- A. Cap all fixture, pipe and equipment openings daily to protect from dust, moisture and incidental debris.
- B. Porous materials that become wetted shall be replaced with new. Drying is not sufficient as it introduces the possibility of microbial growth. This applies to insulation and any material that acts as a sponge.
- C. All air distribution shall be capped during construction to prevent accumulation of dirt, dust and debris.

#### 3.11 SAFETY

- A. The contractor shall be solely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This shall also apply to non-normal working hours.

#### 3.12 RECORD DRAWINGS

- A. Contractor is required to provide record Drawings in accordance with Division 01 – General Requirements and this section.

- B. Keep and accurate record of job progress including as-built locations and of the Work. Keep record up-to-date on legible full size copies as job progresses. Make available to Owner and Owner representatives during project.
- C. In addition to any other requirements, include on as-built Drawings the following:
  - 1. Changes in location of piping or equipment.
  - 2. Ceiling access panel locations.
  - 3. Position of buried or concealed mains accurately dimensioned, both horizontally and vertically.

### 3.13 COMPLETION

- A. When Work is completed, or when Owner or Owner representative directs, remove surplus equipment, material, waste, and rubbish and leave building in satisfactory condition.
- B. Adjust faucets and flush valves to give proper supply of water and leave in first class condition.

### 3.14 WARRANTIES AND GUARANTEES

- A. Contractor is required to provide warranties in accordance with Division 1 – General Requirements.
  - 1. Collect all warranties and guarantees for materials and equipment and neatly fill out all required information for the Owner. Provide one copy of each certificate for turn over to Architect. Arrange certificates in a tabbed and indexed binder for Architect ease of use.
- B. At the completion of the work contractor shall guarantee to repair or replace materials and workmanship found defective for a period of one year from date of filing of Notice of Completion. This work shall be performed at no cost to the Owner
  - 1. Work of other trades damaged as a result of faulty workmanship or materials shall be repaired at no cost to the Owner.

END OF SECTION

SECTION 15052  
HANGERS AND SUPPORTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work covered under this section consists of providing all necessary labor, supervision, materials, equipment and services to completely execute the hangers and supports as described in this specification.
- B. All work of this section shall comply with Section 15000 GENERAL REQUIREMENTS – PLUMBING.

1.02 REFERENCES

- A. American Society of Mechanical Engineers:
  - 1. ASME B31.1 - Power Piping.
  - 2. ASME B31.5 - Refrigeration Piping.
  - 3. ASME B31.9 - Building Services Piping.
- B. ASTM International:
  - 1. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel
  - 2. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
  - 3. ASTM A653 – Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process
  - 4. ASTM A1011 - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability (Formerly ASTM A570)

1.03 SUBMITTALS

- A. Submit product data on all hanger and support devices, including shields and attachment methods. Product data to include, but not limited to materials, finishes, approvals, load ratings, and dimensional information.

1.04 QUALITY ASSURANCE

- A. Steel pipe hangers and supports shall have the manufacturer's name, part number, and applicable size stamped in the part itself for identification.

- B. Hangers and supports shall be designed and manufactured in conformance with MSS SP 58.
- C. Supports for sprinkler piping shall be in conformance with NFPA 13.

#### 1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years of documented experience.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

### PART 2 – PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Model numbers are Cooper B-Line. Engineer approved equivalent is acceptable.

#### 2.02 PIPE HANGERS AND SUPPORTS

- A. Hangers
  - 1. Uninsulated pipes 2 inch and smaller:
    - a. Adjustable steel swivel ring (band type) hanger, B-Line B3170.
    - b. Adjustable steel swivel J-hanger, B-Line B3690.
    - c. Malleable iron ring hanger, B-Line B3198R or hinged ring hanger, B3198H.
    - d. Malleable iron split-ring hanger with eye socket, B-Line B3173 with B3222.
    - e. Adjustable steel clevis hanger, B-Line B3104 or B3100.
  - 2. Uninsulated pipes 2-1/2 inch and larger:
    - a. Adjustable steel clevis hanger, B-Line B3100.
    - b. Pipe roll with sockets, B-Line B3114.
    - c. Adjustable steel yoke pipe roll, B-Line B3110.

B. Pipe Clamps

1. When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weld-less eye nuts, B-Line B3140 or B3142 with B3200. For insulated lines use double bolted pipe clamps, B-Line B3144 or B3146 with B3200.

C. Multiple or Trapeze Hanger

1. Trapeze hangers shall be constructed from 12 gauge roll formed ASTM A1011 SS Grade 33 structural steel channel, 1-5/8 inch by 1-5/8 inch minimum, B-Line B22 strut or stronger as required.
2. Mount pipes to trapeze with 2 piece pipe straps sized for outside diameter of pipe, B-Line B2000 Series.
3. For pipes subjected to axial movement:
  - a. Strut mounted roller support, B-Line B3126. Use pipe protection shield or saddles on insulated lines.
  - b. Strut mounted pipe guide, B-Line B2417.

D. Wall Supports

1. Pipes 4 inch and smaller:
  - a. Carbon steel hook, B-Line B3191.
  - b. Carbon steel J-hanger, B-Line B3690.
2. Pipes larger than 4 inch:
  - a. Welded strut bracket and pipe straps, B-Line B3064 and B2000 series.
  - b. Welded steel brackets, B-Line B3066 or B3067, with roller chair or adjustable steel yoke pipe roll. B-Line B3120 or B3110. Use pipe protection shield or saddles on insulated lines.

E. Floor Supports

1. Hot piping under 6 inch and all cold piping:
  - a. Carbon steel adjustable pipe saddle and nipple attached to steel base stand sized for pipe elevation. B-Line and B3088T or B3090 and B3088. Pipe saddle shall be screwed or welded to appropriate base stand.
2. Hot piping 6 inch and larger:
  - a. Adjustable roller stand with base plate, B-Line B3117SL [or B3118SL]

- b. Adjustable roller support and steel support sized for elevation, B-Line B3124

F. Vertical Supports

- 1. Steel riser clamp sized to fit outside diameter of pipe, B-Line B3373.

G. Copper Tubing Supports

- 1. Hangers shall be sized to fit copper tubing outside diameters.
  - a. Adjustable steel swivel ring (band type) hanger, B-Line B3170CT.
  - b. Malleable iron ring hanger, B-Line B3198RCT or hinged ring hanger B3198HCT.
  - c. Malleable iron split-ring hanger with eye socket, B-Line B3173CT with B3222.
  - d. Adjustable steel clevis hanger, B-Line B3104CT.
- 2. For supporting vertical runs use epoxy painted or plastic coated riser clamps, B-Line B3373CT or B3373CTC.
- 3. For supporting copper tube to strut use epoxy painted pipe straps sized for copper tubing, B-Line B2000 series, or plastic inserted vibration isolation clamps, B-Line BVT series.

H. Plastic Pipe Supports

- 1. V-Bottom clevis hanger with galvanized 18-gauge continuous support channel, B-Line B3106 and B3106V, to form a continuous support system for plastic pipe or flexible tubing.

I. Supplementary Structural Supports

- 1. Design and fabricate supports using structural quality steel bolted framing materials as manufactured by Cooper B-Line. Channels shall be roll formed, 12 gauge ASTM A1011 SS Grade 33 steel, 1-5/8 inch by 1-5/8 inch or greater as required by loading conditions. Submit designs for pipe tunnels, pipe galleries, etc., to engineer for approval. Use clamps and fittings designed for use with the

## 2.03 UPPER ATTACHMENTS

A. Beam Clamps

- 1. Beam clamps shall be used where piping is to be suspended from building steel. Clamp type shall be selected on the basis of load to be supported, and load configuration.

2. C-Clamps shall have locknuts and cup point set screws, B-Line B351L, or B3036L. Top flange c-clamps shall be used when attaching a hanger rod to the top flange of structural shapes, B-Line B3034 or B3033. Refer to manufacturer's recommendation for setscrew torque. Retaining straps shall be used to maintain the clamps position on the beam where required.
3. Center loaded beam clamps shall be used where specified. Steel clamps shall be B-Line B3050, or B3055. Malleable iron or forged steel beam clamps with cross bolt shall be B-Line B3054 or B3291-B3297 Series as required to fit beams.

B. Concrete Inserts

1. Cast in place spot concrete inserts shall be used where applicable; either steel or malleable iron body, B-Line B2500 or B3014. Spot inserts shall allow for lateral adjustment and have means for attachment to forms. Select inserts to suit threaded hanger rod sizes, B-Line N2500 or B3014N series.
2. Continuous concrete inserts shall be used where applicable. Channels shall be 12 gauge, ASTM A1011 SS Grade 33 structural quality carbon steel, complete with styrofoam inserts and end caps with nail holes for attachment to forms. The continuous concrete insert shall have a load rating of 2,000 lbs/ft. in concrete, B-Line B22I, 32I, or 52I. Select channel nuts suitable for strut and rod sizes.

2.04 VIBRATION ISOLATION AND SUPPORTS

- A. For refrigeration, air conditioning, hydraulic, pneumatic, and other vibrating system applications, use a clamp that has a vibration dampening insert and a nylon inserted locknut. For copper and steel tubing use B-Line BVT series Vibraclamps, for pipe sizes use BVP series.
- B. For larger tubing or piping subjected to vibration, use neoprene or spring hangers as required.
- C. For base mounted equipment use vibration pads, molded neoprene mounts, or spring mounts as required.
- D. Vibration isolation products as manufactured by B-Line, Vibratrol systems.

2.05 ACCESSORIES

- A. Hanger Rods shall be threaded on both ends, or be continuously threaded rods of circular cross section. Use adjusting locknuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.
- B. Shields shall be 180 degree galvanized sheet metal, 12 inch minimum length, 18 gauge minimum thickness, designed to match outside diameter of the insulated pipe, B-Line B3151.

- C. Pipe protection saddles shall be formed from carbon steel, 1/8 inch minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.

## 2.06 FINISHES

### A. Indoor Finishes

1. Hangers and clamps for support of bare copper piping shall be coated with copper colored epoxy paint, B-Line Dura-Copper®. Additional PVC coating of the epoxy painted hanger shall be used where necessary.
2. Hangers for other than bare copper pipe shall be zinc plated in accordance with ASTM B633 OR shall have an electro-deposited green epoxy finish, B-Line Dura-Green®.
3. Strut channels shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90 OR have an electro-deposited green epoxy finish, B-Line Dura-Green®.

### B. Outdoor and Corrosive Area Finishes

1. Hangers and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123. All hanger hardware shall be hot dip galvanized or stainless steel. Zinc plated hardware is not acceptable for outdoor or corrosive use.
2. Hangers and strut located in corrosive areas shall be type 304 [316] stainless steel with stainless steel hardware.

## PART 3 – EXECUTION

### 3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation products in accordance with the manufacturer's written instruction, commercial and industrial standards, and recognized industry practices to ensure that the installation serves the intended purpose. Surfaces to be attached to shall be thoroughly cleaned prior to making attachments.

### 3.02 PIPE HANGERS AND SUPPORTS

- A. Pipe shall be adequately supported by pipe hanger and supports specified in PART 2 PRODUCTS. Hangers for insulated pipes shall be sized to accommodate insulation thickness.
- B. Horizontal steel piping shall be supported in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

<u>NOMINAL PIPE SIZE (in)</u>	<u>ROD DIAMETER (in)</u>	<u>MAXIMUM SPACING (ft)</u>
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1/2 TO 1-1/4	3/8	7
1-1/2	3/8	9
2	3/8	10
2-1/2	1/2	11
3	1/2	12
3-1/2	5/8	13
4	5/8	14
5	3/4	16
6	3/4	17
8	3/4	19
10	7/8	22
12	7/8	23
14	1	25
16	1	27

- C. Horizontal copper tubing shall be supported in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

NOMINAL PIPE SIZE (in)	ROD DIAMETER (in)	MAXIMUM SPACING (ft)
1/2 TO 3/4	3/8	5
1	3/8	6
1-1/4	3/8	7
1-1/2	3/8	8
2	3/8	8
2-1/2	1/2	9
3	1/2	10
3-1/2	1/2	11
4	1/2	12
5	1/2	13
6	5/8	14
8	3/4	16

- D. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non-adhesive isolation tape- B-Line Iso-pipe. Galvanized felt isolators sized for copper tubing may also be used, B-Line B3195CT.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Install hangers to provide a minimum of 1/2 inch space between finished covering and adjacent work.
- G. Place a hanger within 12 inches of each horizontal elbow.
- H. Support vertical piping independently of connected horizontal piping. Support vertical pipes at every floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.
- I. Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified in Part 2. Trapeze hangers shall be spaced according to the smallest pipe size, or install intermediate supports according to schedule in this section.
- J. Do not support piping from other pipes, ductwork or other equipment that is not building structure.

### 3.03 CONCRETE INSERTS

- A. Provide inserts for placement in formwork before concrete is poured.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Where concrete slabs form finished ceilings, provide inserts to be flush with slab surface.
- D. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch.

END OF SECTION

SECTION 15055  
PIPING IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide complete piping system identification work from equipment for all types of piping systems identified as a part of these specifications. Types of piping identification shall consist of:
  - 1. Painted Identification Materials
  - 2. Plasticized Tags
  - 3. Engraved Plastic Laminate Signs
  - 4. Plastic Tape
- B. Lettering, Size, Colors, and viewing angles of identification devices shall comply with ANSI A13.1.
- C. All work of this section shall comply with Section 15000 GENERAL REQUIREMENTS – PLUMBING.

PART 2 – PRODUCTS

2.01 PIPING PAINT IDENTIFICATION

- A. All exposed piping and piping in accessible chases and areas above ceilings with panels, including stainless steel, galvanized steel, copper, PVC, and Fiberglass RTR piping, shall be completely and totally painted for identification purposes. Piping shall be identified with lettering or tags designating the service of each piping system, shall have flow directional arrows, and shall be completely painted and color coded as scheduled below. All piping scheduled to be color coded shall be completely painted or coated with the indicated colors.
- B. Each pipe identification shall consist of color coding in accordance with PART 3, a painted label and a directional flow arrow. The painted label and directional arrow shall be placed between color bands.

- C. Color Bands and Arrows: Pipe color bands shall be painted on the pipe. Paper or plastic banding of pipe shall not be acceptable. Arrows shall be of the same color as the lettering and shall point away from the lettered labels in the direction of the flow. Color band size shall be as follows:

PIPE SIZE	COLOR BAND SIZE
Less than 1" diameter	1" wide
1" to 12" diameter	1 pipe diameter wide
Greater than 12" diameter	12" wide

- D. For cases where there are insulated lines wrapped with aluminum sheathing, stainless steel sheathing, or gray fabric, the background color shall be applied to a 24 inch length of pipe section and color band centered within the 24 inch field of background color.

- E. Paint Colors: Paint colors shall conform to the following Federal designations:

1.	Light Blue	15200
2.	Dark Blue	15102
3.	Red	11105
4.	Yellow	13655
5.	Orange	12246
6.	White	17875
7.	Light Brown	10219
8.	Dark Brown	10080
9.	Light Green	34540
10.	Green	14187
11.	Black	17038
12.	Silver	17178
13.	Grey	16314
14.	Purple	27144

- F. Lettering: Contents identification labels shall be stenciled directly on pipes. Black identification letters shall be used where the background pipe color is light, and white

identification letters where the background color is dark. The size of the letters for identification labels shall be as follows:

Pipe Diameter	Letter Size
5/8" to 1"	5/16" high
1" to 3"	3/4" high
over 3"	2" high

## 2.02 EXISTING IDENTIFICATION SYSTEMS

- A. In installations where existing piping identification systems have been established, the CONTRACTOR shall continue to use the existing system. Where existing identification systems are incomplete, utilize the existing system as far as practical and supplement with the specified system. The objective is to fully identify all new piping, valves and appurtenances to the level specified herein.

## 2.03 SMALL PIPE IDENTIFICATION

- A. Identifying devices for valves and the sections of pipe that are too short to be identified with color bands, lettered labels, and arrows shall be identified with metal tags as specified herein.
- B. Metal tags shall be of stainless steel with embossed lettering. All tags shall be designed to be firmly attached to the valves or short pipes or to the structure immediately adjacent to such valves or short pipes.

## 2.04 IDENTIFICATION LOCATIONS

- A. Straight lines of pipe shall be identified at intervals of 30 feet maximum, and at least once in each room unless otherwise directed by the Engineer.
- B. Piping shall also be identified at a point approximately within 2 feet of all turns, ells, valves, and on the upstream side of all distribution fittings or branches and on both sides of each floor, wall or barrier through which the line passes.
- C. For pipe runs of 50 feet or less the distance between bands shall be 30 inches. For pipe runs of 50 feet or more, spacing between bands shall be 72 inches.
- D. Sections of pipe that are too short to be identified with color bands, lettered labels, and directional arrows shall be tagged and identified similar to valves.

## 2.05 PIPING IDENTIFICATION TAPE/SIGNS

- A. Plastic Tape

1. General: Manufacturer's standard color-coded pressure sensitive self adhesive vinyl tape, not less than 3 mils thick.
  - a. Width: Provide 1-1/2" inch wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6 inches, 2-1/2 inch wide tape for larger pipes.
  - b. Color: By ANSI A13.1 designation except where other color selection is indicated.
- B. Engraved-Plastic Laminate Signs:
  1. General: Provide engraving stock melamine plastic laminate complying with FS L-P-387 in the size and thickness indicated, engraved with engraver's standard letter style of the size and working indicated, black with white core (letter core) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
    - a. Thickness: 1/6 inch for units up to 20 sq. in. or 8 inch in length; 1/8 inch for larger units.
    - b. Fasteners: Self-tapping stainless screws, except contact type permanent adhesive where screws cannot or should not penetrate the substrate.

## PART 3 – EXECUTION

### 3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceiling and removable concealment.

END OF SECTION

SECTION 15111  
PLUMBING SPECIALTIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide complete plumbing specialties, materials, equipment, and miscellaneous devices to make the plumbing systems completely functional.
- B. Items shall include, but not be limited to:
  - 1. Access Doors
  - 2. Curb Boxes
  - 3. Dielectric Unions
  - 4. Escutcheons
  - 5. Flexible Connections
  - 6. Pipe Sleeves
  - 7. Plumbing Vent Caps
  - 8. Reduced Pressure Backflow Preventers
  - 9. Trap Primers
  - 10. Water Hammer Arrestors
  - 11. Earthquake Valves
- C. All work of this section shall comply with Section 15000 GENERAL REQUIREMENTS - PLUMBING

PART 2 – PRODUCTS

2.01 ACCESS PANELS

- A. Access panels shall be provided wherever required or indicated for proper access to installed equipment, devices, valves and miscellaneous items of the work. Coordinate with the installing trade contractor providing walls, ceilings, and floors in which the access panels are required to be installed. Coordinate the locations, type, style and size carefully to match the intended service, alignment with the ceiling and wall elements and per the Architectural plans.
  - 1. In areas with non-accessible ceilings and walls and where access panels are not provided under other Divisions, provide access panels for concealed valves,

equipment, dampers, and control devices. Size the access panel for proper access, adjusting and maintenance, but not smaller than 14"x14" or as indicated.

## 2.02 CURB BOXES

- A. Valve boxes in sidewalks, other flatwork and at finished/unfinished grade shall be Christy G3 with removable cast iron lid indexed "WATER", "GAS", "SEWER" (or applicable service) and depth extensions to meet bury depth. Box and lid shall be traffic rated.
  - 1. Valve boxes shall allow for adequate arm space to operate valves. Valve box shall also allow adequate space to freely operate, through full range of swing, valve arm. Unless otherwise shown on the Drawings minimum free space between valve arm, through full range of swing, and inside edge of box shall be 3", minimum.
  - 2. Dig grade out from below pipe, valve, pressure regulators, and all specialties a minimum distance of 6". This distance shall be between bottom of specialty and top of grade in box.

## 2.03 DIELECTRICS

- A. Dielectric unions shall be used to prevent accelerated corrosion and deterioration in the piping systems due to galvanic and stray current. Install between pipes made of ferrous and non-ferrous metals. Unit shall consist of a union nut, two tailpieces, and a gasket that separates the tailpieces to prevent an electric current from occurring. Maximum Pressure: 250psi. Watts Series 3001A

## 2.04 ESCUTCHEONS

- A. Where exposed pipes pass through floors, walls, or ceilings, they shall be filled with neat, spun or stamped metal escutcheons, firmly secured to the pipes. Escutcheons shall be of sufficient outside diameter to amply cover up the sleeved openings for the pipes and shall be installed so as to provide a neat finish. Escutcheons shall be attached by means of expansion bolts, clamps or set screws.
  - 1. At exposed locations provide chrome plated finishes.

## 2.05 FLASHINGS

- A. Flashing for penetrations of the roof for Plumbing pipes shall be IPS Corp. Water-Tite adjustable multi-size roof vent flashings with minimum 24 gauge galvanized sheet metal base and elastomer color, color finish to match roofing type.

## 2.06 FLEXIBLE CONNECTIONS

- A. At building joints and seismic separations use Metraflex Metraloop with suitable supports each end.



- B. At gas-fired equipment connections, flexible connections shall be ProCoat stainless steel gas connector with all necessary fittings for complete installation as recommended by the manufacturer.

- 1. Gas connector shall be UV and salt resistant, one piece construction without the use of soldered or brazed joints.

## 2.07 PIPE SLEEVES

- A. Furnish and install sleeves, large enough to accommodate pipe and its coverings, and passing entirely through floor, ceiling, wall, partition, or other building construction. Sleeves shall be set in new concrete construction before pouring. Sleeves not provided before pouring shall be provided together with necessary cutting and the proper grouting in of the sleeves in the cut opening. Sleeve through outside wall or through slab-on-grade shall be Link-Seal.
- B. All vertical pipes in open chases or shafts shall be provided with galvanized sleeves wired on to pipe or to covering. Provision shall be made for expansion of pipes.
- C. Penetrations at fire rated construction: Through penetrations shall be fire stopped with Hilti brand fire-stop systems/materials/sleeves selected to suit construction type.
- D. Unless otherwise noted, sleeves through walls, floors, and partitions shall be 22 gauge galvanized steel and shall extend ¼ inch above finished tile or other finished floor.
- E. All vertical interior exposed sleeves shall be packed with mineral wool. Fiberglass shall not be acceptable.
  - 1. At lightproof or soundproof walls, floors and partitions pack space between galvanized wall pipe sleeves and piping with non-hardening caulking and non-shrinking acoustical caulking.

## 2.08 PLUMBING VENT CAPS

- A. Vent pipe terminations shall have vandal proof caps with cast iron sleeves and domes secured with vandal proof fasteners, Jay R Smith 1748.

## 2.09 REDUCED PRESSURE BACKFLOW PREVENTERS

- A. Backflow preventers shall be of the reduced pressure principle type consisting of two independently acting internally loaded check valves separated by a reduced pressure zone. Preventers shall be provided with bronze ball shut off valves, in-line strainer, test cocks and air gap fittings. Air gap fitting shall be piped to nearest floor drain.
  - 1. 2 inch and smaller: Watts 909QTS.
  - 2. 2-1/2 and larger: Watts 909-FDA-S

## 2.10 TRAP PRIMERS

- A. Trap Primers shall automatic functioning needing no adjustment. Precision Plumbing Products, Inc. Prime-Rite Trap Primer Valve.

#### 2.11 WATER HAMMER ARRESTORS

- A. Water hammer arrestors shall be PDI certified, pre-charged, copper body, piston type with Buna N O-rings, permanently sealed with threaded brass inlet. Zurn Z1705 water hammer arrestor.

#### 2.12 EARTHQUAKE SHUT OFF VALVE

- A. All:
  - 1. Unless shown otherwise on the Drawings, provide, at the gas meter, directly downstream of the meter set, a California (formerly Koso) Seismic Gas Shutoff Valve in vertical or horizontal configuration, flanged or threaded.

### PART 3 – EXECUTION

#### 3.01 GENERAL INSTALLATION

- A. Install all equipment and materials according to the manufacturers written instructions, and in good workmanship.
- B. The Contractor shall be responsible for protecting against damage from building materials, acids, toots, and equipment included in these specifications.

#### 3.02 TRAP PRIMERS

- A. Provide trap primers for floor drains where noted on the plans. Provide a shut off valve at each trap primer. Install primer and shut off valve in wall space with access panel.

#### 3.03 ACCESS DOORS

- A. Provide access doors to all plumbing specialties behind walls and ceiling spaces.

#### 3.04 FLOOR DRAINS

- A. Floor drains shall be set 1/8 inch below floor level unless otherwise noted on the Contract Drawings.

END OF SECTION

SECTION 15212  
LIQUID PETROLEUM GAS DISTRIBUTION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide complete liquid petroleum gas (LPG) systems from point of connection at existing, as indicated on the Drawings or adequately sized stub-out or site gas service to all fuel consuming equipment.
- B. System shall be complete with piping, pressure reducing valves, curb boxes, plug valves and related specialties required for a complete and operational system.
- C. All work of this section shall comply with this Section and Section 15000 GENERAL REQUIREMENTS – PLUMBING

1.02 APPLICABLE PUBLICATIONS

- A. NFPA 58 – Liquefied Petroleum Gas Code

PART 2 – PRODUCTS

2.01 PIPE

- A. Pipe Exposed to Weather:
  - 1. 2" and smaller, Schedule 40 galvanized, threaded connections.
  - 2. 2-1/2" and larger, Schedule 40 black Iron (ungalvanized steel), welded connections. Welds shall be painted with Rust-Oleum paint and finished with silver top coat.
- B. Pipe Protected from Weather:
  - 1. 2" and smaller, Schedule 40 black iron (ungalvanized steel), threaded connections.
  - 2. 2-1/2" and larger, Schedule 40 black iron (ungalvanized steel), welded connections.
- C. All underground piping:
  - 1. Polyethylene tubing with fusion-welded polyethylene fittings.

2.02 SHUT OFF VALVES

- A. Aboveground, lubricated, plug type.

1. 2" and smaller, screwed, Homestead Figure 601
    2. 2-1/2" and larger, flanged, Homestead Figure 602
  - B. Underground
    1. Polyethylene ball valve, fusion welded, Polyvalve.
- 2.03 EARTHQUAKE SHUT OFF VALVE
- A. All:
1. Unless shown otherwise on the Drawings, provide, at the gas meter, directly downstream of the meter set, a California (formerly Koso) Seismic Gas Shutoff Valve in vertical or horizontal configuration, flanged or threaded.
- 2.04 TRACING
- A. Buried PE piping shall be installed with a continuous (no breaks) insulated 18 gauge copper wire to provide sensing for pipe finders. The wire shall be secured to the pipe at 18" on center with tywrap. Terminate wiring wrapped around pipe and with a twisted tie off above finished grade.
1. In addition to the above underground warning tape shall be installed at 12" above the buried pipe to provide a warning to future diggers. Warning tape shall be Identoline® Underground Warning Tape for Gas, Heavy Duty Polyethylene / B-720, Color Yellow.

## PART 3 – EXECUTION

### 3.01 GENERAL INSTALLATION

- A. Piping shall be run parallel to buildings lines and supported at intervals specified. Branches and points of connection to existing systems shall be taken from the top or side at horizontal connections, not from the bottom. All changes in direction shall be made with standard fittings.
- B. Piping shall be run free of traps and shall be pitched to drip legs installed at all low points.
- C. Provide complete LPG system as shown on the drawings. Connect equipment with swing or code approved metallic flexible connections and provide lubricated shut-off cocks where shown on the drawings. Fill cocks with proper lubricant and paint gas cocks yellow.
- D. Remove cutting and threading burrs before assembling piping.

### 3.02 PIPE THREADING

- A. Threaded joints shall be made up without caulking or the use of filler except approved joint compound that is chemically restive to LPG. Joint compound shall be used sparingly, and applied to male threads only.

### 3.03 TESTING

- A. All tests shall be made in the presence of the local authorities having jurisdiction. At least 72 hours (three days) notice shall be given in advance of all tests. Contractor shall make preliminary tests prior to giving notice of final test.
  - 1. Contractor shall furnish all pumps, gauges, instruments and any other equipment, including test medium necessary for conducting prescribed tests.
- B. Gas System
  - 1. Prior to testing the new gas system (downstream of point of connection to existing system) the piping shall be cleaned by blowing the system clear of moisture, dust, and foreign particulates with oil free air or nitrogen.
  - 2. Test new gas system downstream from point of connection to existing systems. (Do not test existing system). Testing of the new system may be done in whole or in parts. Testing shall be done prior to connecting to equipment. Test shall be for 4 hours at four times the design pressure, with no pressure drop, using air or nitrogen. If piping system fails the test the leaky portion(s) shall be redone and the system retested until it passes.

END OF SECTION

## SECTION 15213

### CONDENSATE DRAINAGE SYSTEM

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Provide complete condensate drainage system from point of connection at HVAC equipment to termination points, whether or not shown on the drawings. Connections to include, but not limited to;
  - 1. Primary condensate routed to an approved receptor per 2013 CPC from each piece of HVAC equipment.
  - 2. Secondary condensate routed to a readily observable location per 2013 CPC from each piece of HVAC equipment.
  - 3. Condensate drain lines routed to an approved receptors from all condensing flues and gas-fired heating equipment.
- B. System shall be complete with piping, pressure reducing valves, plug valves and related specialties required for an operational system.
- C. All work of this section shall comply with Section 15000 GENERAL REQUIREMENTS – PLUMBING

#### PART 2 – PRODUCTS

##### 2.01 PIPE

- A. All:
  - 1. DWV copper or type L copper with 95/5 solder joints and DWV or wrought fittings.
  - 2. All condensate piping located in refrigerated areas shall be insulated with ¾" mineral wool insulation.
  - 3. All condensate piping located in freezing conditions shall be heat traced with Raychem XL-Trace and shall be installed in accordance with manufacturer's instructions.

#### PART 3 – EXECUTION

##### 3.01 GENERAL INSTALLATION

- A. Piping shall be run parallel to buildings lines and supported at intervals specified. All changes in direction shall be made with standard fittings. Clean out plugs shall be installed at all cumulative changes of direction of 135 degrees or more as a minimum and as shown on the Drawings.

- B. Piping shall be run free of traps (except trap at equipment connection) and shall be pitched at  $\frac{1}{4}$ " vertical drop for every foot of horizontal run.
- C. Provide complete condensate drainage system as shown on the drawings
- D. Remove cutting and threading burrs before assembling piping.

### 3.02 PIPE JOINTS

- A. Cut square and remove all burrs. Ream both ends to full size of pipe inside diameter. Clean ends of tubing to depth of fittings. Use sand cloth, sand paper or steel wool for cleaning. Apply a coat of Nibco Copperized Flux to tubing and fittings. Solder paste or liquid flux shall not be permitted.

### 3.03 TESTING

- A. All tests shall be made in the presence of the Engineer and the local authorities having jurisdiction. At least 72 hours (three days) notice shall be given in advance of all tests. Contractor shall make preliminary tests prior to giving notice of final test.
  - 1. Contractor shall furnish all pumps, gauges, instruments and any other equipment, including test medium necessary for conducting prescribed tests.
- B. Condensate Drainage System
  - 1. Test condensate drainage systems prior to final connection to equipment. Test shall be for 4 hours with the piping filled full of water. If piping system fails the test the leaky portion(s) shall be redone and the system retested until it passes.

END OF SECTION

SECTION 15411 NATURAL  
GAS SEISMIC LOOP

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide complete seismic protection for gas piping in accordance with 2007 CPC and 2007 CBC.
- B. Seismic protection to include, but not limited to;
  - 1. Flexible expansion loop intended for seismic applications, mounted in accordance with applicable codes and manufacturer's recommendations.
- C. System shall be complete with piping, pipe guides, necessary anchors and related specialties required for an operational system.
- D. All work of this section shall comply with Section 15000 GENERAL REQUIREMENTS – PLUMBING

PART 2 – PRODUCTS

2.01 FLEXIBLE EXPANSION LOOP

- A. All equipment, either rigidly mounted or mounted on vibration isolators, shall be attached to the piping system using flexible loops designed for seismic movement. Flexible loops shall be capable of movement in the X, Y, and Z planes and must completely isolate the equipment from the piping. System design engineer shall determine the amount of seismic movement required by the California Building Code and/or other applicable codes.
- B. All piping passing through building seismic joints or across building partitions shall contain a flexible expansion loop designed for seismic movement. Flexible loops shall be located at, or near the building seismic joint or separation. A support, located within 4 pipe diameters, shall be installed on each side of the flexible loop. Each support to be transversely and longitudinally braced per local codes. Seismic bracing shall not pass through building seismic joint and shall not connect or tie together different sides or parts of building structure. Flexible loops shall be capable of move in the X, Y, and Z planes. System design engineer shall determine the required amount of seismic movement required by the Uniform Building Code and/or other applicable codes.
- C. Flexible loops attached to fuel gas lines, shall be specifically manufactured for fuel gas applications and certified by the American Gas Association. Flexible loops connected to medical gas piping shall be specifically manufactured for medical gas and installed by a certified installer. Unless specified otherwise by system design engineer or governing codes, all flexible loop connections to medical gas piping shall be cleaned, installed, inspected, and tested in accordance with current NFPA-99 standards.



- D. Flexible expansion/seismic loops shall consist of two flexible sections of hose and braid, two 90° elbows, and a 180° return assembled in such a way that the piping does not change direction, but maintains its course along a single axis. Flexible loops shall have a factory supplied, center support nut located at the bottom of the 180° return, and a drain/air release plug. Flexible loops shall impart no thrust loads to system support anchors or building structure. Flexible loops may be installed to accommodate both thermal and seismic motion. For steam service, loops must be installed with flexible legs horizontal to prevent condensate buildup. Materials of construction and end fitting type shall be consistent with pipe material and equipment/ pipe connection fittings. Movement capabilities and location, relative to seismic separation, shall be determined by system design engineer and manufacturers recommendations.

## PART 3 – EXECUTION

### 3.01 GENERAL INSTALLATION

- A. Piping shall be run parallel to buildings lines and supported at intervals specified. All changes in direction shall be made with standard fittings.

### 3.02 TESTING

- A. Seismic loops shall be tested as a part of the system in accordance with 15410 NATURAL GAS SYSTEMS.

END OF SECTION

## SECTION 15500

### GENERAL REQUIREMENTS - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION

- A. The requirements of this section apply to all sections of Division 15.
- B. Section 15500 includes General Requirements for Division 15 work including, but not limited to the following sections:
  - 3. Section 15559 Testing, Adjusting, and Balancing
  - 4. Section 15980 Decentralized HVAC Equipment

##### 1.02 WORK INCLUDED

- A. Provide all materials, equipment, labor, fabrication, specialties, and items necessary and incidental to the installations of a complete system or piece of equipment.
- B. Work included shall also include transportation, storage, utilities and required licenses and permits.

##### 1.03 RELATED WORK AND REQUIREMENTS

- A. The work of this Section shall require work in coordination with other Divisions outside of this Section as follows:
  - 1. Section 013330 Submittal Procedures General
  - 2. Section 16010 Electrical

#### 1.04 QUALITY ASSURANCE

- A. Comply with Division 01 requirements regarding Quality Control.
- B. Mechanical, electrical and associated systems shall be safe, reliable, efficient, durable, easily and safely operable and maintainable, easily and safely accessible, and in compliance with applicable codes as specified. The systems shall be comprised of high quality institutional-class and industrial-class products of manufacturers that are experienced specialists in the required product lines. All construction firms and personnel shall be experienced and qualified specialists in their respective industrial and institutional HVAC system, as applicable.
- C. Products Criteria:
  - 1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. The design, model and size of each item shall have been in satisfactory and efficient operation on at least three installations for approximately three years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years. See other specification sections for any exceptions.
  - 2. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
  - 3. Conform to codes and standards as required by the specifications. Conform to local codes, if required by local authorities such as the natural gas supplier, if the local codes are more stringent than those specified, the more stringent requirement shall be used.
  - 4. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
  - 5. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
  - 6. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.

## 1.05 SUBMITTALS

- A. Comply with Division 01 requirements regarding submittals.
- B. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements.
- C. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.
- D. Prior to submitting layout drawings for approval, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.
- E. Upon request by Engineer, provide lists of previous installations for selected items of equipment. Include contact persons who will serve as references, with telephone numbers and e-mail addresses.
- F. Submittals and layout drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a completely compatible and efficient installation. Final review and approvals will be made only by groups. Submittals and shop drawings shall also incorporate the following items
  - 1. Clear and neat strike out of irrelevant information.
  - 2. Clearly and neatly tag and mark equipment, options and specialties and special features.
  - 3. Key tags to match tags on Drawings.
    - a. If substituting on Specified equipment provide comprehensive written comparison of characteristics between specified and substituted equipment.
  - 4. Provide information in an easily readable and legible format presentation.
  - 5. Provide an index with corresponding labeled and tabbed dividers for sections, in a three ring hard cover binder or hard cover binding folder. Loose leaf sections, provided separately, shall not be acceptable. Front index shall include, at a minimum:
    - a. Full, formal, name and address, including zip code, for job.

- b. Company name, address, phone and fax numbers of General Contractor, including phone land line number of job trailer and cellular phone number and name of job site Superintendent.
  - 6. Submit all items at same time, including all controls information, in one binder/folder. Excluding controls for a later, separate, review shall not be acceptable.
  - 7. Unless specified otherwise in Division 01 requirements submit 5 copies of data. Engineer will return 4 copies while retaining one for internal office use as a Project Record Document.
  - 8. Paper copies shall be the only acceptable submittal medium, electronic submittals are not permitted unless specifically required by Division 01.
  - 9. Submittals shall be prepared and submitted in a timely fashion to allow adequate time for ordering of long lead time equipment and materials.
- G. Layout and Coordination Drawings:
- 1. Submit complete, consolidated and coordinated layout drawings for all new systems, and for existing systems that are in the same areas. Refer to the General Conditions.
  - 2. The drawings shall include plan views, elevations and sections of all systems and shall be on a scale of not less than 1/8-inch equal to one foot. Clearly identify and dimension, horizontally and vertically, the proposed locations of the principal items of equipment. The drawings shall clearly show locations and adequate clearance for all equipment, piping, valves, control panels and other items. Show the access means for all items requiring access for operations and maintenance. Provide detailed layout drawings of all piping and duct systems.
  - 3. Do not install equipment foundations, equipment or piping until layout drawings have been approved.
  - 4. In addition, for HVAC systems, provide details of the following:
    - a. Mechanical equipment rooms.
    - b. Interstitial space.
    - c. Hangers, inserts, supports, and bracing.
    - d. Pipe sleeves.
    - e. Duct or equipment penetrations of floors, walls, ceilings, or roofs.
  - 5. Failure of Contractor to provide adequate coordination and Coordination Drawings shall not be grounds for adjustment of Project cost or extension of time.

- H. Manufacturer's Literature and Data: Submit under the pertinent section rather than under this section.
1. Submit belt drive with the driven equipment. Submit selection data for specific drives when requested by the Engineer of Record.
  2. Submit electric motor data and variable speed drive data with the driven equipment.
  3. Equipment and materials identification.
  4. Fire-stopping materials.
  5. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
  6. Wall, floor, and ceiling plates.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protection of Equipment:

1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
2. Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the Engineer.
3. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

B. Cleanliness of Equipment and Products:

1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping or ductwork.
2. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

## 1.07 CODES, REGULATIONS, STANDARDS, AND GUIDELINES

- A. Work shall be in accordance with requirements of the latest jurisdiction adopted editions of the following:
1. CBC - California Building Code, 2013 Edition
  2. CMC - California Mechanical Code, 2013 Edition
  3. CPC - California Plumbing Code, 2013 Edition
  4. CEC - California Electrical Code, 2011 Edition
  5. CFC - California Fire Code, Latest Edition
  6. CEC - California Energy Commission, Title 24, Part VI
- B. The work shall comply with the latest editions of the following guidelines and standards:
1. AABC Associated Air Balance Council
  2. AGA American Gas Association
  3. AMCA Air Movement and Control Association
  4. ANSI American National Standards Institute
  5. ARI American Refrigeration Institute
  6. ASHRAE American Society of Heating Refrigerating and Air Conditioning Engineers
  7. ASME American Society of Mechanical Engineers
  8. ASTM American Society for Testing and Materials
  9. NEC National Electric Code
  10. NFPA National Fire Protection Association
  11. SMACNA Sheetmetal and Air-Conditioning Contractors National Association
  12. UL Underwriters Laboratories
- C. When the work calls for more stringent requirements than the above listings the Specifications and Drawings shall take precedence.

## 1.08 SITE VISIT AND FAMILIARIZATION

- A. Visit the site and become familiar with the Drawings and Specifications. Examine the site and understand the conditions under which the Contract shall be performed.
- B. Refer to Division 01 for any Pre-Bid Conference requirements.

#### 1.09 REVIEW OF CONSTRUCTION

- A. Work may be reviewed, without prior notice, at any time by representatives of the Owner.
- B. Advise Owner when work is ready for review at the following times:
  - 1. Prior to concealment of work in walls.
  - 2. Prior to concealment of work and above ceilings and any other enclosable spaces. Conceal Work only after obtaining Owner and Architect consent.
  - 3. Maintain an on the job set of Specifications and Drawings for use by Owner and representatives.

#### 1.10 BID DOCUMENT DESCRIPTION

- A. Specifications describe quality of materials and equipment.
- B. Drawings describe the work in diagrammatic form. Drawings do not show exact detail and arrangements. Final requirements of the Work shall be determined by the Contractor after coordination with other trades.
- C. All equipment, systems and items indicated on the drawings and specifications are to be assumed as new unless specifically noted otherwise.

#### 1.11 DEFINITIONS

- A. Definitions following may not match those in other sections. Definitions listed here govern this part of the Work and take precedence over those listed elsewhere.
  - 1. Concealed      Embedded within the construction or installed in furred spaces, within partitions or hung ceilings, in trenches, crawl spaces, or within enclosures.
  - 2. Connect        Complete hook-up of items with required services including all final items necessary for a completely functional installation.
  - 3. Down            A vertical pipe, duct or piece of work that does penetrate a floor.
  - 4. Drop            A vertical pipe, duct or piece of work that does not penetrate a floor.
  - 5. Exposed        Not installed underground or concealed as defined within this list.
  - 6. Indicated       As indicated on the Drawings and Specifications.
  - 7. Install          To erect, mount and connect complete with related accessories.
  - 8. Noted           As indicated on the Drawings and Specifications.



9.	Provide	To furnish, supply, install and connect up complete, ready, safe and in regular operation of particular work referred to.
10.	Riser	A vertical pipe, duct or piece of work having a vertical length greater than one story height.
11.	Shown	As indicated on the Drawings and Specifications.
12.	Supply	To purchase, procure, acquire and deliver complete with related accessories.
13.	Work	Labor, materials, equipment, apparatus, controls, accessories and other items required for complete and proper operation.

## PART 2 – PRODUCTS

### 2.01 NOT USED

## PART 3 – EXECUTION

### 3.01 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery and handling shall be performed in accordance with manufacturer's recommendations. Provide dust and weather covers.
- B. Protect materials from loss or damage. Lost or damaged materials shall be replaced with new at no increase in Contract Sum.
- C. All mechanical equipment requiring power shall be installed with the required working spaces clearances required by the California Electrical Code, Table 110.26 (A)(1) Working Spaces.
- D. All facility service piping and conduits shall be concealed behind finishes. No exposed piping or raceways will be permitted unless specifically noted in writing on the drawings. Coordinate with pertinent sections of other Divisions providing demolition and new finishes. Jointly determine extent of demolition and finish removal necessary to install all indicated facilities services systems concealed behind wall, floor, ceiling finishes.

### 3.02 PROTECTION OF WORK

- A. Cap all duct, pipe and equipment openings daily to protect from dust, moisture and incidental debris. Equipment not capped shall be thoroughly cleaned prior to recommencing construction.
- B. Porous materials that become wetted shall be replaced with new. Drying is not sufficient as it introduces the possibility of microbial growth. This applies to duct liner, insulation wrap, flex duct and any material that has the potential to absorb moisture.
- C. All air distribution shall be capped during construction to prevent accumulation of dirt, dust and debris.

### 3.03 CLEANING AND PRESENTATION

- A. Prepare Work for painting by leaving surfaces free of oil, dust, rust, scale, adhesions and debris.
- B. Remove all shipping labels and tags.
- C. Exterior surfaces of piping, insulation, ducting and equipment shall be left clean.
- D. Inside visible portions of grille cans and adjacent ducting including insulation stick pins, dampers and specialties shall be painted with two coats of flat black paint.
- E. Scratched and marred surfaces of factory painted equipment and materials shall be touched up with matching color/type paint.
  - 1. Clean as recommended by manufacturer. Do not use material or methods which may damage finish surface or surrounding construction.
- F. Cut ends of strut pieces and uncoated/non-galvanized steel materials exposed to the elements shall be painted with two coats of rust inhibiting paint with color and type matched to installation.

### 3.04 SAFETY

- A. The contractor shall be solely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This shall also apply to normal and non-normal working hours.

### 3.05 CUTTING OF STRUCTURE

- A. Do not cut beams, girders, columns, or any other structural members, or run any pipes, ducts or work through slabs, unless specifically shown on the Drawings, or unless written approval is obtained from the Owner.
- B. Cutting of walls, floors, or other parts of the building or repairing any work due to neglect of properly directing the locations of necessary openings and framing beforehand shall be done at no additional cost to the Owner.

### 3.06 SPECIAL TOOLS

- A. Furnish to Owner one set of special tools required to operate, adjust, dismantle, or repair any equipment within this Division. Special tools mean those not normally found in possession of mechanics or maintenance personnel. Also provide location of supplier where extra sets can be purchased.

### 3.07 RECORD DRAWINGS

- A. Contractor is required to provide record Drawings in accordance with Division 01 and this section.

- B. Keep and accurate record of job progress including as-built locations and of the Work. Keep record up-to-date on legible copies as job progresses. Drawings shall be of the same size as provided to the contractor. Make available to Owner and Owner representatives during job.
- C. In addition to any other requirements, include on as-built Drawings the following:
  - 1. Changes in location of piping, duct, or equipment.
  - 2. Ceiling access panel locations.
  - 3. Position of buried or concealed mains accurately dimensioned, both horizontally and vertically.

### 3.08 COMPLETION

- A. When work is completed, or when Owner or Owner representative directs, remove surplus equipment, material, waste, and rubbish and leave building in satisfactory condition.
- B. Adjust and program thermostats and controls per owner direction and as indicated within Division 23 requirements.

### 3.09 WARRANTIES AND GUARANTEES

- A. Contractor is required to provide warranties in accordance with Division 01 – General Requirements.
  - 1. Collect all warranties and guarantees for materials and equipment and neatly fill out all required information for the Owner. Provide one copy of each certificate for turn over to Architect. Arrange certificates in a tabbed and indexed binder for Architect ease of use.
- B. At the completion of the work contractor shall guarantee to repair or replace materials and workmanship found defective for a period of one year from date of filing of Notice of Completion. This work shall be performed at no cost to the Owner.
  - 1. Work of other trades damaged as a result of faulty workmanship or materials shall be repaired at no cost to the Owner.

END OF SECTION

## SECTION 15504

### COORDINATION

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section Includes: Provision of coordination of the Work of the Contract.

##### 1.02 GENERAL COORDINATION

- A. Contractor shall be responsible for all project coordination.
- B. Coordinate schedules, submittals and work of the various trades to ensure efficient and orderly sequence of installation of construction, with provisions for accommodating items to be installed later. Coordinate the work among the Specifications and Drawings. Work shown on any drawing or specification is required by the Contract irrespective of the trade sub-division. Contractor shall require each trade subcontractor to review all other subdivisions of the documents for related work and shall coordinate the subcontracts accordingly.
- C. Require all parties involved in the performance of the Work to cooperate in the overall coordination of the work under the direction of the Contractor. Each party, when requested to do so, shall furnish information concerning its portion of the work and shall respond promptly and reasonably to the decisions and requests of persons designated with coordination, supervisory, administrative, or similar authority.
- D. The Drawings use graphic symbols to show certain physical relationships of the various elements and systems and their interfacing with other elements and systems. Establishing and coordinating the actual physical relationships is the responsibility of the Contractor. Layout and arrange all elements to contribute to safety and efficiency while maintaining the intent of the design. Before work proceeds in areas of potential conflict for installing different components of the work, Contractor shall prepare supplementary drawings for review by the Architect and resolve the conflict.
- E. Coordinate continuous checking of architectural and structural clearances for accessibility of equipment and mechanical and electrical systems. No allowances of any kind will be made for the Contractor's failure to coordinate sequence of installing materials/equipment into position. Contractor shall verify that equipment will fit within the prescribed equipment room spaces.
- F. Prior to installation of each major unit of work which requires coordination and interfacing with other work, meet at project site with installer and representatives of manufacturers and fabricators who are involved in or affected by unit of work. Review progress of other work and preparations for particular work under consideration.
- G. Coordinate the tolerances of all materials to ensure a proper fit in achieving the requirements of the Contract Documents.
- H. Coordinate matching finish, texture, color, etc. for the new work on existing components in the project.

- I. Coordinate work of like materials by submitting pilot samples to the Architect for review of acceptable ranges of finish textures and color variation.
- J. Coordinate completion and cleanup Work of various trades in preparation for the Substantial Completion and for occupancy of the Building.

#### 1.03 SUBCONTRACT COORDINATION

- A. The General Contractor shall coordinate the Work and do not delegate responsibility for coordination to any Subcontractor.
- B. Anticipate the interrelationship of all Subcontractors and their relationship with the Work.
- C. Resolve differences or disputes between Subcontractors concerning coordination, interference, or extent of work between sections of the specifications. Contractor's decisions, if consistent with the Contract Document requirements, shall be final.
- D. Coordinate the work of Subcontractors so that their portions of the work are performed in a manner that minimizes interference with the progress of the Work.

#### 1.04 ADMINISTRATION

- A. General: Prepare a written memorandum on required coordination activities. Include such items as required notices, reports and attendance at meetings. Distribute this memorandum to each trade performing work at the project site. Prepare similar memorandum for separate contractors where interfacing of their work is required.
- B. Coordination Meetings: Conduct general project coordination meetings with Subcontractors at least weekly at regularly scheduled times convenient for all parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special preinstallation meetings. Request representation at each meeting by every party currently involved in coordination or planning for the work of the entire project. Keep the Owner Representatives informed about coordination meetings. Conduct meetings in a manner which will resolve coordination problems. Record results and minutes of each meeting and distribute copies to everyone in attendance and to the Owner Representatives. Owner Representatives may attend weekly jobsite meetings with subcontractors.
- C. Superintendent: Provide a full-time Superintendent experienced in administration and supervision of building construction. This Superintendent shall be authorized to act as general coordinator of interfaces between units of work. This Superintendent shall be on site, continuously during the construction period. Construction coordination shall be his/her principal duty.
  - 1. For the purpose of this provision, "interface" is defined to include scheduling and sequencing of work, sharing of access to work spaces, installations, protection of each other's work, cutting and patching, tolerances, cleaning, selections for compatibility, preparation of coordination drawings, inspections, tests and temporary facilities and services.
  - 2. Mechanical/Electrical Coordinator: Provide a single individual, a mechanical/electrical coordinator, experienced in administrative and supervisory coordination

of mechanical and electrical work. This experience in coordination shall include coordination of the type of mechanical/electrical work required for this project. The mechanical/electrical coordinator is required to act as the specialized coordinator of interfaces both within mechanical/electrical work and between that work and other trades. The Mechanical/Electrical Coordinator shall be on site, full time during the construction period. Project Superintendent may serve as mechanical/electrical coordinator.

#### 1.05 COORDINATION DRAWINGS AND SUBMISSION

- A. Prepare Coordination Drawings where required before beginning fabrication or delivery of materials and equipment to the jobsite.
  - 1. Coordination Drawings shall clearly indicate coordination of mechanical, plumbing, fire protection, electrical, lighting, signal and equipment installations with structural, architectural and finish elements.
  - 2. Scale:  $1/2" = 1'-0"$ . Scale may be revised to  $1/4" = 1'-0"$  with consent of all involved subcontractors.
- B. Keep copies of Coordination Drawings at the jobsite.
- C. Contractor shall provide the Owner with a record copy of initial Coordination Drawings and with revisions to Coordination Drawings, within three (3) working days of completion of each drawing or revised drawing and 30 days before work begins. The Owner will verify that Coordination Drawings have been made, but no approval of these drawings will be made. Include in submission of drawings the names of coordination staff.
- D. Coordination Drawings shall include, but are not limited to: structural, fire protection, plumbing, heating, ventilation and air conditioning, electrical power and lighting, security, life safety, data, telephone system, existing or reinstalled equipment and new equipment.
- E. Coordination Drawings, shall indicate layout of Work for all trades, for purposes of showing overlays and potential conflicts of crossover work and adjoining work.
- F. Conditionally revise Coordination Drawings as subsequent work is added to areas containing existing work.
- G. Provide dimensions and elevations where conflicts may exist and coordinate conflicts on Coordination Drawings to prevent conflicts in the field.
- H. Contractor shall require Subcontractors to develop Subcontractor Coordination Plans of the same scale as Contractor's Coordination Drawings to assist in making transcripts for transfer to Coordination Drawings; use approved Shop Drawings for Coordination Drawings where available.
- I. Coordination Drawings shall include dates and signatures of Contractor and Subcontractors involved in coordination; signed Coordination Drawings shall be subject to examination by the Owner at any time. Failure to maintain up-to-date drawings will be considered non-conformance with Contract Documents and progress payment will be withheld.
- J. Failure of Contractor to provide adequate coordination and Coordination Drawings shall not be grounds for adjustment of Project cost or extension of time.

#### 1.06 STRUCTURAL, MECHANICAL, PLUMBING AND ELECTRICAL COORDINATION

- A. Use Coordination Drawings of structural, mechanical, plumbing and electrical Work, together with shop drawings and layout drawings of affected Work to check, coordinate and integrate the Work to prevent interferences.
- B. Coordinate space requirements and installation of mechanical and electrical Work which are indicated by graphic symbols on Contract Documents.
- C. Routing shown for pipes, ducts and conduits on Drawings are shown by graphic symbols only; make runs parallel with lines of building.
- D. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.
- E. Conceal pipes, ducts and wiring in finished areas, unless otherwise indicated; coordinate locations of fixtures and outlets with finish elements.
- F. Where there is a potential conflict in the layout or interferences between the work, including structural and architectural, layout the work with tape or other means to depict the layout on site to reduce or resolve the conflict and to allow the Owner to review the work prior to execution. The tape or other means to depict layout shall not cause any damage, change in color or appearance of any work to remain, or leave a residue.
- G. Contractor shall coordinate steel shop drawings to include any and all penetrations of framing members resulting from the coordination of and with the work of the mechanical and electrical subcontractors. See Section 05120 for additional structural coordination requirements.
  - 1. Steel shop drawings shall be reviewed and approved by the mechanical, electrical and plumbing subcontractors prior to submission and fabrication.

#### 1.07 INTERSTITIAL SPACE COORDINATION

- A. Contractor shall provide Coordination Drawings for the Interstitial Spaces to resolve installation conflicts prior to final approval of any shop drawings.
- B. All conflicts shall be brought to the attention of the Architect.
- C. Elements to include in the Coordination Drawings:
  - 1. Mechanical ducts and pipes, including floor penetrations.
  - 2. Plumbing pipes.
  - 3. Fire branch lines and sprinkler heads.
  - 4. Electrical bus ducts.
  - 5. Telephone communication and data lines.
  - 6. Interstitial space access.

7. Structural elements including, but not limited to, beams, columns, slabs, hangers and seismic bracing.
8. Suspended ceilings.
9. Insulation.
10. Security system elements.
11. Others as necessary.

D. Schedule of Submission

1. Refer to ACoordination Drawings and Submission@ specified in this Section.
2. Review of the coordinated drawings shall be required prior to approval of any of the sub-system shop drawings for the elements listed above.

E. An as-built version of this drawing should be required at the end of installation.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION



## SECTION 15510

### HVAC AIR DISTRIBUTION SYSTEM CLEANING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Provide complete duct cleaning services for the all components associated with the Heating, Ventilating and Air Conditioning equipment, distribution and systems.
- B. All work of this section shall comply with Section 15500 GENERAL REQUIREMENTS - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC).

##### 1.02 RELATED WORK

- A. Section 15559 - Testing, Adjusting, and Balancing for HVAC

##### 1.03 REFERENCE STANDARDS

- A. NADCA (National Air Duct Cleaners Association) Mechanical Cleaning of Non-Porous Air Conveyance System Components
- B. NADCA (National Air Duct Cleaners Association) Understanding Microbial contamination in HVAC Systems
- C. NAIMA (North American Insulation Manufacturers Association) Cleaning Fibrous Glass Insulated Air Duct Systems

##### 1.04 QUALITY ASSURANCE

- A. A Regular Member in good standing of NADCA (National Air Duct Cleaners Association). Maintain membership for the entire duration of the project. Maintain a staff of at least one Certified Air System Cleaning Specialist (ASCS).

##### 1.05 SHOP DRAWINGS

- A. Refer to Division 1, General Conditions, Submittals.
- B. Refer to Section 23 00 00 for additional submittal requirements.
- C. Include manufacturer's data and/or Contractor data for the following:
  - 1. List of equipment to be used.
  - 2. Product description and MSDS sheets for cleaners, biocides and encapsulants.
  - 3. Access doors.

##### 1.06 HVAC SYSTEM CLEANING CONTRACTOR QUALIFICATIONS

- A. Membership: The HVAC system cleaning contractor shall be a certified member of the National Air Duct Cleaners Association (NADCA), or shall maintain membership in a nationally recognized non-profit industry organization dedicated to the cleaning of HVAC systems.
- B. Certification: The HVAC system cleaning contractor shall have a minimum of one (1) Air System Cleaning Specialist (ASCS) certified by NADCA on a full time basis, or shall have staff certified by a nationally recognized certification program and organization dedicated to the cleaning of HVAC systems.
- C. Supervisor Qualifications: A person certified as an ASCS by NADCA, or maintaining an equivalent certification by a nationally recognized program and organization, shall be responsible for the total work herein specified.
- D. Experience: The HVAC system cleaning contractor shall submit records of experience in the field of HVAC system cleaning as requested by the owner. Bids shall only be considered from firms which are regularly engaged in HVAC system maintenance with an emphasis on HVAC system cleaning and decontamination.
- E. Equipment, Materials and Labor: The HVAC system cleaning contractor shall possess and furnish all necessary equipment, materials and labor to adequately perform the specified services.
  - 1. The contractor shall assure that its employees have received safety equipment training, medical surveillance programs, individual health protection measures, and manufacturer's product and material safety data sheets (MSDS) as required for the work by the U.S. Occupational Safety and Health Administration, and as described by this specification. For work performed in countries outside of the U.S.A., contractors should comply with applicable national safety codes and standards.
  - 2. The contractor shall maintain a copy of all current MSDS documentation and safety certifications at the site at all times, as well as comply with all other site documentation requirements of applicable OSHA programs and this specification
  - 3. Contractor shall submit to the owner all Material Safety Data Sheets (MSDS) for all chemical products proposed to be used in the cleaning process.
- F. Licensing: The HVAC system cleaning contractor shall provide proof of maintaining the proper license(s), if any, as required to do work in this state. Contractor shall comply with all Federal, state and local rules, regulations, and licensing requirements.

#### 1.07 STANDARDS

- A. NADCA Standards: The HVAC system cleaning contractor shall perform the services specified here in accordance with the current published standards of the National Air Duct Cleaners Association (NADCA).

1. All terms in this specification shall have their meaning defined as stated in the NADCA Standards.
2. NADCA Standards must be followed with no modifications or deviations being allowed.

#### 1.08 DOCUMENTS

- A. Mechanical Drawings: The owner shall provide the HVAC system cleaning contractor with one copy of the following documents:
  1. Project drawings and specifications.
  2. Approved construction revisions pertaining to the HVAC system.
  3. Any existing indoor air quality (IAQ) assessments or environmental reports prepared for the facility.

### PART 2 -- PRODUCTS

#### 2.01 GENERAL

- A. Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke developed rating no higher than 50.

#### 2.02 CLEANERS, BIOCIDES AND ENCAPSULANTS

- A. Manufacturer: H.B. Fuller/Foster, Porter, or approved equal.
- B. Cleaners, biocides and encapsulants shall be water based products specifically designed for application to HVAC duct interiors and capable of being applied with airless spray equipment. Biocides and encapsulants must be colored differently than substrate to be coated.
- C. Biocidal agents to be formulated for long term fungicidal activity with no loss on aging. Biocidal agents must be registered with the U.S. Environmental Protection Agency for use on the interior of HVAC duct systems.
- D. Cured biocides and encapsulants must provide tough washable elastic protective finish able to withstand light impact or abrasion without breaking down over time or releasing fibers.

#### 2.03 EQUIPMENT

- A. Particulate Collection Equipment: Fan/filter unit sized to create sufficient quantity of negative pressure for capture and filtration of air and contaminants dislodged during duct cleaning. Equipment to include pre-filtration and HEPA final filtration with 99.97% collection efficiency for 0.3 micron size particles.
- B. Portable pressure washers to be capable of 500 psig to 1000 psig operation.

- C. Power brush systems designed specifically for duct cleaning.

#### 2.04 SCOPE OF WORK

- A. Scope: This section defines the minimum requirements necessary to render HVAC components clean, and to verify the cleanliness through inspection and/or testing in accordance with items specified herein and applicable NADCA Standards.
- B. The Contractor shall be responsible for the removal of visible surface contaminants and deposits from within the HVAC system in strict accordance with these specifications.
- C. The HVAC system includes any interior surface of the facility's air distribution system for conditioned spaces and/or occupied zones. This includes the entire heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts to the air handling unit (AHU), the interior surfaces of the AHU, mixing box, coil compartment, condensate drain pans, humidifiers and dehumidifiers, supply air ducts, fans, fan housing, fan blades, air wash systems, spray eliminators, turning vanes, filters, filter housings, reheat coils, and supply diffusers are all considered part of the HVAC system. The HVAC system may also include other components such as dedicated exhaust and ventilation components and make-up air systems.
- D. Note: Users of this specification must modify the above paragraph to succinctly and specifically define those systems and components requiring cleaning.

#### 2.05 SYSTEM COMPONENT INSPECTION AND SITE PREPARATION

- A. HVAC System Component Inspections: Prior to the commencement of any cleaning work, the HVAC system cleaning contractor shall perform a visual inspection of the HVAC system to determine appropriate methods, tools, and equipment required to satisfactorily complete this project. The cleanliness inspection should include air handling units and representative areas of the HVAC system components and ductwork. In HVAC systems that include multiple air handling units, a representative sample of the units should be inspected.
- B. The cleanliness inspection shall be conducted without negatively impacting the indoor environment through excessive disruption of settled dust, microbial amplification or other debris. In cases where contamination is suspected, and/or in sensitive environments where even small amounts of contaminant may be of concern, environmental engineering control measures should be implemented
  - 1. Damaged system components found during the inspection shall be documented and brought to the attention of the owner.
- C. Site Evaluation and Preparations: Contractor shall conduct a site evaluation, and establish a specific, coordinated plan which details how each area of the building will be protected during the various phases of the project.

- D. Inspector Qualifications: Qualified personnel should perform the HVAC cleanliness inspection to determine the need for cleaning. At minimum, such personnel should have an understanding of HVAC system design, and experience in utilizing accepted indoor environmental sampling practices, current industry HVAC cleaning procedures, and applicable industry standards.

## 2.06 GENERAL HVAC SYSTEM CLEANING REQUIREMENTS

- A. Containment: Debris removed during cleaning shall be collected and precautions must be taken to ensure that Debris is not otherwise dispersed outside the HVAC system during the cleaning process.
- B. Particulate Collection: Where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size (or greater) particles shall be used. When the Particulate Collection Equipment is exhausting outside the building, Mechanical Cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to contain Debris removed from the HVAC system. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to locate the equipment down wind and away from all air intakes and other points of entry into the building.
- C. Controlling Odors: Measures shall be employed to control odors and/or mist vapors during the cleaning process.
- D. Component Cleaning: Cleaning methods shall be employed such that all HVAC system components must be Visibly Clean as defined in applicable standards (see NADCA Standards). Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.
- E. Air-Volume Control Devices: Dampers and any air-directional mechanical devices inside the HVAC system must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.
- F. Service Openings: The contractor shall utilize service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry, and inspection.
  - 1. Contractor shall utilize the existing service openings already installed in the HVAC system where possible.
  - 2. Other openings shall be created where needed and they must be created so they can be sealed in accordance with industry codes and standards.
  - 3. Closures must not significantly hinder, restrict, or alter the airflow within the system.
  - 4. Closures must be properly insulated to prevent heat loss/gain or condensation on surfaces within the system.

5. Openings must not compromise the structural integrity of the system.
  6. Construction techniques used in the creation of openings should conform to requirements of applicable building and fire codes, and applicable NFPA, SMACNA and NADCA Standards.
  7. Cutting service openings into flexible duct is not permitted. Flexible duct shall be disconnected at the ends as needed for proper cleaning and inspection.
  8. Rigid fiber glass duct systems shall be resealed in accordance with NAIMA recommended practices. Only closure techniques that comply with UL Standard 181 or UL Standard 181a are suitable for fiber glass duct system closures.
  9. All service openings capable of being re-opened for future inspection or remediation shall be clearly marked and shall have their location reported to the owner in project report documents.
- G. Ceiling sections (tile): The contractor may remove and reinstall ceiling sections to gain access to HVAC systems during the cleaning process.
- H. Air distribution devices (registers, grilles & diffusers): The contractor shall clean all air distribution devices.
- I. Air handling units, terminal units (VAV, Dual duct boxes, etc.), blowers and exhaust fans: The contractor shall insure that supply, return, and exhaust fans and blowers are thoroughly cleaned. Areas to be cleaned include blowers, fan housings, plenums (except ceiling supply and return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. All visible surface contamination deposits shall be removed in accordance with NADCA Standards. Contractor shall:
1. Clean all air handling units (AHU) internal surfaces, components and condensate collectors and drains.
  2. Assure that a suitable operative drainage system is in place prior to beginning wash down procedures.
  3. Clean all coils and related components, including evaporator fins.
- J. Duct Systems. Contractor shall:
1. Create service openings in the system as necessary in order to accommodate cleaning of otherwise inaccessible areas.
  2. Mechanically clean all duct systems to remove all visible contaminants, such that the systems are capable of passing Cleaning Verification Tests (see NADCA Standards).

## 2.07 HEALTH AND SAFETY

- A. Safety Standards: Cleaning contractors shall comply with applicable federal, state, and local requirements for protecting the safety of the contractor's employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) shall be followed when working in accordance with this specification.
- B. Occupant Safety: No processes or materials shall be employed in such a manner that they will introduce additional hazards into occupied spaces.
- C. Disposal of Debris: All Debris removed from the HVAC System shall be disposed of in accordance with applicable federal, state and local requirements.

## 2.08 MECHANICAL CLEANING METHODOLOGY

- A. Source Removal Cleaning Methods: The HVAC system shall be cleaned using Source Removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. It is the contractor's responsibility to select Source Removal methods that will render the HVAC system Visibly Clean and capable of passing cleaning verification methods (See applicable NADCA Standards) and other specified tests, in accordance with all general requirements. No cleaning method, or combination of methods, shall be used which could potentially damage components of the HVAC system or negatively alter the integrity of the system.
  - 1. All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device must be of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment are assured.
  - 2. All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet-vacuums.
  - 3. All vacuum devices exhausting air outside the facility shall be equipped with Particulate Collection including adequate filtration to contain Debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standards, codes or regulations.
  - 4. All methods require mechanical agitation devices to dislodge debris adhered to interior HVAC system surfaces, such that debris may be safely conveyed to vacuum collection devices. Acceptable methods will include those, which will not potentially damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.
- B. Methods of Cleaning Fibrous Glass Insulated Components

1. Fibrous glass thermal or acoustical insulation elements present in any equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the HVAC system is under constant negative pressure, and not permitted to get wet in accordance with applicable NADCA and NAIMA standards and recommendations.
2. Cleaning methods used shall not cause damage to fibrous glass components and will render the system capable of passing Cleaning Verification Tests (see NADCA Standards).

C. Damaged Fibrous Glass Material

1. Evidence of damage: If there is any evidence of damage, deterioration, delaminating, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, they shall be identified for replacement.
2. Replacement: When requested or specified, Contractor must be capable of remediating exposed damaged insulation in air handlers and/or ductwork requiring replacement.
3. Replacement material: In the event fiber glass materials must be replaced, all materials shall conform to applicable industry codes and standards, including those of UL and SMACNA.
4. Replacement of damaged insulation is not covered by this specification.

D. Cleaning of coils

1. Any cleaning method may be used which will render the Coil Visibly Clean and capable of passing Coil Cleaning Verification (refer to applicable NADCA Standards). Coil drain pans shall be subject to Non-Porous Surfaces Cleaning Verification. The drain for the condensate drain pan shall be operational. Cleaning methods shall not cause any appreciable damage to, displacement of, inhibit heat transfer, or erosion of the coil surface or fins, and shall conform to coil manufacturer recommendations when available. Coils shall be thoroughly rinsed with clean water to remove any latent residues.

E. Antimicrobial Agents and Coatings

1. Antimicrobial agents shall only be applied if active fungal growth is reasonably suspected, or where unacceptable levels of fungal contamination have been verified through testing.
2. Application of any antimicrobial agents used to control the growth of fungal or bacteriological contaminants shall be performed after the removal of surface deposits and debris.



3. When used, antimicrobial treatments and coatings shall be applied in strict accordance with the manufacturer's written recommendations and EPA registration listing.
4. Antimicrobial coatings shall be applied according to the manufacturer's written instructions. Coatings shall be sprayed directly onto interior ductwork surfaces, rather than "fogged" downstream onto surfaces.

## 2.09 CLEANLINESS VERIFICATION

- A. General: Verification of HVAC System cleanliness will be determined after mechanical cleaning and before the application of any treatment or introduction of any treatment-related substance to the HVAC system, including biocidal agents and coatings.
- B. Visual Inspection: The HVAC system shall be inspected visually to ensure that no visible contaminants are present.
  1. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean; however, the owner reserves the right to further verify system cleanliness through Surface Comparison Testing or the NADCA vacuum test specified in the NADCA standards.
  2. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.
  3. NADCA vacuum test analysis should be performed by a qualified third party experienced in testing of this nature.
- C. Verification of Coil Cleaning
  1. Cleaning must restore the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil will be considered clean only if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection (refer to NADCA Standards).

## 2.10 PRE-EXISTING SYSTEM DAMAGE

- A. Contractor is not responsible for problems resulting from prior inappropriate or careless cleaning techniques of others.

## 2.11 POST PROJECT REPORTING

- A. At the conclusion of the project, the Contractor shall provide a report to the owner indicating the following:

1. Success of the cleaning project, as verified through visual inspection and/or gravimetric analysis.
2. Areas of the system found to be damaged and/or in need of repair.

## 2.12 APPLICABLE STANDARDS AND PUBLICATIONS

- A. The following current standards and publications of the issues currently in effect form a part of this specification to the extent indicated by any reference thereto:
1. National Air Duct Cleaners Association (NADCA): "Assessment, Cleaning & Restoration of HVAC Systems (ACR 2013)," Latest Edition.
  2. National Air Duct Cleaners Association (NADCA): "Understanding Microbial Contamination in HVAC Systems," Latest Edition.
  3. National Air Duct Cleaners Association (NADCA): "Introduction to HVAC System Cleaning Services," Latest Edition.
  4. National Air Duct Cleaners Association (NADCA): Standard 05 "Requirements for the Installation of Service Openings in HVAC Systems," Latest Edition.
  5. Underwriters' Laboratories (UL): UL Standard 181.
  6. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE): Standard 62.1, "Ventilation for Acceptable Indoor Air Quality".
  7. Environmental Protection Agency (EPA): "Building Air Quality," Latest Edition.
  8. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): "HVAC Duct Construction Standards - Metal and Flexible," Latest Edition.
  9. North American Insulation Manufacturers Association (NAIMA): "Cleaning Fibrous Glass Insulated Air Duct Systems," Latest Edition.

## PART 3 – EXECUTION

### 3.01 GENERAL

- A. Use products and equipment in accordance with manufacturer's instructions.

### 3.02 CLEANING

- A. Clean ductwork systems and associated turning vanes, dampers, coils, VAV boxes, drain pans, plenums, diffusers, registers, grilles and louvers; air handling units and associated fans, coils, drain pans, plenums and dampers; fans; terminal units and other equipment described below:

<b>System/Component</b>	<b>Location</b>	<b>Action</b>
Supply Duct Systems	Throughout Building	Remove Liner, Clean, Encapsulant
Return Duct Systems	Throughout Building	Clean
Transfer Duct Systems	Throughout Building	Clean
Exhaust/Relief Duct Systems	Throughout Building	Clean
Outside Air/Mixed Air Duct Systems	Throughout Building	Clean
Air Handling Units	Throughout Building	Clean
Heat Recovery Units	Throughout Building	Clean
Packaged Air Conditioning Units	Throughout Building	Clean
Makeup Air Units	Throughout Building	Clean
Furnaces	Throughout Building	Clean
Exhaust Fans	Throughout Building	Clean
Relief Fans	Throughout Building	Clean
Transfer Fans	Throughout Building	Clean
Unit Ventilators	Throughout Building	Clean
Cabinet Heaters	Throughout Building	Clean

- B. Visually inspect systems and site prior to cleaning. Document and report damaged system components to Owner's Construction Representative prior to cleaning. Mark damper and other component positions prior to cleaning and reset after cleaning to original position. Establish a specific, coordinated plan detailing how each area of the building will be protected during the various phases of work.
- C. Protect building occupants, components and furnishings from cleaning activities. Use polyethylene sheeting covers and barriers where cleaning will disperse debris outside the HVAC systems. Install critical barriers within the building, at inlets/outlets and within the system to prevent migration of dust and debris to clean areas.
- D. Use particulate collection equipment to remove and capture debris. Connect to system downstream of cleaning operations. Wherever possible, duct the exhaust to the exterior of the building. Avoid discharge near air intakes and points of entry. Arrange source of makeup air to flow from clean area to work area negatively pressurizing work area. Take measures to control offensive odors and vapors during the cleaning process.

- E. Clean systems using mechanical cleaning methods, such as vacuum cleaning, compressed air sweeping and mechanical brushing, designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. No cleaning methods are to be used which damage components of the system or negatively alter the integrity of the system.
- F. Clean fibrous glass thermal or acoustical insulation with HEPA vacuuming equipment. Document locations of damage, deterioration, delamination, mold, fungus growth or excessive moisture which cannot be restored by cleaning or resurfacing with repair coating. Report locations and conditions to Architect/Engineer and Owner's Project Representative for determination of removal and/or replacement.
- G. Where fibrous glass thermal or acoustical insulation is to be removed, scrape and brush metal clean. Remove loose fasteners, weld pins where required for cleaning work and sheet metal covers associated with insulation. Patch and seal fastener openings.
- H. Clean coils to restore pressure drop to within 10% of design rating. Where design rating is unknown, coils must be cleaned free of foreign material and chemical residue. Cleaning methods used must not bend, erode or damage coil surfaces, fins or tubes. Clean coil drain pans and drain. Make drain fully operational. Where wet methods are used, thoroughly rinse coils and drains pans with clean water to remove latent residues. Provide temporary drain pans below coils without drain pans to capture water.
- I. Where systems and equipment containing filters are cleaned, obtain replacement filters from building occupant and replace existing filters.
- J. Verification of HVAC system cleanliness will be performed after cleaning and prior to application of biocides and encapsulants. The Contractor shall notify the Owner's Construction Representative and Architect/Engineer in advance of verification. Verification will consist of inspection by the Contractor, Owner's Construction Representative and/or Architect/Engineer. If surfaces are visibly clean, no contaminants are evident through visual inspection and coils are within 10% of design pressure drop, the HVAC system shall be considered clean. However the Owner reserves the right to further verify system cleanliness through third party gravimetric or wipe testing analysis per NADCA standards.

### 3.03 BIOCIDES AND ENCAPSULANTS

- A. Biocides and encapsulants are to be applied only after cleaning and verification have been completed and surfaces are dry. System fans are to remain off and critical barriers maintained to prevent migration of biocides and encapsulants from the HVAC systems.
- B. Apply biocides to the following surfaces which are suspected of or have been tested and verified for microbial contamination:
  - 1. Plenums and ductwork around and 5' downstream of cooling coils and humidifiers.
  - 2. Cooling coil drain pans.
  - 3. Outdoor air intake drain pans.

4. Edit for project requirements. The use of biocides should be limited to areas tested for or reasonably suspected (duct liner, wet locations) of microbial contamination.
- C. Apply encapsulants to the following surfaces where microbial contamination is not suspected:
1. Damaged fibrous glass thermal or acoustical insulation.
  2. Sheet metal where thermal or acoustical insulation has been removed.
  3. Revise above locations to be site and project specific. The need for encapsulants should be determined through prior field inspection of equipment and ductwork where accessible.
- D. Biocides and encapsulants to be directly sprayed (not fogged), brushed or rolled onto surfaces to achieve a continuous film of thickness recommended by manufacturer. Increase application rate on porous or rough surfaces. Protect coils, fan blades, bearings, damper linkages and seals, fire/smoke dampers, humidifiers, airflow sensors, pressure sensors, temperature sensors and humidity sensors during application of biocides and encapsulants. Clean any overspray from these components immediately. Allow products to fully cure prior to using HVAC systems. Operate systems during unoccupied hours flushing with fresh air to purge system prior to occupied use.

#### 3.04 CLEANING REPORT

- A. Provide a report describing pre-cleaning inspection and damage, systems cleaned, methods and materials used, problems encountered, final verification and any remaining problems noted. Submit three copies to Owner's Construction Representative.
- B.

#### 3.05 ACCESS DOORS

- A. Install access doors where indicated on the drawings and in locations where access is required for cleaning or inspection. See specification Section 23 33 00 for access door requirements.
- B. Size and numbers of duct access doors to be sufficient to perform the intended service. Minimum access door size shall be 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, or other size as indicated. Install access doors on both inlet and outlet sides of reheat coils as well as other duct mounted coils if not existing.

END OF SECTION

SECTION 15548  
VIBRATION AND SEISMIC CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide complete vibration and seismic control for the Work as required by this Section for HVAC equipment and accessories indicated in the Contract Documents.
- B. All work of this section shall comply with Section 15000 GENERAL REQUIREMENTS - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC).

1.02 QUALITY ASSURANCE

- A. Only firms whose products of vibration isolation products, of types and sizes required and have been in exceptional use in similar service for not less than five years shall be considered.
- B. Unless otherwise indicated, obtain isolation units from a single manufacturer.
- C. Where vibration isolation support units are indicated for minimum static deflection, provide manufacturer's certification that units have been tested and comply with the indicated requirements.

1.03 SUBMITTALS

- A. Submit in accordance with specification Division 01 and Section 15500.
- B. In addition, manufacturer's literature and data shall include:
  - 1. Vibration isolators:
    - a. Floor mountings
    - b. Hangers
    - c. Snubbers
    - d. Thrust restraints
  - 2. Bases.
  - 3. Seismic restraint provisions and bolting.
  - 4. Acoustical enclosures.
  - 5. Duct liner

- C. Isolator manufacturer shall furnish with submittal load calculations for selection of isolators, including supplemental bases, based on lowest operating speed of equipment supported.
- D. Seismic Requirements: Submittals are required for all equipment anchors, supports and seismic restraints. Submittals shall include; weights, dimensions, standard connections, and manufacturer's certification that all specified equipment will withstand seismic lateral force requirements as shown on drawings and required by their scheduled weights and centers of gravity.

## PART 2 – PRODUCTS

### 2.01 FLEXIBLE DUCT CONNECTORS

- A. Isolate all equipment from ductwork with flexible ductwork connections and, for outside installations, UV resistant flexible connections, reinforced with steel wire mesh where required for strength to withstand duct pressure indicated. Form connectors with full-faced flanges and accordion bellows to perform as flexible isolation units, and manufacturer's standard length for each size unless otherwise indicated.
- B. Equip each unit with galvanized steel retaining rings for airtight connections to ductwork. Flexible duct connectors exposed to the outside shall be watertight and exteriors finished with an impregnated fiberglass cloth bonded to flexible connectors. All flexible connectors shall meet or exceed the requirements of NFPA bulletin 90A, U.L. listing 181, Class 1.

### 2.02 DUCT LINER

- A. Supply and return ductwork shall have acoustic lining where shown on the drawings and as specified herein. Acoustic lining shall be a minimum of 1-1/2 inches thickness and incorporate an integral mat-face of type in accordance with NFPA 90A, of minimum 1-1/2 lb. per cubic foot density. Adhere mat-faced duct liner with a fire retardant adhesive. Mechanical fasteners that do not pierce the sheet metal shall be on min. 16 inch centers on top sections (when duct width exceeds 12 inches) and on sides when height exceeds 24 inches. All leading edges at beginning of runs and all exposed edges shall be installed with sheet metal nosings to prevent delamination and prevent peel off.
  - 1. Insulate all supply and return ductwork min. 20 ft. from HVAC units, or to lengths shown on drawings.
  - 2. Where ductwork is acoustically lined, thermal insulation is not required if the thermal performance is at least equal to that specified for thermal insulation.
  - 3. Sizes shown on drawings for lined ducts are inside-clear dimensions.
- B. Duct dimensions listed on the Drawings are net interior clear dimensions. Incorporate allowances for linings and insulation to provide the net clear dimensional data provided.

- C. Provide duct lining including facings and adhesives with incombustible materials meeting all code requirements and fire and smoke hazard ratings as tested by procedure ASTM E-84M, NFPA 225, and U.L. 723, not exceeding flame spread 25 and developed smoke of 50.

## 2.03 VIBRATION ISOLATORS

- A. Vertically restrained spring isolators: Units shall be equipped with an adjustable assembly which will limit vertical movement, both up and down, without degrading performance of unit for normal equipment loading and operation.
- B. Type of isolator, base, and minimum static deflection shall be as required for each specific equipment application as recommended by isolator or equipment manufacturer but subject to minimum requirements indicated herein and in the schedule on the drawings.
- C. Floor Mountings:
  - 1. Double Deflection Neoprene (Type N): Shall include neoprene covered steel support plated (top and bottom), friction pads, and necessary bolt holes.
  - 2. Spring Isolators (Type S): Shall be free-standing, laterally stable and include acoustical friction pads and leveling bolts. Isolators shall have a minimum ratio of spring diameter-to-operating spring height of 1.0 and an additional travel to solid equal to 50 percent of rated deflection.
  - 3. Captive Spring Mount for Seismic Restraint (Type SS):
    - a. Design mounts to resiliently resist seismic forces in all directions. Snubbing shall take place in all modes with adjustment to limit upward, downward, and horizontal travel to a maximum of 6 mm (1/4-inch) before contacting snubbers. Mountings shall have a minimum rating of one G coefficient of gravity as calculated and certified by a registered structural engineer.
    - b. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50 percent of the rated deflection. Mountings shall have ports for spring inspection. Provide an all directional neoprene cushion collar around the equipment bolt.
  - 4. Spring Isolators with Vertical Limit Stops (Type SP): Similar to spring isolators noted above, except include a vertical limit stop to limit upward travel if weight is removed and also to reduce movement and spring extension due to wind loads. Provide clearance around restraining bolts to prevent mechanical short circuiting. // Isolators shall have a minimum seismic rating of one G.



5. Pads (Type D), Washers (Type W), and Bushings (Type L): Pads shall be felt, cork, neoprene waffle, neoprene and cork sandwich, neoprene and fiberglass, neoprene and steel waffle, or reinforced neoprene. Washers and bushings shall be reinforced neoprene. Size pads for a maximum load of 345 kPa (50 pounds per square inch).
  6. Seismic Pad (Type DS): Pads shall be felt, cork neoprene waffle, neoprene and cork sandwich, neoprene and fiberglass, neoprene and steel waffle, or reinforced neoprene, with steel top plate and drilled for an anchor bolt. Washers and bushings shall be reinforced neoprene. Size pads for a maximum load of 345 kPa (50 pounds per square inch).
- D. Hangers: Shall be combination neoprene and springs unless otherwise noted and shall allow for expansion of pipe.
1. Combination Neoprene and Spring (Type H): Vibration hanger shall contain a spring and double deflection neoprene element in series. Spring shall have a diameter not less than 0.8 of compressed operating spring height. Spring shall have a minimum additional travel of 50 percent between design height and solid height. Spring shall permit a 15 degree angular misalignment without rubbing on hanger box.
  2. Spring Position Hanger (Type HP): Similar to combination neoprene and spring hanger except hanger shall hold piping at a fixed elevation during installation and include a secondary adjustment feature to transfer load to spring while maintaining same position.
  3. Neoprene (Type HN): Vibration hanger shall contain a double deflection type neoprene isolation element. Hanger rod shall be separated from contact with hanger bracket by a neoprene grommet.
  4. Spring (Type HS): Vibration hanger shall contain a coiled steel spring in series with a neoprene grommet. Spring shall have a diameter not less than 0.8 of compressed operating spring height. Spring shall have a minimum additional travel of 50 percent between design height and solid height. Spring shall permit a 15 degree angular misalignment without rubbing on hanger box.
  5. Hanger supports for piping 50 mm (2 inches) and larger shall have a pointer and scale deflection indicator.
- E. Snubbers: Each spring mounted base shall have a minimum of four all-directional or eight two directional (two per side) seismic snubbers that are double acting. Elastomeric materials shall be shock absorbent neoprene bridge quality bearing pads, maximum 60 durometer, replaceable and have a minimum thickness of 6 mm (1/4 inch). Air gap between hard and resilient material shall be not less than 3 mm (1/8 inch) nor more than 6 mm (1/4 inch). Restraints shall be capable of withstanding design load without permanent deformation.

- F. Thrust Restraints (Type THR): Restraints shall provide a spring element contained in a steel frame with neoprene pads at each end attachment. Restraints shall have factory preset thrust and be field adjustable to allow a maximum movement of 6 mm (1/4 inch) when the fan starts and stops. Restraint assemblies shall include rods, angle brackets and other hardware for field installation.

## 2.04 SEISMIC RESTRAINT REQUIREMENTS FOR EQUIPMENT

- A. Bolt pad mounted equipment, without vibration isolators, to the floor or other support using ASTM A307 standard bolting materials and methods.
- B. Floor mounted equipment, with vibration Isolators: Type SS. Where Type N isolators are used provide channel frame base horizontal restraints bolted to the floor, or other support, on all sides of the equipment size and material required for the base shall be as recommended by the isolator manufacturer.
- C. On all sided of suspended equipment, provide bracing for rigid supports and provide restraints for resiliently supported equipment. The slack cable restraint method, Mason Industries, or equal, is acceptable.

## 2.05 BASES

- A. Rails (Type R): Rails with isolator brackets shall be designed to reduce mounting height of equipment and cradle machines having legs or bases that do not require a complete supplementary base. To assure adequate stiffness, height of members shall be a minimum of 1/12 of longest base dimension but not less than 100 mm (4 inches). Where rails are used with neoprene mounts for small fans or close coupled pumps, extend rails to compensate overhang of housing.
- B. Integral Structural Steel Base (Type B): Design base with isolator brackets to reduce mounting height of equipment which require a complete supplementary rigid base. To assure adequate stiffness, height of members shall be a minimum of 1/12 of longest base dimension, but not less than 100 mm (four inches).
- C. Inertia Base (Type I): Base shall be a reinforced concrete inertia base. Pour concrete into a welded steel channel frame, incorporating pre-located equipment anchor bolts and pipe sleeves. Level the concrete to provide a smooth uniform bearing surface for equipment mounting. Provide grout under uneven supports. Channel depth shall be a minimum of 1/12 of longest dimension of base but not less than 150 mm (six inches). Form shall include 13-mm (1/2-inch) reinforcing bars welded in place on minimum of 203 mm (eight inch) centers running both ways in a layer 40 mm (1-1/2 inches) above bottom. Use height saving brackets in all mounting locations. Weight of inertia base shall be equal to or greater than weight of equipment supported to provide a maximum peak-to-peak displacement of 2 mm (1/16 inch).
- D. Curb Mounted Isolation Base (Type CB): Fabricate from aluminum to fit on top of standard curb with overlap to allow water run-off and have wind and water seals which shall not interfere with spring action. Provide resilient snubbers with 6 mm (1/4 inch) clearance for wind resistance. Top and bottom bearing surfaces shall have sponge type

weather seals. Integral spring isolators shall comply with Spring Isolator (Type S) requirements.

### PART 3 – EXECUTION

#### 3.01 ISOLATOR PERFORMANCE

- A. Comply with minimum static deflection recommended ASHRAE including definitions of critical and non-critical locations, for selection and application of vibration isolation materials and devices.
- B. Comply with manufacturer's recommendations for selection and application of vibration isolation materials and units.

#### 3.02 ISOLATOR INSTALLATION

- A. Anchor and attach unit to substrate and equipment as required for secure operation and to prevent displacement by seismic forces, and as indicated.
- B. Adjust leveling devices as required to distribute loading uniformly onto isolators. Shim units as required where leveling devices cannot be used to distribute loading properly. Install so that HVAC units are level.
- C. Adjust isolators to ensure that units do not exceed rated operating deflections or bottom out under loading, and are not short circuited by other contacts or bearing points. Remove space blocks and similar devices (if any) intended for temporary protection against overloading during installation.
  - 1. No metal-to-metal contact will be permitted between fixed and floating parts.
  - 2. Connections to Equipment: Allow for deflections equal to or greater than equipment deflections. Electrical, drain, piping connections, and other items made to rotating or reciprocating equipment (pumps, compressors, etc.) which rests on vibration isolators, shall be isolated from building structure for first three hangers or supports.
  - 3. Common Foundation: Mount each electric motor on same foundation as driven machine. Hold driving motor and driven machine in positive rigid alignment with provision for adjusting motor alignment and belt tension. Bases shall be level throughout length and width. Provide shims to facilitate pipe connections, leveling, and bolting.
  - 4. Provide heat shields where elastomers are subject to temperatures over 38 degrees C (100 degrees F).
  - 5. Extend bases for pipe elbow supports at discharge and suction connections at pumps. Pipe elbow supports shall not short circuit pump vibration to structure.

6. Non-rotating equipment such as heat exchangers and convertors shall be mounted on isolation units having the same static deflection as the isolation hangers or support of the pipe connected to the equipment.

### 3.03 ISOLATOR ADJUSTMENTS

- A. Adjust vibration isolators after piping systems are filled and equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4 inch (6-mm) movement during start and stop.
- D. Adjust active height of spring isolators.
- E. Adjust snubbers according to manufacturer's recommendations.
- F. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.
- G. Torque anchor bolts according to equipment manufacturer's recommendations to resist seismic forces.

### 3.04 DEFLECTION MEASUREMENTS

- A. At job close out prepare and submit to Engineer a record showing measured equipment deflection for each major item of equipment.

### 3.05 ACOUSTIC LINING INSTALLATION

- A. Acoustic linings shall be adhered to all interior sides of duct with minimum 100% coverage for fire-retardant adhesive similar to Benjamin Foster 4 and with weld pins and washer or equivalent mechanical fastening starting 3 inches from edges and sides, 12 inches on center, all sides. Minimum one row per side for duct size of 12 inches size or less. Mechanical fasteners shall cause quilting of surface. Neoprene coated surface shall be toward air stream. Before installing liner seal all butting edges and final edges with heavy coat of adhesive to seal off air between lining and duct. All exposed edges of lining shall be installed with sheet metal nosing 1-1/2" wide, two gauges heavier than duct. Installation shall be suitable for duct velocities up to 3,000 feet per minute.

### 3.06 BALANCING AND ALIGNMENT OF ROTATING EQUIPMENT

- A. Statically and dynamically balance all pumps, fans, compressors and drivers. Align shafts of pumps, fans, and drivers to limit noise and vibration to specified values. Level and anchor equipment as necessary to achieve and maintain proper alignment.

### 3.07 VIBRATION TESTS ON ROTATING EQUIPMENT

- A. Perform vibration tests on all pumps, fans, compressors and drivers during the pretest of the equipment. Tests shall be conducted by an experienced technician in the presence of an Owner representative.
- B. Perform tests at each bearing in axial, horizontal, and vertical positions.
- C. RMS vibration velocity shall not exceed 0.0025 m/s (0.10-inch per second). Correct the cause of excessive vibration and provide retest.
- D. Test instruments furnished by contractor:
  - 1. Portable, with output capability to print data.
  - 2. Frequency range, 600-150,000 CPM minimum.
  - 3. Amplitude range, 2.54 m/s (0-100 inches per second).
  - 4. Sensitivity, 0.00013 m/s (0.005-inch per second).
  - 5. Frequency filter "out" for tests.
- E. Submit tabulated vibration readings to the Owner representative.

### 3.08 SOUND LEVELS

- A. Sound level limitations apply to all burners, fans, blowers, pumps, compressors, control valves, pressure reducing valves, motors, and turbines.
- B. Sound levels shall not exceed 85 DBA when measured 1400 mm (4.5-feet) above the floor and 910 mm (3-feet) horizontally from each surface of the smallest imaginary rectangular box which could completely enclose the entire unit which contains the sound source. Sound level limitations apply to the operation of the equipment at all loads within the equipment requirements.
- C. If sound levels exceed requirements, modify or replace the equipment as necessary to achieve required sound levels and other specified requirements.
  - 1. Submit all proposed modifications or replacements for review prior to starting the work.
  - 2. After completing the work, provide complete retest of equipment operation and performance.

END OF SECTION

SECTION 15553 HVAC  
IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide complete HVAC system identification work for all equipment and ducting from point of connection at HVAC equipment to termination points. Types of HVAC identification shall consist of:
  - 1. Painted Identification Materials
  - 2. Plasticized Tags
  - 3. Engraved Plastic Laminate Signs
  - 4. Plastic Tape
- B. Lettering, Size, Colors, and viewing angles of identification devices shall comply with ANSI A13.1.
- C. All work of this section shall comply with Section 15500 GENERAL REQUIREMENTS - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

PART 2 – PRODUCTS

2.01 HVAC IDENTIFICATION MATERIALS

- A. Painted Identification Materials:
  - 1. Stencils: Standard fiberboard stencils with letters not less than 1-1/4 inches high for ductwork and not less than 3/4" inches high for access door signs and similar operational instructions.
  - 2. Identification paint: Standard exterior type stenciling enamel of wither brushing grade or pressurized spray can form and grade.
  - 3. Identification Paint: Standard identification enamel.
- B. Plastic Tape
  - 1. General: Manufacturer's standard color-coded pressure sensitive self-adhesive vinyl tape, not less than 3 mils thick.
    - a. Width: Provide 1-1/2" inch wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6 inches, 2-1/2 inch wide tape for larger pipes.

- b. Color: By ANSI A13.1 designation except where other color selection is indicated.
- C. Engraved-Plastic Laminate Signs:
  - 1. General: Provide engraving stock melamine plastic laminate complying with FS L-P-387 in the size and thickness indicated, engraved with engraver's standard letter style of the size and working indicated, black with white core (letter core) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
    - a. Thickness: 1/6 inch for units up to 20 sq. in. or 8 inch in length; 1/8 inch for larger units.
    - b. Fasteners: Self-tapping stainless screws, except contact type permanent adhesive where screws cannot or should not penetrate the substrate.

### PART 3 – EXECUTION

#### 3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceiling and removable concealment.

#### 3.02 GENERAL DUCTWORK IDENTIFICATION

- A. Identify air supply, return, exhaust, outside air and intake relief ducting with stenciled signs and arrows, showing ductwork service in direction of flow, in black or white (whichever provides best contrast)
- B. In each space where ductwork is exposed, or concealed by removable ceiling system, locate signs near points of ductwork origin or where the ducts continue on into concealed enclosures and at 50 ft. spacing along exposed runs.
  - 1. Access doors shall be provided with stenciled or plastic-laminate type signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions and appropriate safety and procedural information.

#### 3.03 HVAC EQUIPMENT IDENTIFICATION

- A. Install engraved plastic laminate signs on or near each equipment item and each operational device, if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:
  - 1. Air Handling Units

2. Package Units
  3. Exhaust Fans
  4. Mixing Boxes
  5. Split System Fan Coils
  6. Condensing Units
  7. Heat Pumps
  8. Chillers
  9. Cooling Towers
  10. Boilers
  11. Pumps
  12. Air Separators
  13. Significant Shut Off Valves (Isolation)
  14. Main control and operating dampers, including safety devices and hazardous units.
- B. Where lettering larger than 1 inch height is needed for proper identification, because of distance from normal location of required identification, stenciled signs may be provided in lieu of engraved plastic, at Installer's option.
- C. Minimum 1/4" high lettering for name of unit where viewing distance is less than 2 feet and 1/2" high for distances up to 6 feet and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 or 3/4 the size of the principal lettering.
- D. In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operating requirements, indicate safety and emergency precautions, and warn of hazard and improper operations.

END OF SECTION



SECTION 15559  
TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Work Included: This Section covers requirements for testing, adjusting, and balancing work for the air distribution systems and associated equipment and apparatus described herein.
- B. All work of this section shall comply with Section 15500 GENERAL REQUIREMENTS - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC).

1.02 QUALITY ASSURANCE

- A. Engage the services of an independent balancing and testing agency specializing in the balancing and testing of heating, ventilating and air conditioning systems to perform the work.
- B. TAB Agency:
  - 1. The TAB agency shall be a subcontractor of the General Contractor and shall report to and be paid by the General Contractor.
  - 2. The TAB agency shall be a certified member of AABC to perform TAB service for HVAC, water balancing and vibrations and sound testing of equipment. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason, the agency loses subject certification during this period, the General Contractor shall immediately notify the Engineer of Record and submit another TAB firm for approval. Any agency that has been the subject of disciplinary action by AABC within the five years preceding Contract Award shall not be eligible to perform any work related to the TAB. All work performed in this Section and in other related Sections by the TAB agency shall be considered invalid if the TAB agency loses its certification prior to Contract completion, and the successor agency's review shows unsatisfactory work performed by the predecessor agency.
- C. TAB Specialist:
  - 1. The TAB specialist shall be a member of. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason, the Specialist loses subject certification during this period, the General Contractor shall immediately notify the Resident Engineer and submit another TAB Specialist for approval. Any individual that has been the subject of disciplinary action by the AABC within the five years preceding Contract Award shall not be eligible to perform any duties related to the HVAC systems, including TAB. All work specified in this Section and in other related Sections performed by the

TAB specialist shall be considered invalid if the TAB Specialist loses its certification prior to Contract completion and must be performed by an approved successor.

2. TAB Specialist shall be identified by the General Contractor within 60 days after the notice to proceed. The TAB specialist will be coordinating, scheduling and reporting all TAB work and related activities and will provide necessary information as required by the Resident Engineer. The responsibilities would specifically include:
  - a. Shall directly supervise all TAB work.
  - b. Shall sign the TAB reports that bear the seal of the TAB standard. The reports shall be accompanied by report forms and schematic drawings required by the TAB standard, AABC.
  - c. Would follow all TAB work through its satisfactory completion.
  - d. Shall provide final markings of settings of all HVAC adjustment devices.
  - e. Permanently mark location of duct test ports.
3. All TAB technicians performing actual TAB work shall be experienced and must have done satisfactory work on a minimum of 3 projects comparable in size and complexity to this project. Qualifications must be certified by the TAB agency in writing.
4. Test Equipment Criteria: The instrumentation shall meet the accuracy/calibration requirements established by AABC National Standards. Provide calibration history of the instruments to be used for test and balance purpose.
5. Tab Criteria:
  - a. One or more of the applicable AABC or SMACNA publications, supplemented by ASHRAE Handbook "HVAC Applications" Chapter 36, and requirements stated herein shall be the basis for planning, procedures, and reports.
  - b. Flow rate tolerance: Following tolerances are allowed. For tolerances not mentioned herein follow ASHRAE Handbook "HVAC Applications", Chapter 36, as a guideline. Air Filter resistance during tests, artificially imposed if necessary, shall be at least 90 percent of final values for pre-filters and after-filters.
    1. Air handling unit and all other fans, cubic meters/min (cubic feet per minute): Minus 0 percent to plus 10 percent.
    2. Air terminal units (maximum values): Minus 2 percent to plus 10 percent.

3. Exhaust hoods/cabinets: 0 percent to plus 10 percent.
  4. Minimum outside air: 0 percent to plus 10 percent.
  5. Individual room air outlets and inlets, and air flow rates not mentioned above: Minus 2 percent to plus 10 percent except if the air to a space is 100 CFM or less the tolerance would be 0 to plus 5 percent.
  6. Heating hot water pumps and hot water coils: Minus 5 percent to plus 5 percent.
  7. Chilled water and condenser water pumps: 0 percent to plus 5 percent.
  8. Chilled water coils: 0 percent to plus 5 percent.
- c. Systems shall be adjusted for energy efficient operation as described in PART 3.
  - d. Typical TAB procedures and results shall be demonstrated to the Resident Engineer for one air distribution system (including all fans, three terminal units, three rooms) and one hydronic system (pumps and three coils) as follows:
    1. When field TAB work begins.
    2. During each partial final inspection and the final inspection for the project if requested by VA.
- D. AABC Compliance: Comply with AABC's Manual MN-1 "AABC National Standards", as applicable to mechanical air distribution systems and associated equipment and apparatus, except as otherwise specified.
1. NEBB is deemed unacceptable and any submittals by NEBB Certified firms shall be rejected without review.
- E. Industry Standards: Comply with American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise specified.

### 1.03 SUBMITTALS

- A. Comply with Submittal Requirements of Division 01.
- B. Submit names and qualifications of TAB agency and TAB specialists within 60 days after the notice to proceed. Submit information on three recently completed projects and a list of proposed test equipment.
- C. For use by the Resident Engineer staff, submit one complete set of applicable AABC publications that will be the basis of TAB work.
- D. Submit Following for Review and Approval:

1. Design Review Report within 90 days for conventional design projects and within 60 days for design-build projects after the system layout on air and water side is completed by the Contractor.
  2. Systems inspection report on equipment and installation for conformance with design.
  3. Duct Air Leakage Test Report.
  4. Systems Readiness Report.
  5. Intermediate and Final TAB reports covering flow balance and adjustments, performance tests, vibration tests and sound tests.
  6. Include in final reports uncorrected installation deficiencies noted during TAB and applicable explanatory comments on test results that differ from design requirements.
  7. Submit certification that balancing personnel have been trained in accordance with AABC standards.
  8. Submit certification of test equipment calibration and currency.
  9. Maintenance Data: Include in maintenance manuals, copies of certified test reports.
  10. Submit certified test reports signed by the Test and Balance Supervisor who performed testing and balancing work. In addition, have report certified by a Registered Professional Engineer who is familiar with testing and balancing work and also with project.
- E. Prior to request for Final or Partial Final inspection, submit completed Test and Balance report for the area.
- F. Make all other submittals specified under this Section.

#### 1.04 JOB CONDITIONS

- A. Do not proceed with TAB work until work has been completed and is operable. Ensure that there is no latent residual work still to be completed.
- B. Do not proceed until work scheduled for testing, adjusting, and balancing is clean and free from debris, dirt and discarded building materials.

### PART 2 – PRODUCTS

#### 2.01 GENERAL

- A. PATCHING MATERIALS: Except as otherwise indicated, use same products as used by original installer for patching holes in insulation, ductwork and housings which have

been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes. In each case, patching shall be completed by original installer.

- B. TEST INSTRUMENTS: Utilize test instruments and equipment for testing and balancing work required, of type, precision, and capacity as recommended in AABC's Manual MN-1 "AABC National Standards".

## 2.02 PLUGS

- A. Provide plastic plugs to seal holes drilled in ductwork for test purposes.

## 2.03 INSULATION REPAIR MATERIAL

- A. Provide for repair of insulation removed or damaged for TAB work.

# PART 3 – EXECUTION

## 3.01 GENERAL REQUIREMENTS

- A. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Do not proceed with testing and balancing work until unsatisfactory conditions have been corrected in manner acceptable to Tester.
- B. Test, adjust and balance environmental systems and components, as indicated, in accordance with procedures outlined in applicable standards.
- C. Test, adjust and balance system during summer season for air conditioning systems and during winter season for heating systems, including at least period of operation at outside conditions within 5 °F (3 °C) wet bulb temperature of maximum summer design condition, and within 10 °F (6 °C) dry bulb temperature of minimum winter design condition. When seasonal operation does not permit measuring final temperatures, then take final temperature readings when seasonal operation does permit.
- D. Prepare report of test results, including instrumentation calibration reports, in format recommended by applicable standards.
- E. Patch holes in insulation, ductwork and housings, which have been cut or drilled for test purposes.
- F. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers and similar controls and devices, to show final settings at completion of testing and balancing work. Provide markings with paint or other suitable permanent identification materials.
- G. Prepare a report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced, including, where necessary, modifications which exceed requirements of the Contract Documents.

Submit report to the Engineer for review. Carry out corrective modifications as approved by the Engineer.

- H. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.
- I. Units shall not be operated without air filters. Air filters shall be replaced completely after construction is complete and just prior to air balancing.

### 3.02 BALANCING PROCEDURES - WATER SYSTEMS

- A. Prior to balancing the Contractor shall complete construction of piping systems with all components installed, and controls operative and calibrated. Schedule balancing for completion four calendar weeks prior to the completion of the building or the area the water system is servicing.
- B. Verify the following conditions prior to balancing:
  - 1. Piping systems have been flushed and treated in accordance with Hydronic Piping, Valves, and Specialties Section.
  - 2. Strainers have been cleaned.
  - 3. Inside of traps, reducing and regulating valves have been cleaned.
  - 4. Expansion tanks are not air bound.
  - 5. Piping systems are completely full of water, all air properly vented off.
  - 6. All coil and isolation shut off and balance valves are fully open.
  - 7. Check pumps:
    - a. Rotation
    - b. Pump factory impeller trimming by comparing shut off heads with pumps curves from approved submittals.
      - 1. Report discrepancies in shut off head to Owner's Representative and if impeller does not appear to be properly trimmed, wait for direction before proceeding with pump test and balance.
  - 8. DDC Operability:
    - a. Do not proceed with any of the following balancing procedures until the DDC system is capable of operating equipment such as fans, pumps, boiler, control valves, etc. in manual and automatic modes and capable of reading sensors such as differential pressure, flow rates, temperature, etc. of air and hydronic systems to be tested and balanced.

C. Pumps:

1. Test and report for each pump:
  - a. Tag, manufacturer and model of pump, motor manufacturer, service, model and size.
  - b. Motor horse power, volts, phase, full load amps.
  - c. Pump shut off head from curves and measured shut off head.
  - d. With all control valves open to coils:
    1. Volts and amps, measured with handheld meter, and calculated brake power.
    2. Entering and leaving gage pressure and difference in feet.
    3. Suction, discharge and total flow rates, deduced from pump curve.

D. Hydronic system:

1. At three way valves, adjust balance valves in bypass leg as required to make pressure drop across the coil-valve assembly when valve is in full bypass position equal to that when the valve is in the through coil position. Leave isolation shut off valves full open.
  - a. Report:
    1. Coils:
      - a) Tags of coils with 3- way valves that are balanced.
      - b) Inlet, outlet, and pressure drop across the assembly with valve open to coil.
      - c) Pressure drop across the assembly with valve open to bypass before and after bypass valve balance.
      - d) Hot water return temperature.
      - e) Hot water supply temperature.
      - f) Coil flow rate.
      - g) Design and final inlet and outlet pressures.
    2. Boiler:
      - a) Design and measured differential pressure across boiler before and after balance.

- b) Hot water return temperature.
  - c) Hot water supply temperature.
  - d) Design and final inlet and outlet pressures.
  - e) Calculated heating energy transferred to water, in btu/h.
  - f) Calculated efficiency (heat transferred to water divided by gas energy input).
3. Test control valve shutoff
- a) Close all control valves in the system. Run pumps individually, at full speed, dead headed.
  - b) Verify that all control valves remain shut with no measurable flow, as indicated by pump differential pressure, and any temperature rise across coils.
  - c) Do not run pumps dead headed for more than five minutes at any one time.
  - d) Report:
  - e) Tag of coils where flow is detected.
  - f) Measured pump inlet and outlet pressures, with differences converted to feet.

### 3.03 BALANCING PROCEDURES - AIR SYSTEMS

- A. Prior to balancing, the Contractor shall complete construction of air handling system with all components installed, and controls operative and calibrated. Schedule balancing for completion four calendar weeks prior to the completion of the building or the area the air system is servicing.
- B. Before balancing, check alignment of fan and motor sheaves.
- C. Obtain copies of fan pressure volume power characteristics at rated speed. Prepare line drawings of systems with identifying designations for each section of the distribution systems and all outlets.
- D. Set all fans at rated speeds for design volumes and pressure. Simultaneously operate all supply and exhaust systems serving common areas on 100% outside air or full recirculation throughout the balancing period.
- E. Measure flow and pressure in ducts by means of pitot tube and manometer or U-gage having a minimum sensitivity of 0.02 inch of water.



- F. For rectangular ducts, take readings at the center point of equal rectangles with not less than 16 and a maximum of 64 readings. Center distances between rectangular areas shall be not more than 6 inches. Take readings as far downstream of fittings as is practicable up to an equivalent of seven duct diameters.
- G. Measure fan and motor speed with a direct reading tachometer and Strobo Tach. Measure amperage and voltage with direct connected or clamp-on instruments.
- H. Measure flow at air outlets and inlets with velometer in accordance with air outlet manufacturer's instructions.
- I. Submit to the Engineer duplicate copies of final test and balancing measurements, drawings and operating data on fan curves.
- J. Determine actual air volume delivery of all fans by measuring fan performance point on fan pressure volume curve.
  - 1. Measure and record fan performance data on Fan Data Sheet. Plot operating point on fan pressure volume curve. Plot BHP on fan power CFM curve.
  - 2. Measure total system flow in main supply duct by means of pitot tube traverse.
  - 3. If volumes determined by each method described in 1 and 2 above are within 5% of one another, continue test. If, in excess of 5% notify Engineer and have fan checked by manufacturer, then repeat pitot tube traverse.
  - 4. If measured volumes are within 5% of one another but at other than design volume, readjust fan speed for design volume delivery.
- K. Test and record static pressure drop across all filters and note the condition of the filter at the time of test.
- L. Test and record entering and leaving db and wb temperature after the air systems have been balanced. Note whether system is on the heating or ventilation cycle.
- M. After all fans have been adjusted, proceed with balancing of systems. Adjust outside quantities by temperature of outside air, recirculated air and mixture on a day in which outside air is at least 30 °F colder than room air. Maximum and minimum air volumes through outdoor, return and exhaust air combination are to be adjusted in conjunction with automatic controls manufactured by means of linkage stops on damper motors.
- N. Balance systems to the following tolerances:
  - 1. Fans: Design volume plus 5%
  - 2. Outlets: Design volume plus 5%
  - 3. Leakage: 3%

- O. Where duct joints present leakage, the contractor shall reseal joints with 3M EC-800 cement, or equal.
- P. The following data shall be measured and recorded for all systems after balancing and adjusting to within limits specified herein, for submission of balancing report:
1. Fan Data:
    - a. Manufacturer and model number (where available)
    - b. CFM, design
    - c. CFM, actual
    - d. RPM
    - e. Inlet static pressure
    - f. Discharge static pressure
    - g. Total static pressure
    - h. For purpose of balancing, fan BHP shall be calculated as follows:

Actual Amps X Actual Volts

BHP = Nameplate Amps X Nameplate Volts X Nameplate HP

- i. If more accurate reading is necessary for resolution of performance data conflict, use a calibrated wattmeter for measuring power.
2. Motor Data:
    - a. Manufacturer model number
    - b. Horsepower
    - c. Phase
    - d. Frequency
    - e. NEMA code letter
    - f. Rated volts
    - g. Actual volts
    - h. Rated amperes
    - i. Actual amperes

- j. Calculated operating BHP
- k. Locked rotor amperes
- 3. Hydronic Coils (where occurs):
  - a. Coil tag or note to which air handler coil serves.
  - b. Airflow in CFM
  - c. Inlet air temperature
  - d. Outlet air temperature
  - e. Air inlet pressure
  - f. Air outlet pressure
- 4. Electric Heaters (where occurs):
  - a. Manufacturer model number
  - b. Heater size
  - c. Line voltage
  - d. Ampere rating
  - e. Control voltage
  - f. Frequency
- 5. Air Outlet Data:
  - a. Schedule showing all air outlet locations and numbers assigned to outlets for purpose of test
  - b. Air outlet manufacturer and model number where available
  - c. Size
  - d. Actual free area
  - e. Manufacturers test factor
  - f. Measured velocity
  - g. CFM, design
  - h. CFM, actual

- i. CFM, percentage above or below design

6. Outdoor Air Data:

- a. Size and inlet

- b. Actual free area

- c. Manufacturers test factor

- d. Measured velocity

- e. Outdoor air temperature

- f. Return air temperature

- g. Mixed air temperature with averaged traverse readings

3.04 AUTOMATIC CONTROL DEVICES:

A. Automatically operated devices that are pertinent to the adjustment of the air system shall be set and adjusted to deliver the required quantities of air. All control work shall be done in collaboration with the representative of the control device manufacturer.

3.05 BI-SEASONAL ADJUSTMENT:

A. Within the two year guarantee period following initial acceptance of systems, the Contractor shall return to the site and complete the adjustment of any equipment that was not thoroughly tested under maximum obtainable load conditions in the pre-acceptance period.

3.06 PATCHING MATERIALS:

A. Except as otherwise indicated, use the same products as used in the original installation for patching holes in insulation, ductwork and housings which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes. In each case, patching is to be completed by original installer.

3.07 MARKINGS:

A. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings at completion of testing, adjusting and balancing work. Provide markings with paint or other suitable permanent identification materials.

3.08 IDENTIFICATION OF TEST PORTS

A. The TAB Specialist shall permanently and legibly identify the location points of duct test ports. If the ductwork has exterior insulation, the identification shall be made on the

exterior side of the insulation. All penetrations through ductwork and ductwork insulation shall be sealed to prevent air leaks and maintain integrity of vapor barrier.

### 3.09 RECOMMENDATIONS

- A. Prepare a report of recommendations to the Engineer for correcting unsatisfactory mechanical performance when systems cannot be successfully balanced, including, where necessary, modifications.
- B. Retest, adjust and balance systems subsequent to significant system modifications and resubmit test results.

END OF SECTION

SECTION 15700  
THERMAL INSULATION FOR MECHANICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work covered under this section consists of providing all necessary labor, supervision, materials, equipment and services to completely execute the complete HVAC system insulation work for equipment, piping, ductwork and other items where shown on the drawings and required herein.
- B. All insulation that is exposed to weather shall be protected with weather covers of stainless steel or aluminum jacketing.
- C. Insulate equipment and products at the following locations;
  - 1. Where the fluid being transported is 60 degrees Fahrenheit or below in temperature.
  - 2. Where the fluid being transported is 100 degrees Fahrenheit or above in temperature.
  - 3. All hot surfaces above 120 degrees in temperature to prevent personnel burns.
  - 4. All condensate pans serving HVAC equipment.
  - 5. All piping, equipment, ducting, valves, etc., which require insulation but come uninsulated from the manufacturer.
- D. All work of this section shall comply with Section 15700 GENERAL REQUIREMENTS - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC).

1.02 REFERENCES

- A. Insulation work shall comply with the requirements of the 2013 California Energy Commission requirements.
- B. ASTM E84 – Standard Test Method for surface Burning Characteristics of Building Materials (NFPA 255).
- C. UL 723 – Test for Surface Burning Characteristics of Building Materials.
- D. UL 263 – Fire Tests of Building Construction and Materials.

1.03 SUBMITTALS

- A. Comply with Division 01 requirements in addition to Section 15500 for submittals.

- B. Submit product data on all insulation products inclusive of R-Value, flame spread rating, developed smoke rating and locations.

## PART 2 – PRODUCTS

### 2.01 GENERAL

- A. The type of insulation and its installation shall be in accordance with this Specification for each service and the application technique shall be as recommended by the manufacturer.
- B. Fire Rating of all insulation shall have a composite (insulation, jacket/facing and adhesive used to adhere facing or jacket to insulation) fire and smoke hazard, as tested by ASTM E84, UL 263, and UL 723, not to exceed a flame spread of 25 and smoke developed by 50.
  - 1. Accessories such as adhesives, mastics, tapes, and cements shall have the same component ratings as listed herein.
  - 2. Products shall have integral factory labeling indicating that flame spread and developed smoke ratings do not exceed the above requirements.

### 2.02 DUCT AND PLENUM INSULATION

- A. Linings:
  - 1. Duct linings shall be flexible, coated, fiberglass, 1 inch minimum thickness (2 inch minimum thickness for exterior ducts), minimum density of 1.5 pounds per cubic foot, maximum thermal conductivity of 0.26 BTUH per sq. ft. degree F/in. at 75 degrees, and minimum noise reduction coefficient of 0.60 for 1 inch thickness.
  - 2. Plenum linings shall be rigid, neoprene coated fiberglass board, 2 inch thickness, minimum density of 3.0 pounds per cubic foot, maximum thermal conductivity of 0.23 btu/h per sq. ft. degree F/in. at 75 degrees, and minimum noise reduction coefficient of 0.90 for 2 inch thickness.
  - 3. Comply with SMACNA Duct Liner Application Standard and manufacturers recommendations in addition to the following:
    - a. Surface adjacent to air flow, including at joints, to be uniformly flat.
    - b. Seal butt joint edges of liner to prevent erosion. Provide sheet metal end caps to cover liner edges at entering and leaving edges of lined duct sections.
    - c. Meet the requirements of the Vibration and Seismic Control Specification Section.

B. Duct wrap with Vapor Barrier:

1. Insulation shall be flexible fiberglass wrap with a minimum density of 1 pound per cubic foot, maximum thermal conductivity of 0.27 btu/h per sq. ft. degree F/in. at 75 degrees, 1-1/2" thick minimum thickness, vapor permeance of 0.02 perm and a glass fiber blanket factory laminated to a reinforced foil/draft (FRK) vapor barrier facing with 2" stapling and taping flange on one edge.
2. Comply with manufacturer's recommendations and the following:
  - a. Secure with 4" strips of adhesive, 8" on center.
  - b. Staple edges at 6" on center/
  - c. For rectangular ducts 20" and wider secure to bottom of duct with mechanical fasteners, 12" on center.

C. Rigid Board with Vapor Barrier:

1. Insulation shall be fiberglass board with a minimum density of 6.0 pounds per cubic foot and a maximum conductivity of 0.23 btu/h per sq. ft. degree F/in. at 75 degrees, 1inch thick minimum thickness.
2. Jacketing shall be factory applied, paint-able, white Kraft outer surface bonded to aluminum foil and reinforced with fiberglass yarn with maximum vapor permeance of 0.02 perms and a maximum beach puncture of 50 units.
3. Comply with manufacturer's recommendations in addition to the following:
  - a. Apply to exterior of duct impaled on weld pins or Tuft-Weld nylon pins on maximum 12" centers with minimum of two rows per side of duct.
  - b. Where used at exterior locations paint with two coats of paint to provide UV protections. Color selection by Owner.

## PART 3 – EXECUTION

### 3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation products in accordance with the manufacturer's written instruction, commercial and industrial standards, and recognized industry practices to ensure that the insulation serves the intended purpose. Surfaces shall be thoroughly cleaned with all testing successfully completed prior to insulating.
- B. In addition to where specified, provide insulation by type and locations as indicated on the Drawings.
- C. After the installation of insulation protect the insulation from moisture and weather damage.



- D. Provide complete weather protection for all outdoor piping insulation.

### 3.02 INSULATION LOCATIONS

- A. Apply insulation by type and location as follows:

- 1. Ductwork

- a. Linings:

- 1. Supply and return ducts at the following locations:

- a) Outside.

- b) At ducts and plenums as indicated on the drawings.

- b. Duct wrap with vapor barrier:

- 1. Concealed supply and return ducts and plenums, except that lined ducts need not be wrapped, unless where indicated otherwise.

- c. Rigid board with vapor barrier:

- 1. Exposed supply and return ducts and plenums that are not lined, but only where indicated on the drawings.

### 3.03 DUCTWORK APPLICATION

- A. After ductwork testing has been completed insulate ductwork as specified. On ducts over 18 inches wide apply weld clips or stick clips to bottom of duct, space 18 inches on center each way, maximum. Seal all longitudinal and transverse seams and all punctures caused by weld clips or stick clips with 2" wide SMACNA labeled, and manufacturer approved, duct tape and mastic.
- B. Provide staples, bands, wires, tape, anchors, corner angles, cements, adhesives, coatings, sealers, protective finishes, and similar compounds as recommended by the insulation manufacturer to the applications indicated.
- C. Insulate all air distribution (grilles, register and diffusers) not factory insulated with fiberglass duct-wrap where located in ceilings or spaces not used as return air plenums.
- D. Install insulation materials with smooth, even surfaces.
- E. Clean and dry all ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- F. Extend duct-wrap insulation without interruption through walls, floors, and similar ductwork penetrations, except where otherwise indicated.

### 3.04 AFTER INSTALLATION CHECK

- A. Visually inspect the complete installation and repair or replace any improperly sealed joints.
- B. Where there is evidence of vapor barrier failure or wet insulation after installation the damaged insulation shall be removed, the surfaces shall be cleaned and dried and the new insulation shall be installed.

END OF SECTION

## SECTION 15813

### METAL DUCTS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Provide complete materials, equipment, fabrications, installation and tests in conformity with applicable codes and authorities having jurisdiction for the following:
  - 1. Ductwork and Plenums
  - 2. Fasteners and Sealants
  - 3. Access doors
  - 4. Balancing dampers
  - 5. Backdraft dampers
  - 6. All duct accessories

##### 1.02 DEFINITIONS

- A. In addition to Section 15500 GENERAL REQUIREMENTS - HEATING, VENTILATING, AND AIR-CONDITIONING the following abbreviations apply:
  - 1. Seam: locks or weld applied longitudinally to close section of duct. Examples: longitudinal seam, spiral seam.
  - 2. Joint: abutting connection between duct sections for continuity of air passage. Examples: cross joint, transverse joint, coupling.
  - 3. Reinforcement: hardware applied to strengthen duct. Examples: girth angles, tie rods, fasteners (not connectors).
  - 4. Stiffening: folding, bending, cross-breaking or corrugating of sheets to achieve strength through shape. Examples: pocket lock secures joint and is transverse stiffener, with girth angle and/or fasteners applied (not connectors), joint or stiffener is reinforced.
- B. Duct Classifications:
  - 1. Velocity:
    - a. Low: to 2,000 feet per minute.
    - b. High: above 2000 feet per minute.

2. Pressure classification: except as noted:
  - a. Low: Up to 2 inches water gauge.
  - b. Medium: Above 2 inches to maximum 6" water gauge.
  - c. High: Above 6" water gauge.

#### 1.03 QUALITY ASSURANCE

- A. In addition to Section 15500 GENERAL REQUIREMENTS - HEATING, VENTILATING, AND AIR-CONDITIONING quality assurance requirements the ductwork shall:
  1. Entire ductwork system, including materials and installation shall be installed in accordance with NFPA 90A.
  2. Ductwork and components shall be listed as U.L. 181, Class 1 air duct, flame rating not to exceed 25 and smoke rating not to exceed 50.
  3. Fire Safety Code: Comply with NFPA 90A.
  4. Duct System Construction and Installation: Referenced SMACNA Standards are the minimum acceptable quality.
  5. Duct Sealing, Air Leakage Criteria, and Air Leakage Tests: Ducts shall be sealed as per duct sealing requirements of SMACNA HVAC Air Duct Leakage Test Manual for duct pressure classes shown on the drawings.
  6. Duct accessories exposed to the air stream, such as dampers of all types (except smoke dampers) and access openings, shall be of the same material as the duct or provide at least the same level of corrosion resistance.

#### 1.04 SUBMITTALS

- A. Manufacturer's Literature and Data:
  1. Rectangular ducts:
    - a. Schedules of duct systems, materials and selected SMACNA construction alternatives for joints, sealing, gage and reinforcement.
    - b. Duct liner.
    - c. Sealants and gaskets.
    - d. Access doors.
  2. Round and flat oval duct construction details:
    - a. Manufacturer's details for duct fittings.

- b. Duct liner.
    - c. Sealants and gaskets.
    - d. Access sections.
    - e. Installation instructions.
  - 3. Volume dampers, back draft dampers.
  - 4. Upper hanger attachments.
  - 5. Fire dampers, fire doors, and smoke dampers with installation instructions.
  - 6. Sound attenuators, including pressure drop and acoustic performance.
  - 7. Flexible ducts and clamps, with manufacturer's installation instructions.
  - 8. Flexible connections.
  - 9. Instrument test fittings.
  - 10. Details and design analysis of alternate or optional duct systems.
- B. Coordination Drawings: Refer to article, SUBMITTALS, in Section 15500.

#### 1.05 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
- 1. A167-99(2009) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - 2. A653-09 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy coated (Galvannealed) by the Hot-Dip process.
  - 3. A1011-09a Standard Specification for Steel, Sheet and Strip, Hot rolled, Carbon, structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
  - 4. B209-07 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 5. C1071-05e1 Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

6. E84-09a Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. National Fire Protection Association (NFPA):
1. 90A-09 Standard for the Installation of Air Conditioning and Ventilating Systems.
  2. 96-08 Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
1. 2nd Edition – 2005 HVAC Duct Construction Standards, Metal and Flexible.
  2. 1st Edition - 1985 HVAC Air Duct Leakage Test Manual.
  3. 6th Edition – 2003 Fibrous Glass Duct Construction Standards.
- E. F. Underwriters Laboratories, Inc. (UL):
1. 181-08 Factory-Made Air Ducts and Air Connectors.
  2. 555-06 Standard for Fire Dampers.
  3. 555S-06 Standard for Smoke Dampers.

## PART 2 – PRODUCTS

### 2.01 MANUFACTURERS

- A. Spiral round duct: McGill Airflow
- B. Duct Connection Systems: Ductmate Industries
- C. Flexible Connections: Ventfabrics
- D. Flexible Ducts: ATCO Rubber Products, Inc.
- E. Duct Sealants: Foster
- F. Flexible Duct Clamps: ATCO Rubber Products
- G. Spin-in fittings: Buckley Associates, Inc.
- H. Duct Access Doors at ducts: Ventfabrics
- I. Duct Access Doors at plenums: Ventfabrics
- J. Multi-blade volume dampers: Ruskin

- K. Backdraft Dampers: Ruskin
- L. Damper Hardware: Young Regulator Company

## 2.02 DUCT MATERIALS AND SEALANTS

- A. General: Except for systems specified otherwise, construct ducts, casings, and accessories of galvanized sheet steel, ASTM A653, coating G90; or, aluminum sheet, ASTM B209, alloy 1100, 3003 or 5052.
- B. Specified Corrosion Resistant Systems: Stainless steel sheet, ASTM A167, Class 302 or 304, Condition A (annealed) Finish No. 4 for exposed ducts and Finish No. 2B for concealed duct or ducts located in mechanical rooms.
- C. Joint Sealing: Refer to SMACNA HVAC Duct Construction Standards, paragraph S1.9.
  - 1. Sealant: Elastomeric compound, gun or brush grade, maximum 25 flame spread and 50 smoke developed (dry state) compounded specifically for sealing ductwork as recommended by the manufacturer. Generally provide liquid sealant, with or without compatible tape, for low clearance slip joints and heavy, permanently elastic, mastic type where clearances are larger. Oil base caulking and glazing compounds are not acceptable because they do not retain elasticity and bond.
  - 2. Tape: Use only tape specifically designated by the sealant manufacturer and apply only over wet sealant. Pressure sensitive tape shall not be used on bare metal or on dry sealant.
  - 3. Gaskets in Flanged Joints: Soft neoprene.
- D. Approved factory made joints may be used.

## 2.03 DUCT CONSTRUCTION AND INSTALLATION

- A. Regardless of the pressure classifications outlined in the SMACNA Standards, fabricate and seal the ductwork in accordance with the following pressure classifications:
- B. Duct Pressure Classification:
  - 1. 2 inch
  - 2. > 2 inch to 3 inch
  - 3. > 3 inch to 4 inch
- C. Seal Class: All ductwork shall receive Class A Seal
- D. Casings and Plenums: Construct in accordance with SMACNA HVAC Duct Construction Standards Section 6, including curbs, access doors, pipe penetrations, eliminators and drain pans. Access doors shall be hollow metal, insulated, with latches and door pulls, 20

inches wide by 48 - 54 inches high. Provide view port in the doors where shown. Provide drain for outside air louver plenum. Outside air plenum shall have exterior insulation. Drain piping shall be routed to the nearest floor drain.

- E. Volume Dampers: Single blade or opposed blade, multi-louver type as detailed in SMACNA Standards. Refer to SMACNA Detail Figure 2-12 for Single Blade and Figure 2.13 for Multi-blade Volume Dampers.
- F. Duct Hangers and Supports: Refer to SMACNA Standards Section IV. Avoid use of trapeze hangers for round duct.

#### 2.04 DUCT LINER

- A. Duct sizes shown on drawings for lined duct are clear opening inside lining.
- B. Rectangular Duct or Casing Liner: ASTM C1071, Type I (flexible), or Type II (board), 25 mm (one inch) minimum thickness, applied with mechanical fasteners and 100 percent coverage of adhesive in conformance with SMACNA, Duct Liner Application Standard.
- C. Round and Oval Duct Liner: Factory fabricated double-walled with two inch thick sound insulation and inner perforated galvanized metal liner. Construction shall comply with flame and smoke rating required by NFPA 90A. Metal liner shall be 1.0 to 0.60 mm (20 to 24 gage) having perforations not exceeding 2.4 mm (3/32 inch) diameter and approximately 22 percent free area. Metal liner for fittings need not be perforated. Assemblies shall be complete with continuous sheet Mylar liner, 2 mil thickness, between the perforated liner and the insulation to prevent erosion of the insulation. Provide liner couplings/spacer for metal liner. At the end of insulated sections, provide insulation end fittings to reduce outer shell to liner size. Provide liner spacing/concentricity leaving airway unobstructed.

#### 2.05 DUCT ACCESS DOORS, PANELS AND SECTIONS

- A. Provide access doors, sized and located for maintenance work, upstream, in the following locations:
  - 1. Each duct mounted coil and humidifier.
  - 2. Each fire damper (for link service), smoke damper and automatic control damper.
  - 3. Each duct mounted smoke detector.
  - 4. For kitchen hood exhaust duct, locate access doors at 20 feet intervals and at each change in duct direction.
- B. Openings shall be as large as feasible in small ducts, 12 inch by 12 inch minimum where possible. Access sections in insulated ducts shall be double-wall, insulated. Transparent shatterproof covers are preferred for uninsulated ducts.



1. For rectangular ducts: Refer to SMACNA HVAC Duct Construction Standards (Figure 2-12).
2. For round and flat oval duct: Refer to SMACNA HVAC duct Construction Standards (Figure 2-11).

## 2.06 FLEXIBLE AIR DUCT

- A. General: Factory fabricated, complying with NFPA 90A for connectors not passing through floors of buildings. Flexible ducts shall not penetrate any fire or smoke barrier which is required to have a fire resistance rating of one hour or more. Flexible duct length shall not exceed 5 feet. Provide insulated acoustical air duct connectors in supply air duct systems and elsewhere as shown.
- B. Flexible ducts shall be listed by Underwriters Laboratories, Inc., complying with UL 181. Ducts larger than 8 inches in diameter shall be Class 1. Ducts 8 inches in diameter and smaller may be Class 1 or Class 2.
- C. Insulated Flexible Air Duct: Factory made including mineral fiber insulation with maximum C factor of 0.25 at 24 degrees C (75 degrees F) mean temperature, encased with a low permeability moisture barrier outer jacket, having a puncture resistance of not less than 50 Beach Units. Acoustic insertion loss shall not be less than 3 dB per foot of straight duct, at 500 Hz, based on 6 inch duct, of 2500 fpm.
- D. Application Criteria:
  1. Temperature range: -0 to 200 degrees F internal.
  2. Maximum working velocity: 4000 feet per minute.
  3. Minimum working pressure, inches of water gage: 10 inches positive, 2 inches negative.
- E. Duct Clamps: 100 percent nylon strap, 175 pounds minimum loop tensile strength manufactured for this purpose or stainless steel strap with cadmium plated worm gear tightening device. Apply clamps with sealant and as approved for UL 181, Class 1 installation.

## 2.07 FLEXIBLE DUCT CONNECTIONS

- A. Where duct connections are made to fans and air handling units, install a non-combustible flexible connection of 29 ounce neoprene coated fiberglass fabric approximately 6 inches wide. For connections exposed to sun and weather provide hypalon coating in lieu of neoprene. Burning characteristics shall conform to NFPA 90A. Securely fasten flexible connections to round ducts with stainless steel or zinc-coated iron draw bands with worm gear fastener. For rectangular connections, crimp fabric to sheet metal and fasten sheet metal to ducts by screws 2 inches on center. Fabric shall not be stressed other than by air pressure. Allow at least one inch slack to insure that no vibration is transmitted.

## 2.08 PREFABRICATED ROOF CURBS

- A. Galvanized steel or extruded aluminum 12 inches above finish roof service, continuous welded corner seams, treated wood nailer, 1-1/2 inch thick, 3 pound/cubic feet density rigid mineral fiberboard insulation with metal liner, built-in cant strip (except for gypsum or tectum decks). For surface insulated roof deck, provide raised cant strip (recessed mounting flange) to start at the upper surface of the insulation. Curbs shall be constructed for pitched roof or ridge mounting as required to keep top of curb level.

## 2.09 TURNING VANES

- A. Galvanized steel constructed per SMACNA HVAC Duct Construction Standards for:
  - 1. Single wall vanes with 3/4 inch trailing edges (double wall vanes not acceptable).
  - 2. Provide separate equal size sections for vane length greater than those indicated in SMACNA where occurs.
  - 3. Vane runners shall be Type 1 or 2.
  - 4. Vane radius shall be 2 inch for duct widths up to 36 inches and 4-1/2" for larger ducts.
  - 5. Low pressure round duct take-off fittings in rectangular ductwork:
    - a. Factory fabricated spin-in fitting of die-formed galvanized steel with integral balancing damper (spring loaded with locking regulator) and sealed at both ends to prevent leakage. Use no scoops. Buckley Associates, Inc.

## PART 3 – EXECUTION

### 3.01 GENERAL INSTALLATION

- A. Fabricate and install ductwork and accessories in accordance with referenced SMACNA Standards:
  - 1. Drawings show the general layout of ductwork and accessories but do not show all required fittings and offsets that may be necessary to connect ducts to equipment, boxes, diffusers, grilles, etc., and to coordinate with other trades. Fabricate ductwork based on field measurements. Provide all necessary fittings and offsets at no additional cost to the owner. Coordinate with other trades for space available and relative location of HVAC equipment and accessories on ceiling grid. Duct sizes on the drawings are inside dimensions which shall be altered by Contractor to other dimensions with the same air handling characteristics where necessary to avoid interferences and clearance difficulties.
  - 2. Provide duct transitions, offsets and connections to dampers, coils, and other equipment in accordance with SMACNA Standards, Section II. Provide

streamliner, when an obstruction cannot be avoided and must be taken in by a duct. Repair galvanized areas with galvanizing repair compound.

3. Provide bolted construction and tie-rod reinforcement in accordance with SMACNA Standards.
  4. Construct casings, eliminators, and pipe penetrations in accordance with SMACNA Standards, Chapter 6. Design casing access doors to swing against air pressure so that pressure helps to maintain a tight seal.
- B. Install duct hangers and supports in accordance with SMACNA Standards, Chapter 4.
- C. Install fire dampers, smoke dampers and combination fire/smoke dampers in accordance with the manufacturer's instructions to conform to the installation used for the rating test. Install fire dampers, smoke dampers and combination fire/smoke dampers at locations indicated and where ducts penetrate fire rated and/or smoke rated walls, shafts and where required by the Resident Engineer. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges per UL and NFPA. Demonstrate re-setting of fire dampers and operation of smoke dampers to the Engineer.
- D. Seal openings around duct penetrations of floors and fire rated partitions with fire stop material as required by NFPA 90A.
- E. Flexible duct installation: Refer to SMACNA Standards, Chapter 3. Ducts shall be continuous, single pieces not over 5 feet long (NFPA 90A), as straight and short as feasible, adequately supported. Centerline radius of bends shall be not less than two duct diameters. Make connections with clamps as recommended by SMACNA. Clamp per SMACNA with one clamp on the core duct and one on the insulation jacket. Flexible ducts shall not penetrate floors, or any chase or partition designated as a fire or smoke barrier, including corridor partitions fire rated one hour or two hour. Support ducts SMACNA Standards.
- F. Where diffusers, registers and grilles cannot be installed to avoid seeing inside the duct, paint the inside of the duct with flat black paint to reduce visibility.
- G. Control Damper Installation:
1. Provide necessary blank-off plates required to install dampers that are smaller than duct size. Provide necessary transitions required to install dampers larger than duct size.
  2. Assemble multiple sections dampers with required interconnecting linkage and extend required number of shafts through duct for external mounting of damper motors.
  3. Provide necessary sheet metal baffle plates to eliminate stratification and provide air volumes specified. Locate baffles by experimentation, and affix and seal permanently in place, only after stratification problem has been eliminated.

4. Install all damper control/adjustment devices on stand-offs to allow complete coverage of insulation.
- H. Air Flow Measuring Devices (AFMD): Install units with minimum straight run distances, upstream and downstream as recommended by the manufacturer.
  - I. Low Pressure Duct Liner: Install in accordance with SMACNA, Duct Liner Application Standard.
  - J. Protection and Cleaning: Adequately protect equipment and materials against physical damage. Place equipment in first class operating condition, or return to source of supply for repair or replacement, as determined by Resident Engineer. Protect equipment and ducts during construction against entry of foreign matter to the inside and clean both inside and outside before operation and painting. When new ducts are connected to existing ductwork, clean both new and existing ductwork by mopping and vacuum cleaning inside and outside before operation.
  - K. Ducts exposed to the weather:
    1. Make ducts watertight with tops sloped to shed water. Standing pools of water on top of ducts shall not be allowed.
      - a. Arrange seams to not act as dams.
      - b. Place longitudinal seams at bottom of ducts.
      - c. Insure water runoff by sloping entire top of duct down toward sides.
      - d. Longitudinal seams and non-bolted joints shall be sealed with SMACNA approved duct sealant for both interior and exterior applications.
      - e. Bolted duct joints: Top of duct shall have a continuous metal cleat from corner to corner to provide a weather cap. The sides, end and bottom shall have intermediate 6" pieces of metal cleats so that any water can drain away.
  - L. Construct with gauges, joints, bracing, reinforcing, and other details per latest edition of the CMC, AHSRAE, SMACNA and NFPA. Comply with most stringent requirement. Provide ducts with CMC required gauges when penetrating rated construction.
  - M. Provide for duct rigidity by either beading at 12 inches on center, maximum, or crossbreaking outward in ducts with positive pressures and crossbreaking inward for ducts having negative pressures. The exception is for ducts exposed to weather which shall crossbreak outward on top of duct.
  - N. At exposed duct penetrations of walls, floors and ceilings provide sheet metal angle type escutcheons with no sharp corners or edges. For round ducts factory angle rings may be used.

- O. Frame, trim, caulk and seal all duct penetrations through acoustical walls and partitions.
- P. Tapers:
  - 1. Pitch sides of ducts in diverging or converging airflow with a maximum 1 to 4 taper. Abrupt bushing type fitting shall not be permitted.
- Q. Duct openings:
  - 1. Provide openings to accommodate instrumentation, thermometers, smoke detectors, controllers and miscellaneous components. Insert through airtight rubber grommets.
  - 2. Where openings are provided in insulated ductwork for insertion of instruments install insulation material inside metal ring for use as a plug.
  - 3. At fire dampers allow adequate length of duct to install access door.
- R. No exposed sharp metal shall be allowed.
  - 1. All exposed pins, screws and sharp objects shall be covered with hardening silicon.
  - 2. All exposed sheet metal edges shall be hemmed with exposed corners rounded smooth.
  - 3. Remove all sheet metal fish hooks.
- S. Flexible duct connectors:
  - 1. Install at connections to fans and air handling units and where indicated on the drawings.
  - 2. Install with 2 inches of slack fabric to allow a minimum movement of 1 inch in each direction.
- T. Elbows:
  - 1. Radius elbows shall have a centerline dimension not less than 1 duct width, unless otherwise noted.
  - 2. Where elbows with turning vanes are shown:
    - a. Install per SMACNA HVAC Duct Construction Standards
- U. Rectangular duct joints:
  - 1. In medium pressure ductwork transverse joints shall be Ductmate. In low pressure ductwork transverse joints shall be Ductmate except that slip and drive may be used at contractor's option for ducts less than 24 inches longest side.

2. Longitudinal seams shall be Pittsburgh type. Snaplock shall not be allowed.
- V. Horizontal supports shall be one or two piece clamp band straps or as otherwise detailed on the drawings with one support minimum per sections and additional as required to prevent sagging.
- W. Vertical supports shall consist of a pedestal at base of vertical or clamp bands with knee bracing or clamp bands with extended ends supported by floor.
- X. Connections to air distribution (grilles, registers and diffusers) shall be by full radius elbow or by a straight duct connection for one duct diameter or greater.
  1. Where space is tight use side inlet plenums (cans) fabricated of minimum 24 gauge galvanized sheet metal, at least as tall as the connecting duct, with turning vanes.
  2. Connections to air distribution shall be insulated just the same as for the ductwork.
  3. Connections to air outlets shall be sealed with duct sealant.
- Y. Duct hangers and supports
  1. Support horizontal ducts with hangers of size and spacing per SMACNA HVAC Duct Construction Standards with attachments to suit structure type and seismic restraints where required.
    - a. See Hangers and Supports Section 23 05 29 for attachments to structure.
  2. Horizontal supports:
    - a. Install hangers at each change in direction of duct.
    - b. Strap hangers:
      - c. Install in pairs on each side of duct, in symmetry, and extend down each side with turn in on bottom of min 2 inches. Metal screw hangers to ducts on bottom, upper and lower sides and no less than 12 inches on center.
    - d. Angle hangers:
      1. Provide angle hangers formed by extended vertical bracing angles or by rods connecting to bottom angles if size or bracing angles conform to SMACNA schedules.
    - e. Vertical supports:

1. Support vertical ducts at every floor with angles or channels riveted to ducts. Set angles or channels on floor slab or structural steel members.
- Z. Volume and Dampers shall be provided at locations shown on the drawings.
  1. Volume dampers shall be installed as far away from air outlets as functionally reasonable to avoid noise in the occupied spaces.
  2. Provide also in wyes and spin-ins to outlets whether shown on drawings or not, except:
    - a. Where dampers are not shown above inaccessible ceilings.
    - b. To sidewall outlets in exposed ducts (opposed blade dampers in outlets shall be provided).

### 3.02 DUCT LEAKAGE TESTS AND REPAIR

- A. Ductwork leakage testing shall be performed by the Testing and Balancing Contractor directly contracted by the General Contractor and independent of the Sheet Metal Contractor.
- B. Ductwork leakage testing shall be performed for the entire air distribution system (including all supply, return, exhaust and relief ductwork), section by section, including fans, coils and filter sections. Based upon satisfactory initial duct leakage test results, the scope of the testing may be reduced by the Engineer on ductwork constructed to the 2" WG duct pressure classification. In no case shall the leakage testing of ductwork constructed above the 2" WG duct pressure classification or ductwork located in shafts or other inaccessible areas be eliminated.
- C. Test procedure, apparatus and report shall conform to SMACNA Leakage Test manual. The maximum leakage rate allowed is 4 percent of the design air flow rate.
- D. All ductwork shall be leak tested first before enclosed in a shaft or covered in other inaccessible areas.
- E. All tests shall be performed in the presence of the Engineer and the Test and Balance agency. The Test and Balance agency shall measure and record duct leakage and report to the Resident Engineer and identify leakage source with excessive leakage.
- F. If any portion of the duct system tested fails to meet the permissible leakage level, the Contractor shall rectify sealing of ductwork to bring it into compliance and shall retest it until acceptable leakage is demonstrated to the Resident Engineer.
- G. All tests and necessary repairs shall be completed prior to insulation or concealment of ductwork.

- H. Make sure all openings used for testing flow and temperatures by TAB Contractor are sealed properly.

END OF SECTION



SECTION 15980  
DECENTRALIZED HVAC EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION

- A. This Section covers the furnishing and installation of Heating, Ventilating and Air Conditioning (HVAC) equipment as indicated on the contract drawings, schedules and as specified herein.
  - 1. SYSTEM TYPE #1
- B. All work of this section shall comply with Section 15500 GENERAL REQUIREMENTS - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC).
- C. Definitions:
  - 1. Energy Efficiency Ratio (EER): (Btu hour/Watt) is equal to the measured cooling capacity of the unit by its electrical input.
  - 2. Unitary (ARI): A Unitary Air Conditioner consists of one or more factory-made assemblies which normally include an evaporator or cooling coil, a compressor and condenser combination, and may include a heating function as well. Where such equipment is provided in more than one assembly the separated assemblies are to be designed to be used together and the requirements of rating are based upon use of matched assemblies.

1.02 QUALITY ASSURANCE

- A. Safety Standards: ASHRAE Standard 15, Safety Code for Mechanical Refrigeration.

1.03 SUBMITTALS

- A. Manufacturer's literature and data:
  - 1. Sufficient information, including capacities, pressure drops and piping connections clearly presented, shall be included to determine compliance with drawings and specifications for units noted below:
    - a. Unitary air conditioners:
      - 1. Self-contained units
      - 2. Split systems
      - 3. Rooftop units

- b. Window air conditioners
  - c. Through-the-wall units
- 2. Unit Dimensions required clearances, operating weights accessories and start-up instructions.
- 3. Electrical requirements, wiring diagrams, interlocking and control wiring showing factory installed and portions to be field installed.
- 4. Mounting and flashing of the roof curb to the roofing structure with coordinating requirements for the roof membrane system.
- B. Certification: Submit proof of specified ARI Certification.
- C. Performance Rating: Submit catalog selection data showing equipment ratings and compliance with required sensible-to-heat-ratio, energy efficiency ratio (EER), and coefficient of performance (COP).
- D. Operating and Maintenance Manual: Submit three copies of Operating and Maintenance manual to Resident Engineer three weeks prior to final inspection.

#### 1.04 APPLICABLE PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

- A. Air-Conditioning and Refrigeration Institute (ARI):
  - 1. 210/240-06 Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment
  - 2. 270-95 Sound Rating of Outdoor Unitary Equipment
  - 3. 310/380-04 Standard for Packaged Terminal Air-Conditioners and Heat Pumps (CSA-C744-04)
  - 4. 340/360-04 Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment
  - 5. 520-04 Positive Displacement Condensing Units
- B. Air Movement and Control Association (AMCA):
  - 1. 210-99 Laboratory Methods of Testing Fans for Aerodynamic Performance Rating (ANSI)
  - 2. 410-96 Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans

- C. American National Standards Institute (ANSI):
  - 1. S12.51-02 Acoustics - Determination of Sound Power Levels of Noise Sources Using Sound Pressure - Precision Method for Reverberation Rooms (same as ISO 3741:1999)
- D. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
  - 1. 2004 Handbook HVAC Systems and Equipment
  - 2. 15-04 Safety Standard for Refrigeration Systems (ANSI)
- E. American Society of Testing and Materials (ASTM):
  - 1. B117-03 Standard Practice for Operating Salt Spray (Fog) Apparatus
- F. National Fire Protection Association (NFPA) Publications:
  - 1. 90A-02 Standard for the Installation of Air-Conditioning and Ventilating Systems

## PART 2 – PRODUCTS

2.01 See equipment schedules on M1.2 for list of equipment

## PART 3 – EXECUTION

### 3.01 INSTALLATION

- A. Roof Curb: Install where indicated on the Drawings, level and secure, according to ARI Guideline B. Secure rooftop units to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.
- B. Rooftop Unit Support: Install unit level on structural curbs, unless otherwise indicated on the Drawings. Coordinate wall penetrations and flashing with wall construction. Secure rooftop units to structural support with anchor bolts.
- C. Install units level and plumb maintaining manufacturer's recommended clearances and tolerances.
- D. Install water-cooled units with thermometer and pressure gage at the water supply and return connection.
- E. Install ground-mounting, compressor-condenser components on 4-inch thick, reinforced concrete base; 4 inches larger on each side than unit.
- F. Install seismic restraints.
- G. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

- H. Install wall sleeves in finished wall assembly and weatherproof. Install and anchor wall sleeves to withstand, without damage seismic forces as required by code.

### 3.02 CONNECTIONS

- A. Verify condensate drainage requirements.
- B. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain or as indicated on the Drawings.
- C. Install piping adjacent to units to allow service and maintenance.
- D. Install ducts to termination at top of roof curb. Cut roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
- E. Install return-air duct continuously through roof structure.
- F. Connect refrigerant piping to coils with shutoff valves on the suction and liquid lines at the coil and a union or flange at each connection at the coil and condenser.
- G. Install ducts to the units with flexible duct connections.

### 3.03 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections: After installing units and after electrical circuitry has been energized, test units for compliance with requirements. Inspect for and remove shipping bolts, blocks, and tie-down straps. After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 16010ELECTRICALPART 1 - GENERAL

## 1.01 SCOPE

- A. Perform electrical work written and/or drawn in the Contract Documents.
- B. The Contractor shall furnish electrical materials necessary to complete the work. He shall provide required labor, transportation, equipment or services necessary to complete the work. When the work is finished, new and existing systems and equipment affected by this work shall be complete and operable to the satisfaction of the Engineer .

## 1.02 DEFINITIONS

- A. Bidders: Bidders are persons or firms who submit a proposal for a prime contract with the owner, as distinct from a sub-bidder who submits a bid to a prime bidder. Bidders are seeking to become the contractor.
- B. Bid Proposal: A bid proposal is submitted by a bidder as his offer to do the work in the contract documents. When equipment is specified by brand name and number, substitutions shall not be used as the basis for formulating a cost to do the work. The bidder may offer costs for substitutions as an option, but the proposal must be based on the contract documents. Options shall be clearly indicated as options, and their cost shall be separately indicated.
- C. Complete: Means that parts, labor, connections and procedures necessary to make systems or equipment ready for operation as intended by the Engineer and/or the manufacturer of the system or equipment to be furnished.
- D. Contract Documents:
  - 1. The Contract Documents are the drawings and specifications of participating divisions which are mutually accepted by the owner and the contractor, when the contract is awarded, as the documents to be used for doing this work. They shall also include vendor drawings for this work and applicable standard published codes, rules and procedures which are being enforced by agencies having jurisdiction on this project.
  - 2. Refer to the drawings and specifications of participating divisions of the contract documents for additional work and responsibilities which may be part of the electrical work. Electrical work is not necessarily limited to what is shown on the electrical documents. If other divisions specifically indicate certain work to be performed by the electrical section, it shall be done by the electrical section.
- E. Contractor: The term contractor in this specification means the person, Company or Corporation who enters into the primary contractual agreement with the owner to do the work in the Contract Documents. If the owner elects to oversee the project in the position normally held by a Contractor, then he shall be considered as the Contractor. Nothing in this division shall be interpreted as relieving the contractor from his responsibility for completion of electrical work in the contract documents. The contractor is responsible for completion of the work even though he may engage the services of subcontractors to do the actual work.
- F. Control Circuits: Circuits, of any voltage, which regulate or guide the operation of motorized or electrified equipment, apparatus or a system.

- G. Demolition: Means to remove and dispose of existing electrical equipment and related circuits, raceways and supporting apparatus that are either replaced by new equipment or have no further use because of this work. Disposal shall be done in an approved manner.
- H. Diagrammatic: A general illustration which is not intended to indicate precise locations, unless specific dimensions are noted. Equipment locations are to be as close as possible to where they are shown, but actual locations must be coordinated with other equipment and architectural or structural items.
- I. Distribution Panelboard: A panelboard which can be wall mounted or floor standing such as a Square D I-Line or QED-2 type. These panels are not intended for service entrance unless indicated for that purpose in the contract documents. They are generally used as an intermediate means of distribution between switchboards and motor control centers or lighting panelboards.
- J. Finished Areas: Interior areas of buildings, except shafts, plenums, mechanical and electrical rooms and similar rooms containing fixed machinery or equipment such as a shop or garage.
- K. Furnish: Means to furnish, install and connect, unless otherwise noted.
- L. Lighting Panelboard: A panelboard containing a maximum of 42 branch circuit breakers or circuit breaker spaces per compartment. This type of panelboard is generally wall mounted with dimensions not exceeding 20 inches in width per compartment such as a Square D NQOD or NEHB type. These panelboards are not limited to serving lighting loads. Branch circuit breakers generally do not exceed 100 amperes. These panelboards may contain multiple compartments if more than 42 circuits are required.
- M. Major Material: Includes switchboards, distribution panelboards, lighting panelboards, transformers, motor control centers, lighting fixtures, conductors rated above 600 volts, generator sets, by-pass/transfer switches, fuel day tanks, bus duct, cable trays, ground fault equipment, motor starters, electrical equipment rated above 600 volts or other equipment specifically noted as requiring a submittal for review.
- N. Manufacturer's Representative: A manufacturer's representative is a person who is either employed directly by the manufacturer of the item or system in question, or he is duly authorized by the manufacturer to be his agent. In either case, he shall be thoroughly trained in the technical skills required to set up and maintain the equipment. He shall also be able to test equipment and resolve questions and disputes arising from the use of the item or system to the ('s)(Engineer's) satisfaction.
- O. Masculine Forms: When masculine forms of language are used in this specification, it shall be understood that they include their feminine opposites when applicable.
- P. Operational: Means equipment and systems are ready to perform in the manner intended by the manufacturer of said equipment or systems to the ('s)(Engineer's) satisfaction.
- Q. Owner: Means the person, Facility, Institution, Company, Corporation or Government Agency, or their Authorized Agent who enters into the primary contractual agreement with the contractor for this work.
- R. Pre-Purchased Electrical Equipment: Equipment which is purchased by the Owner, independent of the Contractor. When so directed by the Contract Documents the Contractor shall install and connect this equipment. He shall provide parts not included with this equipment which are necessary for it to be electrically complete and operational.

- S. Provide: Means to furnish, install and connect, unless otherwise noted.
  - T. Raceways: Steel conduit, electrical metallic tubing, flexible conduit, non-metallic conduit and similar materials shall be considered as raceways.
  - U. Serviceable: Means in useful condition.
  - V. Shop Drawings/Submittals: Means catalog information or custom drawings containing information that will enable Engineer to completely review proposed major material.
  - W. Subcontractor: The term subcontractor in this division means a person or firm who enters into a subcontract agreement with the contractor to do certain portions of the work contained in the Contract Documents. A person or firm who enters into a subcontract agreement with a subcontractor is also a subcontractor.
  - X. Substitutions: A substitution is any equipment which is proposed to be used in lieu of equipment which is specified in the contract documents by means of a manufacturer's name and catalog number.
  - Y. Switchboard: A floor standing, 90-inch high enclosure for electrical devices with utility company metering. It generally contains main overcurrent protection and distribution overcurrent devices. Switchboards are generally used as service entrance equipment.
- 1.03 EXAMINATION OF EXISTING CONDITIONS
- A. It is mandatory that bidders for this work examine existing conditions at the site prior to submitting a bid proposal. Bidders shall thoroughly understand existing conditions which could affect this work and have a clear understanding of how they would do the work. If necessary, bidders shall open and examine the existing electrical equipment to see what is there, and understand how it will be changed. They shall investigate existing building conditions to understand how they would install raceways and equipment. They shall be familiar with existing structural conditions and other obstacles which could affect this work. They shall ask questions and investigate systems to whatever extent is required to formulate an accurate proposal which covers the scope of work.
- 1.04 SUBMISSION OF BID PROPOSAL
- A. Submission of a bid proposal by a bidder shall mean that he has reviewed the Contract Documents and has visited the site to examine existing conditions. It shall also mean that he has a thorough understanding of how he would accomplish the work and has included all costs for material, labor, special equipment, and overtime in his proposal to do the work as specified in the Contract Documents. Bidders are expected to base their bids per the Contract Documents. Do not base bids on substitutions or an alternate method of completing the work. The bidder's assumptions that alternate methods used in their bids will be acceptable to the Architect will not be grounds for additional money if they are subsequently rejected. No extra costs shall be allowed for this work, unless authorized in writing by the Architect.
- 1.05 CONTRACT DOCUMENT REVIEW
- A. Real or suspected conflicts between various divisions of the Contract Documents, and discrepancies within this division shall be reported to the Architect for a corrective decision before starting work. Do not order or install equipment affected by conflicting information. Do not make an independent decision without the (Architect's) ('s) knowledge when conflicting information exists.

- B. Items not specifically mentioned in the Contract Documents, but which are necessary to make a complete and operational installation shall be included.
- C. The Drawings are diagrammatic and shall not be scaled to determine exact equipment locations or raceway distances. They shall be followed as closely as actual construction and the work of other trades will permit. Coordination with other trades on this project is required.

#### 1.06 SUBMITTALS

- A. Preliminary Submittal: Within 30 days after award of the Contract and before any of the materials of this section are delivered to the job site, submit 5 copies of catalog cuts, catalog numbers or descriptions, approximate external dimensions, and other general information to identify the equipment. This information will enable the Engineer to review the submittal for general conformance with the contract documents.
- B. Shop Drawings: Within 90 days after the award of the Contract and before any of the materials of this Section are delivered to the job site, submit 5 copies of complete Shop Drawings to the Architect. The Shop Drawings shall include layouts, elevations, details, and material lists for equipment and other descriptive data necessary to fully describe the equipment specified under this Section.

#### 1.07 OPERATING AND MAINTENANCE DATA

- A. Data shall be submitted to the Owner prior to acceptance of the installation, complete and at one time. Partial or separate data will not be accepted. Data shall consist of the following minimum submissions:
  - 1. Manufacturer's Literature: Three (3) copies of manufacturer's instructions for operation and maintenance of all electrical equipment, including replacement parts list.
  - 2. Written Instruction: Typewritten instructions for operation and maintenance of the system composed of Operating Instructions and Maintenance Instructions. Three (3) copies submitted to the Owner for approval.
    - a. Operating Instructions: A brief description of the system indicating proper setting of switches and other equipment, furnished for the purpose of providing control of the system and its components by the operator. Adjustments requiring the technical knowledge of the service agency personnel shall not be included in the operating instructions.
    - b. Maintenance instruction: A list of each item of electrical equipment requiring inspections, cleaning or services, describing the performance of such maintenance.
  - 3. Verbal Instructions: Upon completion of the work, and at a time designated by the Owner, the Contractor shall instruct the Owner's representative in the operation and maintenance of the equipment installed by the Contractor.
  - 4. Binders: Three (3) complete sets of the above data in loose-leaf ring binders with permanent covers with permanent identification on back and index.

#### 1.08 GUARANTEES

- A. Material furnished and installed to do this work shall be new and without defects. The work and materials shall be guaranteed for a period of one (1) year from the date of acceptance of the work. If any trouble, related to this project, should develop during this period due to defective materials or faulty workmanship, the Contractor shall furnish materials and labor required to correct the trouble at his own expense and at no cost to anyone else. Defective materials or inferior workmanship shall be corrected immediately to the complete satisfaction of the Engineer.

#### 1.09 SCHEDULING THE WORK IN AREAS TO BE REMODELED



- A. The Contractor shall submit his schedule of how the work will progress before he begins. His scheduling shall accommodate the Owner's activities and procedures. The schedule shall show how he plans to perform changeovers one system at a time, if necessary, from the old systems to new systems and how he will keep the systems in operation during these changeovers. This work shall be accomplished at night or on weekends, if necessary, or whenever it does not interfere with Owner's activities and procedures. The schedule shall be approved by the (Owner) Architect before the work begins.
- B. No system shall be shutdown, transferred to temporary power or made inoperable by the Contractor without specific written approval of the Owner or his Representative.
- C. Temporary power shall be provided by the contractor for systems that cannot afford to be without power when an interruption is necessary. Temporary power shall be adequate for the duration and electrical requirements of the task. Shutdowns and temporary power hook-ups shall not be attempted until all parts, equipment, and labor is readily available at the site to do the specific task. Shutdown time shall be held to the time required to do the specific task. In other words, don't start a task of this type and leave it interrupted until the next day of work or until the parts arrive at the site.

#### 1.10 MATERIALS & SUBSTITUTIONS

- A. Material Substitutions: Materials furnished shall be listed by Underwriters' Laboratories (UL). Certain materials have been specified by brand name for the purpose of establishing a standard of quality, performance and appearance. The Contractor shall use specified materials whenever possible, unless there is clearly a good reason to substitute.
- B. Contractor shall understand that the design reflects the approximate dimensions of specified equipment. Alterations to the building or field modifications to substituted equipment to make it fit the space allowed for the specified equipment will not be permitted. Field modifications which would void the manufacturer's UL or NEMA labels will not be permitted. Proposed modifications of any type must be reviewed with the Architect before they are started.
- C. Submittals shall include specific original catalog engineering data sheets or drawings applicable specifically to the item being proposed. Data shall clearly describe the material's performance characteristics, photometric information (if applicable), construction details, efficiency, visual appearance, dimensions, warranty, manufacturer's experience and ability to provide fast, efficient and local service.
- D. The burden of proof of equality or superiority of the substitution shall be upon the contractor.
- E. Incomplete, illegible, inaccurate data or information not specifically pertinent to the material being considered for substitution will be rejected.
- F. A unit cost for each substitution being considered shall be included. If a cost savings will be realized by using the substitution instead of the specified item, a credit equal to the difference shall be due to the Owner, if the substitution is allowed.
- G. Failure to allow sufficient time for the manufacturer to fabricate or deliver the specified materials to the job site under normal working conditions or within a reasonable time period may not be an acceptable reason to substitute.
- H. Substitutions which require the Engineer to do additional design, field work, or coordination between parties involved with the change in equipment shall be cause for additional compensation from the contractor at the standard office rates of the firm(s) required to do the work.

- I. Additional costs, whether architectural, structural, mechanical, electrical or any other system, caused by the substitution of materials, equipment or the installation thereof shall be the burden of the contractor or his subcontractors who do the substituting. Such costs shall not be passed on to anyone else, unless written permission to the contrary is specifically given for each incident by the Architect.

#### 1.11 PERMITS AND INSPECTIONS

- A. The Contractor shall obtain and pay for required permits and arrange for inspections required to execution of the work under this contract.

#### 1.12 LAWS, ORDINANCES, REGULATIONS, AND CODES

- A. Applicable laws, ordinances and regulations shall be considered as part of the Contract Documents. Work shall be performed in accordance with the latest requirements adopted by agencies and authorities having jurisdiction over this project. These may include, but not be limited to:

1. California Code of Regulations Title 8
2. California Code of Regulations Title 19
3. California Code of Regulations Title 22
4. California Code of Regulations Title 23
5. California Code of Regulations Title 24
6. California Electric Code, Part 3 (CEC)
7. California Building Code, Part 2 (CBC)
8. California Fire Code, Part 9 (CFC)
9. California Mechanical Code, Part 4 (CMC)
10. California Plumbing Code (CPC)
11. National Fire Protection Association (NFPA) Standards
12. OSHA and CAL-OSHA
13. California State Fire Marshal
14. Underwriters Laboratories (UL)
15. National Electrical Manufacturers Association (NEMA)
16. Office of Statewide Health Planning and Development (OSHPD)
17. OSHPD Fire Marshal
18. Institute of Electrical and Electronic Engineers (IEEE)
19. American National Standards Institute (ANSI)
20. American Society for Testing Materials (ASTM)
21. Division of the State Architect (DSA)

#### 1.13 AS-BUILT DRAWINGS

- A. The Contractor shall maintain a daily record of the electrical work as it progresses. Upon completion of this project, changes, additions or deletions from the bid documents, which he has performed, shall be recorded on a clean, unmutilated set of transparencies. Said items must be clear, legible and understandable by the Architect. They shall accurately illustrate the electrical system as it was installed. Accuracy and completeness are mandatory prior to acceptance of the work by the Architect .

#### 1.14 WORK INCLUDED

- A. Perform all electrical work covered by the Contract Documents.

#### 1.15 WORK NOT INCLUDED

- A. Furnishing control circuits, their raceways and specific devices such as starters, relays, etc. for any equipment, unless otherwise specifically noted in this division or other divisions to be furnished by the electrical division.
- 1.16 DEPARTURES FROM PLANS
- A. No departures from contract documents shall be permitted without written approval of the Architect.
  - B. Approved departures which require additional drawings, job site inspections or publications from the Architect shall be billable at standard hourly rates and/or material costs of the Architect to the initiator of the departure.
  - C. No person, except the Architect, shall direct the Contractor to make changes, additions or deletions from the contract documents.
- 1.17 EXISTING EQUIPMENT DISPOSAL
- A. Existing electrical equipment which is removed due to demolition and is not to be reinstalled shall be disposed of by the Contractor in a manner approved by authorities having such jurisdiction. The Contractor shall verify that the Owner does not want to retain any of this equipment prior to destroying it and hauling it away.
- 1.18 EXISTING UTILITIES
- A. The Contractor shall investigate and determine the locations of existing utilities that may be affected by this work. He shall take all reasonable precautions to avoid damage or interruptions to these systems. If damage or interruptions do occur due to this work they shall be repaired as directed by the Architect. The Contractor shall pay for costs resulting from said damage and interruptions.
- 1.19 MATERIAL PURCHASES
- A. No materials shall be ordered or purchased for this project until the Contract Documents have been approved by all authorities governing this work.

## PART 2 - PRODUCTS

- 2.01 Components installed in factory-assembled switchboards, panelboards, motor control centers and similar types of equipment shall be standard items listed in the published catalog of the equipment manufacturer. For example; General Electric shall utilize General Electric components. Do not mix components of different companies to assemble equipment, unless approval has been obtained prior to fabrication of the equipment.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Carefully investigate work to be accomplished by other trades prior to doing work in this division. Review the submittals of other divisions for related work and verify that work in this division can be properly installed.
- B. Good workmanship shall be evidenced in the installation of all electrical materials and equipment. Equipment shall be level, plumb and true with the structure and other equipment;

also in a horizontal or vertical position as intended. All materials shall be firmly secured in place and adequately supported and permanent. Materials embedded in concrete or masonry or otherwise part of the structure are considered sufficiently supported. All hardware and accessory fittings shall be of a type designed, intended and appropriate for the use and complement the items with which they are used.

- C. All materials and equipment including any hangers, supports, fastenings or accessory fittings shall have corrosion protection suitable for the atmosphere in which they are installed whether located indoors or outdoors. Care shall be taken during the installation to assure the integrity of corrosion protection.
- D. All screws, bolts, nuts, clamps, fittings or other fastening devices shall be made up tight. All bolts, screws, nuts and other threaded devices shall have standard threads and heads so they may be installed and replaced when necessary without special tools.
- E. All anchors and fasteners shall be of a type designed for the purpose and capable of adequately and safely securing the material. Selection shall be based on the amount and type of load, base material, safe working load and atmosphere.
- F. In addition to the weight of the material consideration shall also be given to vibration, such as with motors or fans; variable loading resulting from internal or external forces, such as operation of safety switches or circuit breakers; and shock load, when such is possible.
- G. The anchor or fastener used shall be of a type designed and intended for use in the base material to which the material or support is to be attached. Generally, screws are used on wood, masonry anchors on concrete or brick, toggle bolts or similar on hollow walls, machine screws, bolts or welded studs on steel. Nails are normally used only for temporary support or for light loads in wood frame construction.
- H. To assure adequacy and safety, consideration must be given to the rated holding power of the anchors or fastening devices used and recognized safety factors. Rated holding power may vary depending upon the base material in which the device is used.
- I. Permanence and good appearance, a part of good workmanship, require that consideration be given to the type of atmosphere surrounding anchors and fasteners. Anchors and fasteners shall be non-corrosive or have suitable corrosive resisting coatings or treatment. Weather conditions must be considered for outdoor locations but there are also indoor locations that may be wet or damp. Fumes from industrial processing also may cause corrosive atmospheres. The possibility of corrosion due to dissimilar metals must also be a consideration.
- J. Hangers and supports shall be used to properly and firmly support electrical materials or equipment in a safe and permanent manner. They may be catalog items or fabricated in the shop or on the job site. They shall be of a type designed or appropriate for the purpose, have a neat and finished appearance and complement the installation.
- K. Job fabricated hangers and supports shall be made from standard structural shapes and hardware or systems of shapes, fittings and hardware designed for the purpose. All bolts, screws, nuts and other threaded devices shall have standard threads and heads so that they do not require special tools and may be readily replaced when necessary. All threads shall be fully engaged and all parts made up tight.
- L. The selection of hangers and supports shall be based upon the following criteria:
  - 1. Amount and type of load.
  - 2. Safe working load.
  - 3. Atmosphere.

- M. The weight of the hanger or support must be considered as part of the total load. The total load also includes the materials within an enclosure. For example, the weights of the conductors in a raceway or junction or pull box shall be added to the load of the raceway or box. External forces such as vibration, operation of equipment such as switch handles or possible shock load also shall be considered. Safe working load shall be determined by applying recognized safety factors to the rated strength of the complete assembly and shall be based on the weakest component member.
- N. Hangers and supports, whether catalog items or job fabricated, shall have corrosion protection suitable for the atmosphere in which they are installed either indoors or outdoors. This corrosion protection applies to all components of the assembly. Care must be taken to prevent corrosion that might result from the use of dissimilar metals in damp or wet locations.
- O. Hangers and supports shall be adequately and safely attached to the building structure or structural member.
- P. The equipment or materials to be supported shall be securely fastened to the supporting means with material suitable for the purpose.

### 3.02 TESTS

- A. A final overall test of the complete electrical system will be required after completion of the tests specified in each Section of Division 16. The Contractor shall notify the Architect when he is ready to make the test and describe the test procedure.
- B. Upon approval of the test procedure and at a time designated by the Architect, the operating test shall be conducted to demonstrate to the satisfaction of the Architect that the complete system operates in accordance with the Contract Documents.
- C. Equipment malfunctions or deviations in performance discovered during the test or thereafter shall be corrected to the satisfaction of the Architect. The test shall be repeated in total until it is satisfactory.

**\*\*END OF SECTION 16010\*\***

SECTION 16120

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope: The Contractor shall furnish conductors providing power for feeders and branch circuits at less than 600 volts, unless noted otherwise on the Drawings or in the Specifications.

1.02 QUALITY ASSURANCE

- A. Standards: Conductors shall conform to applicable requirements of:
1. The Underwriter's Laboratories, Inc. (UL).
  2. The American National Standards Institute (ANSI).
  3. The National Electrical Manufacturer's Association (NEMA).
  4. Federal Specifications.
  5. Insulated Cable Engineers Association (ICEA).

1.03 PRODUCT HANDLING

- A. In the event of conductor damage, the Contractor shall make the necessary replacement. Repairs which would result in "in conduit" splices will not be allowed.

PART 2 - PRODUCTS

2.01 CONDUCTORS (600 VOLTS AND BELOW)

- A. Wire and cable shall be new and shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on outer covering at regular intervals. Wire and cable shall be factory color-coded by integral pigmentation.
- B. Wire shall conform to UL 83 and ANSI C33.8 standards, Federal Specifications JC 30A. Use THHN type of insulation on feeders and branch circuits, unless a different type of insulation is required by the CEC or an agency having jurisdiction over this work.
- C. The copper conductor shall have a 90 percent minimum conductivity and shall be stranded, unless otherwise noted. Minimum wire size shall be No 12 AWG, unless noted otherwise.
- D. Conductors shall be factory color coded as per NEMA WC05 and/or ICEA Publications S-61-420 Standards.
- E. Bare ground conductors shall meet Federal Specification QQ-W-343.
- F. Aluminum wire is not acceptable for this work.
- G. Non-metallic sheathed cable may be used in areas permitted by the CEC, if approved by the local inspector and not prohibited by other parts of the specifications.

## 2.02 TERMINATIONS

- A. Terminations shall conform to the following specifications:
  - 1. Electrical spring steel connectors with UL approved insulating caps shall be used on #10 AWG and smaller stranded or solid copper conductors where splicing is required.
  - 2. Ring or fork type copper terminators with application by a special crimping tool shall be used on #10 AWG and smaller conductors for terminating, except when terminated into circuit breakers or wiring devices with built-in spring clips.
  - 3. For conductors #8 AWG and larger, all splices and/or terminations shall be solderless long barrel color keyed compression types for application with a hydraulic tool.
  - 4. Connectors shall be certified as meeting UL 486 cycling test requirements.
  - 5. Wire markers shall be White PVC tubular type with black letter and/or numbers with an internal oval shaped wire gripper.
  - 6. Insulated tape shall conform to UL 510 and ANSI C33.74 standards.

## PART 3 - EXECUTION

### 3.01 INSTALLATION OF CONDUCTORS

- A. Conductors shall not be subjected to pulling tensions in excess of manufacturer's recommendations.
- B. Conductors shall be continuous from point to point. No splices shall be permitted, except in splice boxes or enclosures approved for this purpose.
- C. Raceways shall be dry and thoroughly cleaned prior to installation of conductors.
- D. Conductors shall be neatly arranged where terminated at equipment and/or panelboards so that a clamp-on ammeter can be easily inserted for load checks.
- E. Conductors shall be tagged at each end with tubular markers. A schedule shall be provided on the As-Built Drawings correlating the wire markings.
- F. Installation of the grounded (neutral) conductors shall comply with Article 200 and 210.5 of the CEC, except that insulation is required on the conductor.
- G. Installation and connection of equipment grounding conductors shall be per Article 210.5 and 250.1 of the CEC.
- H. Use THHN insulated conductors in all lighting and power circuit raceways per Table 310.16 of the CEC, unless otherwise noted.
- I. Conductors shall be rated for an ampacity equal to the overcurrent device that feeds them. It is not acceptable under any circumstances to remove strands of wire from stranded conductors to make them fit terminations. The use of correctly sized lugs shall be required.
- J. Conductor color coding shall conform to standards of the industry for the system voltage.
- K. Conductors terminated in equipment shall always be installed Phase A, Phase B and Phase C from left to right or top to bottom respectively.
- L. Conductors connected to circuit breakers, fused switches and bus bars in switchboards, panelboards, transformers, and motor control centers shall be readily identifiable at their

connection points using one half inch wide plastic tape in the color specified above for the applicable voltage and phase concerned.

- M. No conductor carrying 120 volts or more shall be smaller than #12 AWG.
- N. Non-metallic sheathed cable installed above ceilings shall be supported independent of the ceiling. Do not lay cable on the ceiling.
- O. Wire and cable shall be suitable for the temperature, conditions and location where it is installed. Accessory materials, such as connectors, splice and tap fittings and terminations shall be of a type designed or intended and suitable for the use. They shall be compatible with the conductor material.
- P. Wire and cables shall be installed so as not to damage the insulation or cable sheath. All conductors to be installed in a raceway shall be pulled together. They shall be trained and guided into the raceway using a pulling compound or lubricant when necessary. A means of communication between the pulling and guiding points shall be used to facilitate installation and to help prevent damage. The pulling means, fish tape, cable or rope, shall be of a type that will not damage the raceway.
- Q. Cables that are installed exposed shall be run parallel and perpendicular to the surface or exposed structural members and follow the surface contours as much as practical. Running boards shall be used where necessary to provide sufficient support and a neat installation. Care shall be taken to provide sufficient mechanical protection for exposed cables.
- R. All wires and cables, whether exposed, concealed or in raceways, shall be sufficiently supported using devices intended for the purpose when necessary. Conductors shall not be supported by their terminations.
- S. Conductor splices shall be kept to a minimum. Splices and taps shall have at least the equivalent mechanical strength and insulation as the conductors. Splice and tap devices shall be of the proper size and type for the use and compatible with the conductor material.
- T. The length of conductors within cabinets and cutout boxes shall be sufficient to neatly train the conductor to the terminal point with no excess. When there are many conductors, they shall be cabled or bundled.
- U. Terminations shall be made so that there is no bare conductor at the terminal. The conductor insulation shall bear against the terminal or connector shoulder.
- V. Conductors shall be identified with a means that is neat, legible and permanent. This may be by a clearly lettered or typed directory in panelboard cabinets or by use of tags, pressure sensitive tape or cable ties.

### 3.02 TESTING (600 VOLT OR LESS)

- A. Tests shall be conducted with a 500 volt megger with readings recorded after continuous voltage application of one minute. Values shall not run less than the following:
  - 1. No. 14 or No 12 AWG - 1 Megohm
  - 2. No. 10 thru No. 6 AWG - 1/4 Megohm
  - 3. No. 4 or No. 2 AWG - 50 K Ohms
  - 4. No 1/0 thru 4/0 AWG - 25 K Ohms
  - 5. 250 MCM thru 750 MCM - 12 K Ohms



- B. Tests conducted with a ground megger between the ground bus and absolute earth shall not produce resistance readings in excess of 5 Ohms.

**\*\*END OF SECTION 16120\*\***

SECTION 16130

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Furnish conduits, electrical metallic tubing and fittings for all power, lighting, mechanical equipment and signal systems shown on the Drawings and as specified herein, unless noted elsewhere in these specifications under "Work Not Included".
2. Furnish outlet boxes for wiring devices, lighting fixtures and other electrical equipment.
3. Furnish junction boxes and pullboxes as required for the consolidation of conduit runs and to aid in pulling in conductors.

1.2 QUALITY ASSURANCE

A. Standards: All conduit, tubing, and fittings shall conform to applicable requirements of:

1. The Underwriter's Laboratories, Inc. (UL)
2. Joint Industry Council Standards (JIC)
3. The American National Standards Institute (ANSI)
4. The National Electrical Manufacturer's Association (NEMA)
5. Federal Specifications
6. The serving utilities

1.3 PRODUCT HANDLING

- A. If any conduits or tubing are damaged, the Contractor shall make necessary repairs and replacements as directed by the Engineer. The Contractor shall bear any costs for this.

1.4 INTENT OF DRAWINGS

- A. Exact conduit and tubing locations are not shown unless specifically dimensioned or noted. One-line and riser diagrams are schematic and do not show physical arrangement of equipment, unless specifically noted.

PART 2 - PRODUCTS

2.1 CONDUITS AND TUBING

- A. Rigid Metallic Conduit (RMC): Shall be hot-dip galvanized steel including threads as per UL 6, Federal Specifications WWC-581-D and ANSI C80-1.
- B. Electrical Metallic Tubing (EMT): Shall be electrolytically galvanized steel per UL 797 and ANSI C33.98.
- C. Liquid Tite Flexible Metal Conduit: Shall be electrolytically galvanized steel per UL 1 and ANSI C33.92 and covered with polyvinyl chloride (PVC) to JIC requirements.
- D. Flexible Metal Conduit: Shall be electrolytically galvanized steel per UL 1 and ANSI C33.92.

- E. Rigid Nonmetallic Conduit (PVC) Schedule 40: Shall be polyvinyl chloride (PVC) as required per UL 651, Federal Specifications WC-1094A and NEMA Standards Publication No. TC2-1978.
- F. Rigid Nonmetallic Conduit (PVC) Schedule 80: Shall be polyvinyl chloride (PVC) as required by UL 651, Federal Specifications WC-1094A and NEMA Standards Publication No. TC2-1978.
- G. P & C Duct Type DB (for Direct Burial): Shall comply with NEMA Standard TC-8, DB-120/ASTM F512, heavy wall.
- H. P & C Duct Type EB (for Concrete Encased Installations): Shall comply with NEMA Standard TC-8, EB-35/ASTM F512, heavy wall.

## 2.2 FITTINGS

- A. General: Elbows, couplings, connectors and other fittings shall be of the same material as the conduit they are used with unless otherwise noted. They shall be manufactured in conformance with the standard for the conduit and/or per UL 514.
- B. Electrical Metallic Tubing Fittings: Couplings and insulated throat connectors shall be concrete tight compression type. Set screw fittings are not acceptable.
- C. Condulets: Shall be cast copper free aluminum and/or ferrous material with corrosion resistant finish per UL 514.

## 2.3 METAL OUTLET BOXES

- A. Outlet boxes shall be sized for the application. Boxes shall be equipped with plaster rings or covers when required. Units shall be pressed from galvanized steel. Gangable and through-wall types are not acceptable.
- B. Outlet boxes for wet and exposed locations shall be cast metal type FS units with gasketed covers.

## 2.4 METAL JUNCTION AND PULLBOXES

- A. Junction and pullboxes shall be fabricated from 16 gauge or heavier galvanized sheet steel with a grey enamel finish, except where mounting surfaces are a different color. Paint to match in those cases. Full access flush or surface screw covers shall be furnished as required. Cover retention shall be by corrosion resistant machine screws. Box size shall be per CEC Article 314.

# PART 3 - EXECUTION

## 3.1 INSTALLATION OF CONDUIT AND TUBING

- A. The following Raceways and Fitting Types shall be used in a particular area:
  - 1. Use electrical metallic tubing in interior dry locations whether exposed or concealed. Do not bury in the earth or install in or through concrete. Do not use in areas exposed to weather or subject to physical abuse.
  - 2. Use rigid metallic conduit for exterior exposed locations and for transitions from buried non-metallic conduits when they rise through concrete floors. Use when conduits are cast inside of concrete walls and floors. Use when penetrating concrete walls. Use in areas which may be subjected to high abuse. Use for penetrations through fire rated walls, floors, and ceilings. Conduit penetrations through fire rated walls, floors and ceilings shall be in accordance with U.L. approved systems made for this purpose.

3. Use rigid non-metallic Schedule 40 conduit for conduits buried in the earth. Buried conduit used for hospital work shall be one of the following types if an emergency system is involved:
    - a. Rigid galvanized steel conduit
    - b. PVC Schedule 40 encased in 2 inches of concrete
    - c. PVC Schedule 80 without concrete encasement.
  4. Use P & C type db duct for utility company services buried in the earth.
  5. Use flexible metal conduit for connections to recessed lighting fixtures in ceilings and roof overhangs. Use it for connections to vibrating equipment in interior dry, non-corrosive locations, except when a cord connection is specified.
  6. (Do not use flexible metal conduit, electrical non-metallic tubing, armored cable, metal clad cable, rigid non-metallic conduit, flexible metallic tubing or liquid tight flexible conduit for general wiring in the building.)
  7. (Flexible metal conduit, electrical non-metallic tubing, armored cable, metal clad cable, or flexible metallic tubing may be used on this project for general wiring if approved for the application by the CEC and local inspector.)
  8. Use liquidtight flexible metal conduit for connections to vibrating or moving equipment in wet and corrosive areas.
- B. Installation Methods:
1. Flexible metallic conduit shall have a minimum length of 18 inches. Maximum length shall not exceed 6 feet. Provide with a ground wire per CEC requirements. Minimum inside diameter shall be 1/2 inch.
  2. PVC Schedule 40 or 80 conduit shall be provided with expansion joints per manufacturer's recommendations. Bends 30 degrees or larger shall be factory fabricated. Small bends may be field formed with approved heating equipment. Joint solvent shall be applied only to conduit, not to fittings.
  3. Rigid metallic conduit in contact with the earth shall be assembled with red leaded joints and be wrapped with 10 mil tape and coated with No. 50 bitumastic compound.
  4. A minimum of 6-inches clearance shall be maintained between all electrical conduits and any piping, ducts or objects operating at temperatures over 86 degrees Fahrenheit.
  5. Only threaded fittings shall be used with rigid metallic conduit. Such fittings shall provide a minimum of 5 thread engagement. Field cut threads shall be coated with zinc rich paint.
  6. Install conduit per CEC and conceal wherever possible and/or practical. Rigid metal conduit and EMT, installed exposed shall be mounted on supports spaced as required by the CEC. Runs shall be parallel or perpendicular to walls, ceilings, or structural members.
  7. Supports for conduit shall be fastened by wood screws on wood, toggle bolts on hollow masonry, machine screws on metal, expansion shields on concrete or brick. Wooden plugs, fiber or plastic inserts, or nails are not acceptable.
  8. Direct buried conduits shall not be smaller than 3/4", but shall conform to the sizes and capacities given in the CEC. Underground conduit shall be permanently identified at each end with permanent PVC markers readily visible from above grade.
  9. Underground conduit work shall be coordinated with other underground construction work. Duct banks shall not be installed in fill areas until finish grade is established and 90 percent compaction achieved. Backfilling of trench shall not be accomplished until conduit emplacement has been inspected by the Engineer. Trenches containing conduits shall be backfilled with compacted sand. The sand shall be flooded with water around the conduits so they are firmly supported by the sand. The conduits shall be installed in layers, where necessary, and separated from other layers with 6" of flooded sand.
  10. Every conduit or tubing containing energized conductors and installed as part of this work shall contain a green insulated copper equipment grounding conductor sized in accordance with CEC. Under no circumstances shall conduits or tubing alone be used as an equipment ground conductor. If large conductors are used as equipment grounds and they

- are not available with green colored insulation, they shall be marked with green plastic tape at all terminations and pullboxes to identify them as grounding conductors.
11. Conduit or metallic tubing installed above wood framed ceilings and where trusses occur shall be firmly fastened to the wood framing or trusses.
  12. Conduit or metallic tubing installed above suspended ceilings shall be supported independently from the ceiling system in an approved manner to the building structure. Such conduits or tubing shall be installed in a manner that does not interfere with access to the space. Do not attach or support these conduits or tubing from the ceiling support system.
  13. Types of conduits or electrical metallic tubing to be installed through fire rated walls, floors or ceilings shall be determined by the UL system number of the fire rated sealant selected for the project. The instructions for a particular UL system number should specify what type of conduit can be used with the fire sealant to create an acceptable system. Do not assume that something will be acceptable; consult with the project inspector and the product installation instruction before doing the work. The hourly rating of the surface to be penetrated should determine the UL system to be used.
  14. Conduit and electrical metallic tubing in finished areas shall always be installed concealed from view in walls, above ceilings, or below floors. If there is insufficient space in ceilings, walls or floors to conceal conduit or electrical metallic tubing consult with the Engineer to determine an acceptable method of doing the work prior to doing it.
  15. Hangers and supports shall be of a type compatible with and suitable for the intended use. They may be catalog items or job fabricated. Consideration must be given to the weight of the enclosed conductors when selecting supports and fastening means. Care shall be taken to prevent the entrance of foreign matter into raceways and they shall be cleaned if necessary before pulling in conductors.
  16. Stub-ups shall be protected from damage and carefully re-bent when necessary. Bends and offsets shall be carefully made so that the inside diameter is not effectively reduced. Unless otherwise required, the legs of a bend shall be in the same plane, the straight legs of offsets are parallel.
  17. All raceway fittings shall be of a type compatible with the raceway and suitable for the use and location.
  18. Concealed raceways shall be run with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions.
  19. Raceways placed in slab construction shall occupy the middle third when practical and leave at least 3/4 inch concrete cover. They shall be tied to the reinforcing rods or otherwise supported when necessary to prevent sagging when concrete is poured. They shall be laterally spaced to allow complete coverage.
  20. Exposed raceways shall be run parallel and perpendicular to the surface or exposed structural members and follow the surface contours as much as practical to present a neat appearance.
  21. Exposed parallel or banked raceways shall be run together to provide a neat appearance. Bends in parallel or banked runs shall be made from the same center line so that the bends are parallel. Factory elbows in banked runs may be used when they can be installed parallel. This shall require that there be a change in the plane of the run such as from wall to ceiling and the raceways be of the same size. In other cases, parallel raceways shall be field bent.
  22. Raceways shall be joined with fittings designed for the purpose and shall be made tight. Where the installation situation is such that joints cannot be made tight, bonding jumpers shall be used to provide electrical continuity of the raceway system. Raceway terminations shall be made up tight. When terminations are subject to vibration, bonding bushings or wedges shall be used to assure electrical continuity. When subject to vibration or dampness, insulating bushing shall be used to protect the conductor.
  23. When raceways are terminated with locknuts and bushings, the raceway shall enter squarely and the locknuts shall be installed so that the dished part is against the box. Two

locknuts, one inside and the other outside the box, shall be used to facilitate the termination or to make it more secure when necessary.

24. When terminating in threaded hubs the raceway or fitting shall be screwed tight into the hub so that the end bears against the wire protection shoulder. When chase nipples are used, the raceway and coupling shall be square to the box and the chase nipple tightened with no exposed threads.

### 3.2 OUTLET BOXES

- A. Location of outlets shown is approximate. Exact location shall be verified on the job to avoid conflict with other work.
- B. Blanking covers shall be installed on unused openings.
- C. Boxes shall be securely set in place with appropriate fasteners.
- D. Boxes shall have sufficient volume per CEC Article 314 to accommodate conductors, and fittings if used.
- E. Outlet boxes shall be of a type appropriate for the use and location. They shall be securely and rigidly attached or supported plumb, level and true. Outlet box supports, hangers or brackets when used shall be of a type designed or suitable for the type of box used and the building structural member to which attached. In determining the type of support or fastener, consideration must be given to the load caused by any device or equipment, such as lighting fixtures, which are in turn supported by the outlet box.
- F. Outlet boxes and their covers shall have corrosion protection suitable for the atmosphere in which they are installed. Where necessary, gaskets shall be used to prevent the entrance of moisture. Outlet boxes shall be protected to prevent entrance of plaster, and debris shall be thoroughly cleaned from the box before the conductors are installed.
- G. Generally, outlet boxes for switches shall be mounted with the long axis vertical. Boxes for receptacles shall be mounted either vertically or horizontally but consistent either way. Three or more gang boxes shall be mounted with the long axis horizontal. The boxes shall be so located that the covers or device plates will not span different types of building finishes either vertically or horizontally. Boxes for switches near doors shall be located on the side opposite the hinge and close to the door trim.
- H. Covers for outlet boxes shall be of a type designed, intended and appropriate for the use and location and have suitable corrosion protection. Device plates shall not be used as covers for exposed installations.

### 3.3 JUNCTION AND PULLBOXES

- A. Junction and pull boxes shall be used where necessary to facilitate the installation of raceway and pulling of wire or cable. Consideration shall be given to the size and number of conductors, number of bends in the raceway, change in direction of the raceway or conductors and the need for support of conductors in vertical raceways. They shall be of a type intended or suitable for the use and location. They may be catalog items or custom designed and fabricated to meet the particular requirements.
- B. Junction and pull boxes including hinges or screws used to fasten the cover shall have corrosion protection suitable for the atmosphere in which they are installed.

- C. Junction and pull boxes shall be firmly and securely fastened to or supported from the building structure or structural member. In determining the type of fastener, hanger or support, consideration must be given to the load caused by any conductors supported by the box and any load that might be caused by external forces. Knockouts for raceways enclosing the same conductors shall be arranged to provide the longest sweep or radius for the conductors. See table for raceway spacings.
- D. Covers for large junction or pull boxes, larger than 6 square feet (864 square inches) should be sectionalized to facilitate removal and replacement. When the cover is sectionalized, cross bracing shall be provided to fasten the sections of the cover at the seams.
- E. Junction and pullboxes shall be readily accessible.
- F. Box dimensions shall be in accordance with size and quantity of conductors and conduits entering and leaving the box per CEC Article 314 requirements.
- G. Pullboxes shall be provided at least every 100 feet on straight conduit runs. If the run contains three or more 90 degree angle bends the distance between boxes shall be reduced by 50 feet or less for each 90 degree angle bend over three.
- H. Boxes shall be firmly mounted to building structures.

**\*\*END OF SECTION 16130\*\***

SECTION 16140WIRING DEVICESPART 1 - GENERAL

## 1.01 DESCRIPTION

- A. Scope:
  - 1. Furnish duplex and special purpose receptacles complete with wall plates as shown on the Drawings.

## 1.02 QUALITY ASSURANCE

- A. Standards:
  - 1. Devices shall conform to applicable requirements of:
    - a. The Underwriter's Laboratories, Inc. (UL).
    - b. The American National Standards Institute (ANSI).
    - c. The National Electrical Manufacturer's Association (NEMA).
    - d. Federal Specifications.
    - e. The American Society Testing Materials (ASTM).

## 1.03 PRODUCT HANDLING

- A. In the event of damage to wiring devices and/or cover plates, the Contractor shall replace the damaged item at no additional cost.

PART 2 - PRODUCTS

## 2.01 RECEPTACLES

- A. General:
  - 1. Single and duplex receptacles shall be grounding type with standard NEMA 5-20R configuration rated 20 amperes, 2 pole, 3 wire, 125 volt, grounded.

## 2.02 LIGHTING SWITCHES

- A. Line Voltage Types:
  - 1. Switches shall be specification grade, side and back wired type as manufactured by Hubbell. They shall be rated for 20 amperes at 120/277 volts A.C. Single pole, double pole, three way and four way switches shall be numbers 1221, 1222, 1223 and 1224 respectively. Other switch types will be specified on the drawings when they are required.
  - 2. Switches connected to a normal power circuit shall be colored ivory, unless otherwise noted. Switches connected to an emergency power circuit shall be colored red.

## 2.03 PLATES

- A. General:
  - 1. Plates in finished interior areas shall be smooth nylon configured for the wiring devices on which they mount. Install blank plates on unused outlets. Use pressed steel industrial device covers to mount all devices in industrial and storage areas when outlets are surface mounted in interior areas.



2. Covers for wiring devices mounted in exterior and wet locations shall be gasketed weatherproof aluminum suitable for use with cast aluminum outlet boxes. Receptacle covers shall be hinged and shall only expose one receptacle plug-in position for each cover: Appleton #FSK-WRD. Switch covers shall be similar; such as an Appleton #FSK-WTZ.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION OF WIRING DEVICES

- A. Dry Interior Locations:
  1. Devices shall be installed in flush mounted boxes with washers as required to bring their mounting straps level with the surface of the finished wall.
- B. Damp or Wet Exterior Locations:
  1. Install only wiring devices approved for outdoor service in these locations.
- C. Receptacles:
  1. Receptacles and switches shall be grounded with a green insulated copper grounding conductor, not by a yoke or screw contact. Receptacles shall be oriented so that the ground slot is located at the top of the outlet.
  2. Receptacles shall be installed with connections pigtailed (spliced) to the branch circuit wiring so that removal of a receptacle can be made without losing neutral continuity or branch power to other receptacles on the same circuit.

#### 3.02 INSTALLATION OF WALL PLATES

- A. General: Plates shall be plumb within 1/16" of the vertical or horizontal.
- B. Interior Dry Locations:
  1. Install plates so that all four edges are in continuous contact with the finished wall surfaces. Plaster filling will not be permitted. Do not use sectional type device plates or oversize plates.
- C. Exterior and Wet Locations: Install plates with gaskets on wiring devices in such a manner as to provide a rain-tight weatherproof installation. Cover type shall be match box type.
- D. Future Locations: Install blanking cover plates on all unused outlets.
- E. Every plate installed over a receptacle shall be marked on the front side with a legible marking to clearly indicate the panel and circuit number to which each switch or receptacle is connected. The labels shall indicate this information, such as: L-2, H1-3, etc. Use care not to install plates over the wrong devices after this is done.

#### 3.03 TESTS

- A. Receptacles:
  1. Receptacles shall be tested for blade tension prior to installation. Do not install any receptacles having less than 16 oz. individual blade retention capability.
  2. After installation of receptacles, the circuits shall be energized and each receptacle tested for proper grounding, reversed polarity and/or open neutral condition.

**\*\*END OF SECTION 16140\*\***

SECTION 16425SWITCHBOARDPART 1 - GENERAL

## 1.01 DESCRIPTION

- A. Scope: Furnish new main switchboard.

## 1.02 QUALITY ASSURANCE

- A. Standards:
1. In addition to complying with pertinent standards, comply with pertinent recommendations contained in the following:
    - a. The National Electrical Manufacturer's Association (NEMA).
    - b. The Underwriter's Laboratories, Inc. (UL).

PART 2 - PRODUCTS

## 2.01 MAIN SWITCHBOARD

- A. Furnish the switchboard as herein specified and shown on the associated electrical drawings. The switchboard shall meet Underwriters' Laboratories requirements and be furnished with an Underwriters' Laboratories service entrance label.
- B. The switchboard shall be totally enclosed, dead front, free standing, front and rear aligned with front accessibility only required. The switchboard shall be NEMA enclosed Type 3R. The framework shall be of UL gauge steel and secured together to support all cover plates, bussing and component devices during shipment and installation. Formed removable closure plates shall be used on the (front), rear and sides. Closure plates are to be single tool, screw removable. Ventilation shall be provided when required. Each section shall include a single-piece removable top plate. Provide a thermostatically controlled strip heater in each section complete with power source to operate it.
- C. Painted parts shall be pretreated and provided with a corrosion-resistant, UL Listed acrylic baked paint finish. The paint color shall be #49 medium light gray per ANSI standard Z55.1-1967.
- D. The entire switchboard shall be suitable for operation at the specified available fault current. The switchboard shall be labeled to indicate the maximum available fault current rating, taking into account the structure, bussing, switchboard main disconnect, and switchboard branch circuit devices. The short circuit current rating of the switchboard shall not be less than 50,000 RMS symmetrical amperes. The switchboard branch circuit devices short circuit current rating shall be fully rated.
- E. The switchboard shall contain ground fault for the main overcurrent device in accordance with CEC 230-95 if the service is a solidly grounded wye rated for 1000 amperes or more at 150 volts or more to ground.
- F. The switchboard through-bus shall be tin plated aluminum. The switchboard bussing shall be of sufficient cross sectional area to meet UL Standard 891 for temperature rise. The through bus shall have a maximum ampacity as noted on plans and shall extend the full length of the

switchboard. The through bus shall be 100% rated. Provisions shall be provided for future splicing of additional sections from either end. The neutral bus shall be 100% rated.

1. Each switching and protective device shall be provided with visible means of ON-OFF identification. Terminals shall be of the anti-turn solderless type suitable for UC or AL cable of sizes indicated.
  2. A-B-C type bus arrangement, left-to-right, top-to-bottom, and front-to-rear, as viewed from the front, shall be used throughout.
  3. Submittal drawings shall be furnished providing the following information: switchboard voltage/current ratings, overall outline dimensions including available conduit space, switching and protective device ampere ratings and positions of same, and one line diagram.
  4. The switchboard distribution section bus shall be of the same material as the through bus and shall be rated the same as the through bus. The distribution section neutral plate shall be of copper provided with Cu/Al lugs for the devices installed and future specified devices.
  5. A ground bus shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchboard. A ground lug shall be furnished attached to the ground bus in a convenient location.
  6. Ground rods at the main switchboard shall be copper clad cone pointed steel rods 5/8" diameter by 8 foot long except where noted otherwise. The rod heads shall be chamfered. The copper exterior shall be molten welded to the steel core. Ground rod fittings shall be Thomas and Betts compression fittings applied with a motor driven hydraulic compressing tool.
- G. The switchboard utility metering compartment shall be located in the service entrance section of the switchboard and connected for hot sequence metering. The utility metering compartment shall comply with PG&E requirements.
- H. The main disconnect device shall be a solid state trip or molded case circuit breaker rated for 80% duty.
- I. The switchboard group-mounted circuit breaker branch devices are to be totally front accessible and front connectable. The circuit breaker connections to the distribution panel bussing shall be of a "blow-on" design such that the connections grip the bus bars firmly under high-fault conditions. Circuit breakers shall be rated for (30) KAIC minimum.
1. Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished when required. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips. All hardware used on conductors shall have a high tensile strength and an anti-corrosive zinc plating.
- J. The switchboard shall be separated into shipping blocks. Each switchboard section shall be capable of being handled individually with the use of removable lifting bars or rollers and be clearly labeled with proper handling procedures.
1. Switchboard sections shall be capable of being joined at the job site with the use of internal splice bars. These splice bars shall be preassembled onto the through bus and not shipped loose in a splice bar kit.
  2. The through bus splice bars shall utilize two bolts, one on each side of the shipping split, for each phase. Conical washers shall be used to provide a constant pressure once the proper torque is achieved. The through bus splice connection shall be capable of being maintained by the use of a single tool and shall be from accessible.
- K. 1/8" thick Laminated nameplates shall be installed for each circuit breaker. Nameplates shall be fastened to switchboard with rivets, and have a black background with engraved 1/4" high white letters indicating the function of each circuit breaker.

## L. Factory Assembly and Tests:

1. The switchboard shall be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete switchboard will be tested for operation under simulated service conditions to assure the accuracy of the wiring and the functioning of all equipment.
2. The main circuits shall be given a dielectric test of 2200 volts for one minute between live parts and ground, and between opposite polarities. The wiring and control circuits shall be given a dielectric test of 1500 volts for one minute between live parts and ground.
3. The switchboard shall be Eaton Pow-R-Line C or equal. It shall be approved by the serving utility company..

PART 3 - EXECUTION

## 3.01 MAIN SWITCHBOARD

- A. Sections of switchboard shall be firmly bolted together.
- B. The interiors of all sections shall be clean. Scrap wire, parts and debris shall be removed.
- C. Paint scratched exterior surfaces.
- D. The switchboard equipment shall be installed in place of the existing switchboard as shown on the drawings. Contractor shall modify concrete pad to accommodate the new equipment.

\*\*END OF SECTION 16425\*\*

SECTION 16440

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope: Furnish new disconnect switches.

1.02 QUALITY ASSURANCE

- A. Standards:
1. In addition to complying with pertinent standards, comply with pertinent recommendations contained in the following:
    - a. The National Electrical Manufacturer's Association (NEMA).
    - b. The Underwriter's Laboratories, Inc. (UL).

PART 2 - PRODUCTS

2.01 DISCONNECT SWITCHES

- A. General:
1. Switch assemblies shall be heavy duty types complying with UL-98. Standard for safety, enclosed and dead front switches and NEMA publication K51-1983, enclosed switches.
  2. Switches shall have a built-in interlock by-pass. Switches shall have a provision to padlock the switch in the "off" position.
  3. Highly visible on-off markings shall clearly indicate the position of the switch.
  4. Fusible switches shall contain Class R fuse kits to prohibit insertion of all fuse types other than Class R.
  5. Switches shall include a field installable grounding kit.
  6. Switches shall be rated for the voltage to which they are connected and they shall be horsepower rated.
  7. Switches shall have a NEMA rating of 1 (for indoor applications), 3R (for outdoor applications) and NEMA 4X (for corrosive atmospheres).
  8. General duty switches are not acceptable.
  9. Switches shall be Eaton DH type of equal..

PART 3 - EXECUTION

3.01 DISCONNECT SWITCHES

- A. Install isolation switches within sight of the equipment to be disconnected and preferably at the equipment involved.
- B. If fusible switches are called for, make certain the proper size and type of fuse indicated on the Drawings is installed.

**\*\*END OF SECTION 16440\*\***

SECTION 16470POWER DISTRIBUTION UNITSPART 1 - GENERAL

## 1.01 DESCRIPTION

- A. Scope: Furnish new panelboards.

## 1.02 QUALITY ASSURANCE

## A. Standards:

1. In addition to complying with pertinent standards, comply with pertinent recommendations contained in the following:
  - a. The National Electrical Manufacturer's Association (NEMA).
  - b. The Underwriter's Laboratories, Inc. (UL).

PART 2 - PRODUCTS

## 2.01 PANELBOARDS

- A. Furnish dead-front panelboards incorporating switching and protective devices of the number, rating and type noted on the drawings. Panelboards shall have NEMA 1 enclosures and shall be flush or surface mounted, as noted the drawings. Panelboards shall be rated for the intended voltage and shall be labeled with their correct designation. Panelboards shall comply with NEMA Standard for Panelboards and the CEC.
- B. Interiors:
1. Interiors shall be completely factory assembled with switching and protective devices, wire connectors, etc. Wire connectors, except screw terminals, shall be of the anti-turn solderless type and suitable for copper wire of the sizes indicated.
  2. Interiors shall be so designed that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors. They shall be designed so that circuits may be changed without machining, drilling, or tapping.
  3. Branch circuits shall be arranged using double row construction, except when devices must be singularly mounted due to their physical size.
  4. A nameplate shall be provided listing panel manufacturer, amperage, voltage and phases.
  5. Bus bars for the mains shall be tin-plated aluminum, sized in accordance with Underwriters' Laboratories standards. Unless otherwise noted, full size neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Include a full size grounding bus bar in each panel.
  6. The short circuit rating of the assembled panelboard shall be in accordance with UL Inc. standards and their test verification, unless a specific value is given on the drawings or in these specifications.
  7. Phase bussing shall be full height without reduction. Cross and center connectors shall be tin-plated aluminum.
  8. Neutral bussing shall have a suitable lug for each outgoing feeder or branch circuit requiring a neutral connection. Ground bussing shall be similar.
  9. Spaces for future switching and protective devices shall be bussed for the maximum device that can be fitted into them.
  10. Circuit breakers shall be rated for at least 10 K.A.I.C. or greater if so noted.

- C. Box:
1. Boxes shall be made from unpainted galvanized code gauge steel.
  2. At least four interior mounting studs shall be provided.
  3. Box identification number shall be on box.
- D. Trim:
1. Hinged doors covering switching device handles shall be included in panel trims, except that panelboards having individual metal clad externally operable deadfront units may be supplied without such doors.
  2. Doors in panelboard trims shall conform to the following:
    - a. In making switching device handles accessible, doors shall not uncover any live parts.
    - b. Doors shall have cylinder lock and catch, except that doors over 48 inches high shall have auxiliary fasteners at top and bottom of door in addition to cylinder lock and catch. Locks shall be keyed alike; directory frame and card having a transparent cover shall be furnished on each door. Directories shall be typed, indicating what each circuit serves or if they are spares or spaces.
  3. The trims shall be fabricated from code gauge sheet steel.
  4. Exterior and interior steel surfaces of the panelboard trim shall be properly cleaned and finished with industry standard gray paint over a rust-inhibiting phosphatized coating.
  5. Trims for flush panels shall overlap the box by at least 3/4" all around. Surface trims shall have the same width and height as the box. Trims shall be mounted by a screwdriver without the need for special tools.
  6. Panelboards rated 225 amps or less shall be Eaton Type BR load center, or equal. Panelboards rated greater than 400 amps shall be Eaton Pow-R-Line 4, or equal.
- E. Identification Nameplate:
1. Each panelboard shall have a phenolic laminated nameplate fastened to the front of it, above the door, with rivets. The nameplate shall be black with engraved white 1/4" high letters. The engraved text shall be as shown in the panel schedule on the drawings.

### PART 3 - EXECUTION

#### 3.01 PANELBOARDS

- A. Panels shall be installed in interior dry locations unless otherwise noted.
- B. Panelboard cans shall be plumb within 1/8 inch of vertical.
- C. Panelboard boxes shall be securely attached to or mounted on wall structures.
- D. After connections of all circuits, prepare a typewritten directory. List all circuits originating from the panel and install it behind the plastic card holder on the door. This is absolutely mandatory before acceptance of the project. Accuracy is required.
- E. Panelboards shall be installed in accordance with CEC 384-4. Verify locations of existing piping, ducts or equipment foreign to this panel. Position panel to avoid conflicts with these items.

**\*\*END OF SECTION 16470\*\***

## SECTION 16 700

### FIRE DETECTION AND ALARM

#### PART 1 – GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Section.
- B. Section 16 000 – Common Work Results for Electrical.

##### 1.02 SUMMARY SCOPE

- A. This section of the specification includes furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators, and wiring.
- B. Design Components and Installation shall meet 2014 NFPA 72, 2016 California Building Code and Fire Code (CEC, CFC), and meet local Fire Marshal approval.
- C. Fire alarm contractor is responsible to coordinate with mechanical drawings as well as mechanical contractor for mechanical equipment and devices require shut down, control, notification, alarm and reset. Design build contractor is responsible for full mechanical coordination and operation: additional equipment, connection required should be without extra cost to the owner.

##### 1.03 DEFINITIONS

- A. FACP: Fire alarm control panel.
- B. LED: Light-emitting diode.
- C. Definitions in NFPA 72 apply to fire alarm terms used in this Section. Reference to NFPA 72 indicates 2016 version. Reference to other codes indicates current version of codes adopted by local State Fire Marshal.

##### 1.04 SYSTEM DESCRIPTION

- A. Provide addressable fully automatic fire alarm control panel with voice evacuation system and all accessories for complete operation. Provide remote annunciators. Provide sufficient number of power supply modules in the complex to monitor system initiating devices and notification devices, and control units (elevators, HVAC, etc.) Unless otherwise required by Local Fire Marshal, alarm initiation of devices shall activate notification devices. Activation of alarm or supervisory device at any location throughout the complex shall cause alarm or supervisory signal in main fire alarm control panel and remote annunciators. Stand-alone smoke detectors inside each residential unit, when activated, shall cause alarm inside that residential unit only.
- B. General: Noncoded, addressable-analog system with manual and automatic alarm initiation; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.



C. Basic Performance

1. Alarm, trouble and supervisory signals from intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
2. Initiation Device Circuits (IDC) shall be wired Class B (NFPA Style B) as part of an addressable device connected by the SLC Circuit
3. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y) as part of an addressable device connected by the SLC Circuit.
4. Digitized electronic signals shall employ check digits or multiple polling.
5. A single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
6. Alarm signals arriving at the main FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer product data for each type of product indicated.
- B. Shop Drawings:
- C. Operating Instructions: For mounting at the FACP.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.
- E. Maintenance Data: For fire alarm systems to include in maintenance manuals specified in Division 1. Comply with NFPA 72.
- F. Submissions to Authorities Having Jurisdiction: In addition to distribution requirements for Submittals specified in Division 1 Section "Submittals," make an identical submission to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit comments to Architect for review. (Additional devices on wiring as may be required shall be included in cost.)
- G. Certificate of Completion: Comply with NFPA 72.
- H. Software Modifications:
  1. Provide the services of a factory trained, NECET fire alarm certified, and authorized technician to perform system software modifications, upgrades or changes.
  2. Provide hardware, software, programming tools and documentation necessary to modify the fire alarm system on 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 modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm regularly engaged in manufacturing fire alarm system products and experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.
- B. All equipment and accessories shall be new and listed by U.L. and California State Fire Marshal.
- C. Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.
- D. Installer Qualifications: An experienced installer who is an authorized representative of the FACP manufacturer for both installation and maintenance of units required for this Project. It shall employ NECET (minimum level 2 Fire Alarm Technology) technicians on site to guide the final check-out.
- E. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.
- F. Comply with NFPA 72 and California State Fire Marshal regulations.

#### 1.07 GUARANTY

- A. All work performed and material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct defect during this one-year period shall be included in the submittal bid.

### PART 2 – PRODUCTS

#### 2.01 MATERIALS AND COMPONENTS

- A. Manufactures: Equipment shall be as manufactured by Firelite or approved equal.
- B. Provide the required fire alarm system products in the sizes and capacities required or indicated, complying with the manufacturer's published product information of standard materials and components, designed and constructed for the applications indicated.

#### 2.02 SYSTEM OPERATION (Operation in each Building)

- A. Activation of an "intelligent" smoke detector shall cause the following operations and indications.
  - 1. When an "intelligent" smoke detector senses an abnormal level of smoke, the loop interface shall automatically initiate a "check" mode. Four consecutive samples shall be made of the prospective detector. Upon completion of four consecutive smoke trouble conditions, the detector is considered "checked" and the system goes directly into an alarm mode, unless the verification mode is activated for the detector.
  - 2. Alarm verification shall be programmable by detector(s) to initiate a verification sequence after the "check" procedure and the Fire Alarm Control Panel shall wait a field-programmable delay period (0-50 seconds), and then proceed to resample the detector four more times for continued presence of smoke. If three or more samples verify an alarm condition still exists, the system will then initiate alarm sequences specified herein. Less than three consecutive samples during the verification cycle with NOT result in a system alarm condition. The system shall incorporate the ability to log in memory the number of verification events that have occurred for each selected device.
  - 3. The system common alarm LED on the Fire Alarm Control Panel shall flash. The internal audible trouble device shall sound. Acknowledging the alarm condition shall silence the audible trouble device and revert the flashing common alarm LED to a steady state.

4. An alphanumeric LCD Display shall indicate applicable information associated with the alarm condition including: zone, device type, device location and time of alarm. Location and zoning messages shall be custom field-programmed to respective premises.
  5. Appropriate status change message(s) shall be transmitted to Remote Annunciators and an alarm shall be transmitted to a remote Central Station (Subscription to Central Station Monitoring Company to be provided by owner).
  6. Activate audible alarm zones on floors.
  7. Flash visual alarm signal zones on floors.
  8. Activate addressable output relays to unlock locked security doors.
  9. Activate addressable output relay to release electrical held fire doors.
  10. Shut down air-handling units above 2,000 CFM.
- B. Activation of addressable manual pull station, sprinkler water flow switch or "intelligent" heat detector shall cause the following operations and indications.
1. Cause operations and indications described in Article 2.02, Paragraph A above to occur.
- C. Elevator recall shall be initiated via addressable output relays when one (1) smoke detector in the same elevator lobby, smoke or heat detector in the associated elevator machine room or heat detector in the elevator pit is activated. Elevator recall shall be indicated on the alphanumeric display and shall cause the following to occur.
1. Passenger Elevators shall recall to the First Floor (grade level) for alarms occurring on floors except 1st floor.
  2. Passenger elevators shall recall to the 2nd floor (alternate level) for alarms on 1st floor.
- D. Upon activation of elevator shaft heat or smoke detector, elevator recall shall be initiated for grade level and a relay shall be activated for elevator shunt trip.
- E. Closure of a supervised OS&Y valve sensed via a supervisory switch shall cause the following operations and indications
1. The system common alarm LED of the Fire Alarm Control Panel shall flash. The internal audible trouble device shall sound. Acknowledging the alarm condition shall silence the audible trouble device and revert the flashing common alarm LED to a steady state.
  2. An alphanumeric LCD Display shall indicate applicable information associated with the alarm condition including: zone, device type, device location, and time of alarm. Location and zoning messages shall be custom field-programmed to respective premises.
  3. Appropriate status change message(s) shall be transmitted to Remote Annunciators and Remote Central Station.
- F. The presence of a ground condition or an open circuit on alarm initiation circuit or a ground condition, open circuit or short circuit on alarm indicating circuit shall cause the following actions and indications.
1. The system common trouble LED on the Fire Alarm Control Panel shall flash. The internal audible trouble device shall sound. Acknowledging the trouble condition shall silence the audible trouble device and revert the flashing common trouble LED to a steady state.

2. An alphanumeric LCD Display shall indicate applicable information associated with the trouble condition and its location. System trouble diagnostics shall assist in defining the trouble condition. Unacknowledged alarms/messages shall have priority over trouble displays and take precedence on the LCD annunciator. Trouble conditions will be stored in memory for future recall/display.
  3. Appropriate status change message(s) shall be transmitted to Remote Annunciators and Remote Central Station.
- G. All designated "nonsilenceable" auxiliary control functions shall remain in operation (even upon silencing of audible alarms) until such time as the control panel is cleared and reset manually (i.e. central station interface elevator recall interface, etc.).
- H. Provisions shall be included within the Fire Alarm Control Panel for the following manual controls in addition to those previously mentioned.
1. Disconnect audible signaling while testing.
  2. Temporary software bypass of selected alarm points.
  3. Software assignment of selected alarm point to alarm verification function as a method of tacking alarms caused by environmental factors or maintenance requirements. Waterflow switches, smoke detectors, and valve supervisory switches shall be assigned to the verification group to eliminate nuisance alarms.
- I. Zone may be enabled or disabled remotely via a command using an RS232C Port or other suitable means.

## 2.03 SYSTEM DEVICES

- A. System devices shall be located as indicated on the approved shop drawings. The Contractor shall refer to the drawings to determine where devices are to be located. System devices shall be numbered with a unique number. The numbering system shall include the building area, type of device, and device number. This numbering system shall be indicated on each submitted floor plan drawing, fire alarm riser diagram and be tabulated. The tabulation shall be included in each O&M Manual submitted to the Owner.

## 2.04 SYSTEM ZONING

- A. The system shall employ "intelligent" heat and smoke detectors and addressable interface devices capable of being recognized and annunciated at the main control panel on an individual basis. Devices shall be field-programmed into software zones for the purpose of general area identification and annunciation. However, each device shall also be annunciate identified on an individual basis including exact location and device type. Zoning/device location information shall be totally field-programmable to exact job requirements. Devices shall be zoned as follows:
1. Manual pull stations, area smoke and heat detectors and sprinkler water flow and pressure switches shall be zoned by floor.
  2. Elevator lobby, machine room shall be zoned by elevator group.
  3. HVAC equipment supply air and return air smoke detectors shall be zoned by floor.
  4. Fire suppression system(s), monitoring and similar functions shall each be zoned separately.
- B. Initiating and monitored devices shall include, but not be limited to, the following
1. Manual pull stations.
  2. Ceiling smoke detectors.

3. Duct smoke detectors.
  4. Ceiling heat detectors.
  5. Addressable input devices.
  6. Sprinkler flow and pressure switches.
  7. Valve supervisory switches.
- C. Output devices shall include, but not be limited to, the following
1. Alarm signals.
  2. Alarm signals/integral ADA visual signals.
  3. ADA visual alarm devices.
- D. Addressable interface relays.

## 2.05 SYSTEM CONFIGURATION

- A. System equipment shall include, but not be limited to an operator's control/system control panel, battery back up, alarm indicating devices, and output relays and other devices required to provide a complete and working system.
- B. The system shall be of the active multiplex/addressable type wherein each initiating device shall be repetitively scanned, causing a signal to be transmitted to the control unit that indicates the individual initiating device circuit installation wires are intact. Loss of such a signal at the system control unit shall result in a trouble indication as specified hereinafter for the particular indicating device affected. Indicating devices in the system shall transmit their normal, trouble or actuated status signals in no less than 5 second intervals.
- C. Each system-type smoke detector shall be of the analog type so that the system can be used to read smoke levels on a real time basis from selected smoke detectors for maintenance and diagnostic purposes. Smoke detectors and other initiating devices shall be individually indicated at the main control panel and remote annunciators when changing to an alarm or trouble state.

## 2.06 FIRE ALARM SYSTEM CENTRAL EQUIPMENT

- A. General: The control panel shall be modular in design utilizing distributed solid state microprocessors and be capable of future expansion. The microprocessor-based CPU shall be completely field-programmable. CPU module shall provide for programmable nonvolatile RAM memory utilizing integral lithium-based memory IC chips. Each panel module shall be independent employing its own microprocessor circuitry for reliability and independent operations in case of main CPU failure. The system control unit shall have capacity for the required active detection and output points with space for future use and expansion.
- B. The control unit shall be listed to the latest UL 864 Standard. Circuitry shall be UL-listed for power-limited application and use positive temperature coefficient devices for current limiting. The panel shall be provided with keylock hinged door to access system controls/switches. The panel door shall be provided with a transparent window for viewing alarm, trouble indicators, and LCD annunciator. The control unit shall be designed for recess-mounting.
- C. Central Processing Unit Module (CPU): The CPU shall communicate with monitor and control other modules in the panel via internal serial communications techniques.
1. Removal, disconnection, or failure of control panel module shall be detected and reported by the CPU.

2. The CPU shall contain and execute custom control-by-event programs for specified events if a fire situation is detected in the system. Such programs shall be held in nonvolatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
  3. The CPU module shall contain a real-time clock circuit to time/date stamp system events and execute custom time control programs. Time control program events shall be terminated in a fire condition.
- D. Display Interface Board (DIA): The DIA shall provide touchpad controls and indicators used by the system operator and may also be used to program control panel and system parameters.
1. The DIA shall contain, and display, custom alphanumeric labels for intelligent detectors and addressable modules. Such label information shall be stored in field-programmable nonvolatile memory
  2. The DIA shall provide an 80-character alphanumeric Liquid Crystal Display (LCD).
  3. The DIA shall provide five Light-Emitting Diodes (LEDs) for ac power, system alarm, system trouble, display trouble, and disable.
  4. The DIA shall provide a 25-key membrane keypad with control capability to command system functions, status readouts, manual control action, and entry of alphabetic or numeric information. The keypad shall include means to enter two different five digit passwords to prevent unauthorized manual control or programming.
- E. Serial interface Board (SIB): The SIB shall provide the following interfaces
1. Two ports for remote printer/CRT devices (RS-232c).
  2. Two ports for future local printer (RS-232c).
  3. One port for remote LED annunciators (RS-485).
  4. One part for local LED annunciators (SCB).
- F. Loop Interface Board (LIB): LIB's shall be provided to monitor and control each loop of intelligent detectors and addressable modules.
1. The LIB shall contain its own independent microprocessor control and shall be capable of alarm detection and automatic control action on its own loop even if a failure occurs in the system central processor unit, internal connections, or other modules.
  2. The LIB shall communicate and provide power to devices on its Style 4 loop over a single pair of wires. For dynamic Style 4 supervision the loop may be branch-circuited or "t-tap" connections may be made off of the loop. Loop wiring shall be twisted shielded pair of up to 10,000' in length.
  3. The LIB shall receive digital/analog information from "intelligent" detectors and shall process this information to determine normal, alarm, trouble and sensitivity conditions. The analog information shall also be used for automatic test and determination of maintenance requirements.
  4. The LIB module shall individually monitor "intelligent" detectors for sensitivity variation initiating a trouble condition should detector sensitivity "drift" toward either threshold of false alarming or non-alarming conditions. In addition, the system shall have the capability to read each detector's sensitivity, and if need be, electronically adjust the detector sensitivity for existing conditions with UL-recommended limits.

5. The LIB shall communicate continuously with each "intelligent" detector and addressable module on its loop and verify its proper function and individual status. Communication with up to 198 such devices per loop shall be performed every 6 seconds or less.
- G. Control Switches: Provide the following control switches at the Fire Alarm Control Panel.
1. Acknowledge switch.
  2. Signal silence switch.
  3. System reset switch.
  4. System test switch.
  5. Lamp test.
- H. Nonlock Walk Test: The system shall include a special nonlock "walk test" mode where each initiating device is manually placed in alarm. The control panel pulses the system audible devices on detection of each such alarm and automatically resets the panel, permitting a single serviceman to functionally test the entire system.
- I. Automatic Detector Test: The system shall include a special automatic detector test features which permits reading and adjustment of the sensitivity of intelligent detectors from the main control panel. In addition, the automatic test feature shall also permit the functional testing of "intelligent" detector or addressable interface device individually or by zone from the main control panel. Results of the test are then indicated on the LCD display. A printout of test data shall be capable via the system printer.
- J. Special System Reports: The system shall have the ability to generate and print, upon command, system and point status reports.
1. Selection of "system" read status provides the operator with global system programming information including: alarm verification, SLC loop styles, number of SLC loops, number of software zones, number of auxiliary power supplies, signal silence inhibit.
  2. Selection of "point" read status provides the operator with selected individual point programming data including: point status (normal, alarm, trouble, disabled, etc.), address, type I.D., control by event, custom alphanumeric label, verification status, alarm threshold level, sensitivity, silenceable/nonsilenceable, SLC loop number, and device number.
- K. System Diagnostics: The system shall include special software to detect, diagnose, and report failures and isolate such failures to a printed circuit board level.
1. Selection of "system" read status provides the operator with global system programming information including: alarm verification, SLC loop styles, number of SLC loops, number of software zones, number of auxiliary power supplies, signal silence inhibit.
  2. Selection of "point" read status provides the operator with selected individual point programming data including: point status (normal, alarm, trouble, disabled, etc.), address, type I.D., control by event, custom alphanumeric label, verification status, alarm threshold level, sensitivity, silenceable/nonsilenceable, SLC loop number, and device number.
- L. Field Programming: The system shall be 100% field-programmable without the need for external computers, or PROM programmers, and shall not require replacement of memory IC's. Systems requiring factory-programming/reprogramming or replacement of memory IC chips shall NOT be acceptable.
1. Programming may be accomplished through the front control panel indicators and switches or via a CRT display unit.

2. Programs shall be stored in nonvolatile RAM memory.
  3. Programming shall be accomplished only after entering an appropriate and preselected five digit password security code.
  4. Programming functions shall be initiated via special system "prompting" menus via the system main CPU. The system shall be capable of direct English language programming and prompting and not require complex digital equations or special formulations.
  5. The system shall provide a means to "review" programmed functions.
  6. The system shall be capable of revising/changing programmed functions or system expansion at anytime subsequent to initialization as described herein without factory-modifications or factory-reprogramming.
  7. Addressable indicating circuit or auxiliary addressable relay shall be programmed to activate on alarm of a single initiating device or a combination of initiating devices.
- M. Event History: The main fire alarm panel shall have the resident ability to store a minimum of 400 system events in chronological order of occurrence.
1. Event history shall include system alarms, troubles, operator actions (i.e. acknowledge, silence, reset, program entry, etc.), unverified alarms, circuit/point alterations, component failures.
  2. Events shall be time and date stamped and be capable of being recorded and reviewed without purging the history file.
  3. Events shall be stored on non-volatile buffer memory. Access to history buffer shall be secured via five digit password security code.
  4. Event recording shall automatically overwrite the oldest event(s) in memory beyond the initial 400 events.
  5. Systems not employing event history memory storage shall be required to furnish a printer/recorder for recording system events.
- N. Power Supply: The power supply for the panel and fire alarm peripherals shall be integral to the control panel.
1. The power supply shall provide control panel and peripheral power needs with filtered power as well as 3 amperes of unregulated 24 volt dc power for external audio/visual devices. The audio/visual power may be increased as needed by adding additional modular expansion power supplies.
  2. Power supplies shall be designed to meet UL and NFPA requirements for power-limited operation on external signaling lines, including initiating circuits and indicating circuits.
  3. Circuitry shall be UL-listed for power-limited application and use positive temperature coefficient devices for current limiting. Fuses or other thermal overload type protection shall be unacceptable.
  4. The system shall derive its primary operating power from a 120 volt ac, single phase, 60 Hz supply. There shall also be a 24 volt battery standby power source with internally supervised batteries and automatic charger, capable of operating the entire system for a minimum of 24 hours in the supervisory mode and then be capable of operating the alarm devices for a minimum of 20 minutes.
  5. The power supply unit shall contain suitable overvoltage protection to prevent malfunction or damage which might occur from line power surges (lightening).



6. Upon loss of main power, the power supply unit shall automatically revert to normal operation without requiring manual restarting procedures.
7. When the ac power is restored, the control unit shall automatically revert to normal operation without requiring manual restarting procedures.
8. The battery shall be automatically charged by a built-in short-circuit-proof charger.
9. The charging current shall be automatically controlled according to the battery's ambient temperature.
10. After a full discharge, the system shall be able to recharge the batteries completely within 12 hours.
11. The connection to the battery shall be automatically switches off when the voltage drops below 19 volts to protect battery cells from damage to deep discharge.
12. Sealed lead acid batteries shall be used for emergency power source.
13. The entire power supply charger circuits including fuses shall be supervised both positive and negative ground fault supervision, battery/charger fail condition, ac power fail indicators. The power supply shall also provide supervision of modular expansion power supplies as may be required. Malfuction or blown or missing fuses shall result in a fault indication on the control unit.

## 2.07 SMOKE AND HEAT SENSORS/DETECTORS

- A. Intelligent "Ceiling-mounted" Photoelectric Smoke Sensors: Analog photoelectric smoke sensors shall be provided. Type to match fire alarm control panel.
  1. The intelligent photoelectric smoke sensors shall connect via two wires to one of the intelligent control panel loops.
  2. The sensors shall use the photoelectric principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
  3. The sensor/control panel shall provide automatic sensitivity "drift" compensation to provide longer term stability and reliability. The sensor shall also provide a "maintenance alert" feature whereby the detector shall initiate a trouble condition should the unit's sensitivity approach the outside limits of the normal sensitivity window.
  4. The sensor shall be provided with extensive RF and EMF noise reduction circuitry.
  5. The sensor shall employ sophisticated self-compensating solid state LED light source and photosensitive circuitry.
  6. The sensors/control panel shall provide a calibrated test method whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself, by activating a magnetic test switch, or may be activated remotely on command from the control panel.
  7. The sensors shall provide address-setting means on the sensor head using rotary decimal switches. No binary coding shall be required. The sensor shall also store an internal identification code which the control panel shall use to identify the type of sensor.
  8. The sensors shall provide dual alarm and power/status LEDs. Status LEDs shall flash under normal conditions, indicating that the sensor is operational and in regular communication with the control panel. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected and verified. An output connection shall be provided in the base for connecting an external remote alarm LED.

9. The sensor shall be semiflush ceiling-mounted and be provided with modular detector head with twist-lock base. Sensors shall also be suitable for surface-mounting below raised floors or above ceilings. Sensors shall be provided in smooth attractive white finish, and sealed against dirt, vermin, and back pressure. Sensors shall be provided with fine mesh insect/contaminate screen.
  10. Sensors shall be UL-listed with respective control panel.
- B. Intelligent "Duct Mounted" Photoelectric Smoke Sensors: Duct-mounted intelligent photoelectric smoke sensor shall be installed in the supply duct of Air Handling Units producing greater than 2,000 CFM.
1. Sensors shall operate on the same principals and exhibit the same basic characteristic as area type "intelligent" smoke sensors. The unit shall be capable of interchanging/accepting either photoelectronic or ionization type sensors.
  2. The sensor shall operate in air velocities of 300 FPM to 4,000 FPM without adverse effects in detector sensitivity.
  3. Each sensor shall operate directly with the intelligent control panel loop, without an interface module.
  4. The unit shall consist of a Noryl mounted plastic enclosure with molded integral conduit knock-outs. The unit shall be provided with clear faceplate cover to provide visual viewing of detector/sensor for monitoring sensor operation and chamber condition. The duct housing shall be provided with gasket seals to provide proper sealing of housing to mechanical ductwork and to ensure proper air flow into the detector sampling chamber. Duct housing shall be designed to easily mount to rectangular or round ducts.
  5. The duct sensor unit shall be UL-listed with the fire alarm control panel.
  6. Each duct sensor unit shall be equipped with sampling tubes protruding into the associated ductwork. Sampling tubes shall be provided with integral porosity filter system to aid in reducing detector contamination. Sensors shall be installed per NFPA 90A.
  7. Duct sensors shall be provided with remote alarm indicator (remote alarm indicator/test switch). Remote unit shall be mounted on single gang, stainless plate and be located in an accessible location for easy viewing and monitoring.
  8. Coordinate the location of duct smoke detectors with the HVAC system duct installer.
- C. Intelligent Ceiling Mounted Heat Sensors: Analog thermal sensors shall be provided.
1. The intelligent thermal sensors shall connect via two wires to one of the intelligent control panel loops.
  2. The sensors shall use dual electronic thermostats to measure temperature levels in its chamber and shall, on command from the control panel, send data to the panel representing the analog temperature level.
  3. The sensors/control panel shall provide a test method whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the sensor itself, by activating a magnetic switch, or may be activated remotely on command from the control panel.
  4. The sensors shall provide address-setting means on the sensor head using rotary decimal switches. No binary coding shall be required. The sensors shall also store an internal identification code which the control panel shall use to identify the type of detector.

5. The sensors shall provide dual alarm and power/status LEDs. Status LEDs shall flash under normal conditions, indicating that the sensor is operational and in regular communication with the control panel. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.
6. The sensor shall be semiflush ceiling-mounted and be provided with modular detector head with twist-lock base. Sensors shall be provided in smooth white finish.

## 2.08 MANUAL STATIONS

- A. Addressable Manual Stations: Manual stations with an addressable interface module.
  1. The manual station addressable module shall connect with two wires to one of the intelligent control panel loops.
  2. The module at the manual station shall, on command from the control panel, send data to the panel representing the state of the manual station switch.
  3. The manual station addressable module shall provide address-setting means using rotary decimal switches and shall also store an internal identification code which the control panel shall use to identify the type of device. No binary coding shall be required.
  4. A LED shall be provided on the addressable module which shall flash under normal conditions, indicating that the manual station is operational and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been initiated via the station.

## 2.09 INPUT/OUTPUT DEVICES

- A. Sprinkler Waterflow and Pressure Switches: Switches shall be furnished and installed under Division 22, with wiring and addressable input device interface by this Contractor.
- B. Fire Protection OS&Y Valve Supervisory Switches: Switches shall be furnished and installed under Division 21, with wiring and addressable input device interface by this Contractor. Switches shall activate a supervisory signal within two turns of the valve or more than 1/3 of the valve travel toward the closed position.
- C. Provide addressable module at each residential smoke detector.
- D. Elevator Recall: Addressable fire alarm system dry output contacts installed by this Contractor shall provide a recall signal to the elevators furnished and installed under Division 14.
- E. Security/Access Control Interface: Addressable fire alarm system dry output contacts installed by this Contractor shall provide an unlock signal to the Security/Access Control system furnished and installed under another Division. Magnetic Door Security Contacts provided and installed by the contractor shall be monitored as supervisory alarms by addressable input devices, reported to fire alarm control panel as individual supervisory alarms and displayed on the fire alarm control panel and remote annunciators as individual supervisory alarms.
- F. HVAC Control: Addressable fire alarm system dry output contacts installed by this Contractor shall provide fail safe stop and start signals for equipment shutdown and start signals for equipment start-up to the Building HVAC Units and motorized fire/smoke dampers furnished and installed under Division 23, as applicable. Electrically-supervised control relays shall be located within 2 feet of the controlled device.
- G. Provide interface module(s) as required compatible to emergency call system.

- H. To transmit fire alarm system alarm and trouble signals and alarm conditions and address of each residential smoke detector.

## 2.10 ALARM SIGNAL DEVICES

- A. Horn/Strobes: Provide solid state electronic alarm device where indicated on the contract drawings. Electronic device shall not contain vibrating electromechanical solenoids or contacts for reliability and performance. Electromechanical devices shall not be considered ad equal.
  - 1. Units shall operate at 24 volts dc and be polarized supervised.
  - 2. Preferred alarm signals shall be a slow whoop or fast warble tone producing a sound pressure level of 91 dBA.
  - 3. Units shall be flush mounted and molded of high-impact beige thermo plastic.
  - 4. Each alarm device shall be provided with an integral high intensity flashing xenon strobe tube. Visual strobe shall operate on the same voltage as the audible alarm device. Strobe shall produce a minimum of 15/75 candela and flash at a rate of two times/second. Strobe shall be xenon solid state type.
  - 5. Provide candela ratings to comply with ADA spacing requirements.
- B. Visual Signals: Visual alarm signals shall be installed where required.
  - 1. Visual units shall be of the electronic flashing strobe type and operate on 24 volts dc.
  - 2. Strobe signals shall be Notifier S234 Series or equal, flush wall mounted and utilize a high intensity solid state xenon strobe tube on a standard single device electrical outlet box.
  - 3. Lights shall operate in unison with audible alarm signals and discontinue flashing upon silencing of alarm signals.
  - 4. Strobe lights shall be on supervised circuits.
  - 5. Wall coverplates shall have a beige color.
  - 6. Provide candela ratings to comply with ADA spacing requirements.

## 2.11 REMOTE LCD ANNUNCIATORS

- A. Provide ar LCD-80 remote LCD alpha-numeric annunciator to annunciate system events and duplicate the displated status at the main FACP. The annunciator shall be a backlit eighty character LCD display and operate via the system RS485 or RS232 serial output terminal from the main FACP. The LCD display shall automatically illuminate upon receipt of an alarm or trouble condition. The unit shall operate on 24VDC power and function during system power failure via standby batteries. The remote LCD annunciator shall include:

Integral time-date clock	System reset
Time-date select switch	System silence
Time-date/contrast adjust.	System acknowledge
Display/step switch	Integral trouble buzzer

- B. Annunciator shall upon command display the first system alarm, last alarm, and system alarm count. The unit shall be equipped with an integral lamp test feature. The unit shall be flush mounted where shown, or at location approved by Fire Marshal.
- 2.12 NOTIFICATION APPLIANCE CIRCUIT EXTENDER PANELS (ONE PER BUILDING MINIMUM)
- A. Provide as may be required by manufacturer, Notifier or EST Fire Alarm Power Supply and Battery Charger and minimum of 6AH Sealed Maintenance-free Batteries for standby power.  
Unit shall be self-contained and provide dual power supply and notification appliance circuit extension capability. Unit shall produce 6.0 amps at 24VDC of full load output and be capable of providing four Notification Appliance Circuits wired in Style Y configuration.
- 2.13 DOOR SECURITY MAGNETIC CONTACT
- A. Provide Sentrol 1076 or approved equal magnetic door contact. Device shall consist of a flush-mounted, sealed magnetic switch with wire leads and armature magnet. Unit shall be wired to fire alarm addressable input device. Upon opening of a monitored exit door, the magnetic door contact shall report as a supervisory alarm to the fire alarm system.
- 2.14 ELECTROMAGNETIC DOOR HOLDERS
- A. Provide door holders Notifier Type FM Series, type as approved by Architect.
- 2.15 SYSTEM WIRING
- A. The equipment supplier shall furnish to the installing contractor a complete detailed point-to-point wiring diagram showing the system equipment and required number, type and sizes of conductors and conduit sizes. Where common devices which break the alarm circuit are installed on a common zone with shorting type device, the circuit breaking devices shall be wired electrically downstream of the shorting type devices.
  - B. Fire alarm system wiring which is exposed, concealed in inaccessible locations, wired between floors or wired between building smoke compartments shall be installed in an approved raceway. Fire alarm wiring routed horizontally in concealed accessible locations may be installed without conduit, using approved plenum rated fire alarm cable, if allowed by Code and local Fire Marshal.
  - C. Fire alarm system wiring shall be multiconductor, UL-listed FLP for limited energy (300 volt) and fire alarm applications, and NEC approved fire alarm cable. Wiring shall be installed in accordance with NEC, local codes, Article 210 of NFPA Standard 72, and manufacturer's recommendations. Wiring shall be copper.
  - D. Fire alarm system wiring shall be color coded.
  - E. Fire alarm system junction boxes, including covers, shall be secured, painted red and marked in white lettering.
  - F. Wire size shall be determined by calculated voltage drop and circuit loading. Minimum wire size shall be as follows
    1. #18 AWG twisted and shielded for data circuits.
    2. #18 AWG for nondata and communications initiating and low voltage auxiliary control circuits.
    3. #16 AWG twisted for alarm circuits.
    4. #14 AWG for power circuits.
  - G. Maximum voltage drop in notification circuit shall be 10% or as recommended by manufacturer, whichever is smaller.

## PART 3 – EXECUTION

### 3.01 INSPECTION

- A. Installer shall examine the areas and conditions under which the fire alarm system is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

### 3.02 SYSTEM DESIGN

- A. Design and Installation shall meet NFPA 72 and meet California State Fire Marshal approval. Work or additional devices, equipment or wiring is required to comply with State Fire Marshal's requirements shall be included in contractor's bid.

### 3.03 PROGRAMMING

- A. General: The manufacturer shall provide and install a menu driven software package, and shall provide required programming of the system, including digitized voice alarms, graphic and action messages. Map and report formatting will be part of the software package. The software programming shall provide clear decision-making displays and text during critical alarm conditions that will allow the operator to make simple decisions during a crisis.

### 3.04 INSTALLATION

- A. General: Install system and materials in accordance with manufacturer's instructions. Install electrical work and use electrical products complying with the requirements of the applicable Division 26 sections of these Specifications. Wiring: Wiring shall be in accordance with current NFPA 72, the National Electrical Code, California Electrical Codes, and Article 760 of NFPA Standard 70. Wiring sizes shall conform to recommendations of the equipment manufacturer.
  - 1. Install fire alarm system line voltage and low-voltage wiring in a suitable raceway. Conceal fire alarm system conduit except in mechanical rooms and areas where other conduit and piping are exposed. Fasten flexible conductors, which bridge cabinets and doors, neatly along hinge side and protect against abrasion. Tie and support the conductors neatly.
  - 2. Wiring shall be run in a supervised fashion (i.e. no branch wiring or dog-legged wiring) per NFPA requirements. Intelligent SLC loops may be T-tapped/branch wired due to inherent dynamic supervision.
  - 3. Wiring splices shall be kept to a minimum with required splices to be made in designated terminal boxes or at field device junction boxes. Transposing or color code changes of wiring will not be permitted. End-of-line supervisory devices shall be installed with the last device on the respective circuit. Said device shall be appropriately marked designating it as the terminating device on the respective circuit.
  - 4. No AC wiring or other wiring shall be run on the same conduit as fire alarm wiring.
  - 5. Number code and color code conductors appropriately and permanently for future identification and servicing of the system.
- B. Conduit/Raceway: Refer to paragraph 2.15 (System Wiring) for allowed wiring.
  - 1. Conduit and raceway system shall be installed as specified under Section 26 05 00 Specification.
  - 2. Minimum conduit size shall be ¾" EMT. Maximum conduit "fill" shall not exceed 40%.

3. Systems utilizing open wiring techniques with low smoke plenum cable shall provide conduit in inaccessible locations, inside concealed walls, mechanical/electrical rooms, or other areas where wiring might be exposed and subject to damage.
  4. Vertical wiring and main trunk/riser wiring shall be installed in a complete raceway/conduit system. Riser Boxes shall be adequately sized for the number of conductors transversing the respective box as well as the number of terminations required.
- C. Checkout: Check wiring to ensure that wiring is in accordance with the system manufacturer's wiring diagrams and that the system is free of open circuits, short circuits, and grounds.
- D. Identification: Refer to Section 26 05 00 for additional requirements concerning painting, nameplates and labeling.

### 3.05 COORDINATION

- A. It shall be the responsibility of the installing contractor to coordinate requirements surrounding installation of the fire alarm system with other trades. Adequate coordination shall be provided to ensure proper installation and interface to peripheral items required to interact with the fire alarm to provide a complete and functional life safety system.
- B. The installing contractor shall be fully responsible for coordinating system and device messages and system operation with the Owner's Representatives and Operating Personnel.

### 3.06 SYSTEM CHECKOUT AND TEST

- A. Final control panel connections shall be made by a state licensed, factory-trained technical representative of the manufacturer and who shall supervise a System Checkout and Test to demonstrate and confirm to the Engineer, Owner's Representative and the fire department, that the fire alarm system is 100% operational upon completion of the installation and certification of the system, and that it complies with local code requirements and these specifications. It is intended that the System Checkout and Test be followed by a continuing program of inspection testing and maintenance.
- B. The Contractor shall provide to the Owner a Maintenance, Inspection and Quarterly Testing Contract in compliance with NFPA 72H, upon completion and system checkout.
- C. The System Checkout and Test shall be performed within 30 days after the fire alarm installation and peripheral systems are completed. The System Checkout and Test shall be performed by a minimum of two licensed fire alarm technicians, one of which is licensed by the State, and acceptable to the Engineer and the authority having jurisdiction. The test shall be performed in two parts and two-way radios for use by the test observers shall be provided. The first part shall be a full dry-run test with subcontractors present, but without the Owner's Representative or fire department present. After the dry-run test is successfully completed, then the final test with the Owner's Representative and fire department present shall be performed.
- D. The Contractor shall coordinate the test schedule with necessary parties and subcontractors required to be present for a complete and functional test.
- E. The System Checkout and Test which is a comprehensive 100% inspection and test of fire alarm system equipment and shall include, but not be limited to the following
1. Fire Alarm Control Equipment
    - a. A visual and functional test of fire alarm control and auxiliary control equipment.
    - b. A visual inspection shall be conducted to establish that electrical connections and equipment as required are properly installed and operating.

- c. A remote functional fault simulation test shall be conducted on relevant field wiring terminations to ensure that wiring is properly supervised as required.
  - d. Indicators shall be tested to ensure proper function and operation.
  - e. Device messages shall be verified to be correct, as installed.
  - f. System auxiliary functions including, but not limited to, elevator recall, HVAC equipment control and shutdown, and other specified control functions shall be functionally tested to verify proper operation and proper system messages.
  - g. Control panel supervisory and alarm current readings shall be taken to verify that the control panel has the appropriate power supplies and standby batteries to operate the system as required. A 3 minute general alarm stress test both under ac power and standby power shall be conducted to further ensure complete operation of the system.
  - h. The alarm signaling shall be visually and functionally tested to verify proper operation. Alarm device zoning shall be verified and automatic operation of the alarm signaling system shall be fully verified. Self-monitoring functions of the alarm signaling system shall be verified.
- 2. Annunciators: Annunciators shall be tested to ensure that each point activates properly and is labeling correctly.
  - 3. Fire Alarm Peripheral Devices: Fire alarm peripheral devices shall be functionally tested and the location and testing information recorded for each device.
  - 4. Initiating Devices (Manual and Automatic)
    - a. Manual and automatic initiating devices shall be inspected to ensure proper placement and mounting as recommended by the manufacturer and as indicated in these specifications.
    - b. Manual fire alarm stations and automatic initiating devices (smoke detectors, heat detectors, waterflow switches, etc.) shall be functionally tested for alarm operation.
    - c. A minimum of 10% of initiating devices shall be functionally tested for proper wiring supervision. Failure of tested device on zone shall require that devices in that zone shall be tested for supervision.
  - 5. Alarm Signaling Devices
    - a. Visual alarm indicators and exit sign flashing shall be functionally tested to ensure proper operation and that they are clearly visible.
    - b. Alarm signaling devices shall be field-checked and tested for proper operation and output.
    - c. Decibel reading shall be taken to ensure that the alarm signal level can be clearly heard in areas of the facility, if required by the authority having jurisdiction. Additional devices may be required to provide adequate sound penetration (or as required by the local authority having jurisdiction). Contractor shall provide a unit price for such devices should they be required.
    - d. A minimum of 10% of the alarm signaling device shall be functionally tested for proper wiring supervision.
  - 6. Reporting



- a. Upon completion of the 100% System Checkout and Test, four copies of the final report shall be documented, certified, and sent to the Engineer for distribution to the Owner to authorized Owner's Representative indicating that fire alarm equipment has been tested and is 100% operational.
- b. The final report shall be generated by the equipment manufacturer's headquarters or authorized representative to ensure integrity and uniformity of testing information, stating the precise location and operational status of each and every peripheral device and shall include a Fire Alarm System Certification and Description Document per NFPA 72.
- c. The 100% System Checkout and Test shall be performed by factory-trained representatives, and one of the individuals shall possess a state license for fire alarm installation supervision.

### 3.07 TRAINING

- A. Upon completion of the installation, the equipment manufacturer shall furnish his services for a period of 8 hours of demonstration and training in the use of the system and its connected equipment. The 8 hour training period shall consist of operations and trouble shooting and technical trouble shooting of the fire alarm panel and system. Training shall be provided at the site. Owner to advise.

### 3.08 AS-BUILT/RECORD DRAWINGS

- A. Two sets of manuals and as-built drawings shall be provided by the Contactor. The as-built drawings shall include a reproducible drawing and two copies of each as-built drawing. The drawings and manuals shall be used in the training sessions. At this time, manuals describing the system equipment, as-built wiring diagrams, system keys, and certification of a 100% system audit will be delivered to the Owner. Record drawings shall include, but not be limited to:
  1. As-built wiring and conduit layout diagrams incorporating wire color code and/or label numbers and showing interconnections in the system.
  2. Actual locations of each input and output circuit termination, the identification marking of each circuit and the address of each device. Provide an input/output assignment chart. A unique identification number shall be assigned to each alarm initiating device. Identification should be by zone number and device number within the zone. This number shall be noted on the record drawing and also be permanently mounted adjacent to the device or its mounting base. Markings with felt-tip pens will not be acceptable.
  3. As-built schematic wiring diagrams of control panels, modules, annunciators and communications panels.
  4. As-built heat and smoke detector location drawings showing location dimension of each detector and alarm box.
  5. Copies of the manufacturer's technical literature on major parts of the system including detectors, manual stations, signaling appliances, alarm panels, communication panels and equipment and power supplies.
  6. Completed Fire Alarm System Certification and Description requirements.

### 3.09 OPERATING AND MAINTENANCE DATA

- A. The manufacturer's authorized representative shall instruct the Owner's designated employees in the proper operation of the system and required periodic maintenance. This instruction will include three copies of a written summary in booklet or binder form so employees can retain for future reference. Basic operating instructions for the system shall be framed and mounted at the main control unit. Refer to Section 26 0500 for additional requirements.

### 3.10 WARRANTY

- A. The fire alarm and security systems shall be warranted against defects in workmanship and materials, under normal use and service, for a period of 1 year from the date of acceptance by the Owner. Equipment shown to be defective shall be repaired, replaced or adjusted free of charge.
- B. The warranty period shall begin after successful completion of the Owner's inspections and tests. In the event of system malfunctions or nuisance alarms, the Contractor will take appropriate corrective action. This action may necessitate a repeat of the response test if the Owner so desires. Continued improper performance during warranty shall be cause to require the Contractor to remove the system.

END OF SECTION

# ES-200X

## Intelligent Addressable FACP with Communicator



### Addressable Fire Alarm Control Panels

#### General

The **ES-200X** is the latest intelligent addressable Fire Alarm Control Panel (FACP) from Fire•Lite Alarms and is a direct replacement for the MS-9200UDLS. The ES-200X comes with a pre-installed communicator and supports up to 198 addressable devices (99 detectors and 99 modules). With an extensive list of powerful features, the ES-200X programs just like Fire•Lite's other addressable products, yet fits into applications previously served only by conventional panels.

The pre-installed IPOTS-COM is a dual technology (POTS and IP) communicator. The POTS transmits system status (alarms, troubles, AC loss, etc.) to a Central Station via the public switched telephone network. The IP communicator's internet monitoring capability sends alarm signals over the Internet saving the monthly cost of two dedicated business telephone lines. Although not required, the secondary telephone line may be retained providing backup communication over the public switched telephone line. Optional cellular reporting is available using the CELL-MOD or CELL-CAB-FL.

Remote and local programming of the control panel is possible using the FS-Tools Upload/Download utility. Programming databases can be uploaded/downloaded via the panel's USB port (and USB cable) or via an ethernet connection using the IPOTS-COM communicator. The USB port also allows for the download or upload of the entire program, history file, walk-test data, current status and system voltages by means of a USB flash drive.

The power supply and all electronics are contained on a circuit board supported on a new quick install chassis and housed in a metal cabinet. Available accessories include local and remote upload/download software, remote annunciators, and reverse polarity/city box transmitter (4XTMF).

#### Features

- Listed to UL Standard 864, 10th edition
- Pre-installed IPOTS-COM Ethernet IP and POTS (Plain Old Telephone Service) Central Station Communicator over AlarmNet
- Optional CELL-MOD or CELL-CAB-FL GSM Central Station Communicator over AlarmNet®
- Automated activation of the ECC-50/100 Emergency Command Center
- ECC-FFT Firefighter Telephone option
- Compatible with SWIFT® wireless devices
- Auto-programming (learn mode) reduces installation time. Reports two devices set to the same address
- Four built-in, independently programmable Style Z (Class A) or Style Y (Class B) NAC circuits
- Selectable strobe synchronization for System Sensor, Wheelock, and Gentex devices
- Notification Appliance Circuit End of Line resistor matching
- Four programmable function keys for ease of maintenance
- Two programmable relays and one fixed trouble relay
- Built-in Programmer
- Integral 80-character LCD display with backlighting
- Real-time clock/calendar with automatic daylight savings control
- History file with 1,000 event capacity
- Addressable sounder base compatibility
- Multi-criteria detector (smoke, heat, CO) with programmable response
- Control module delay timer
- Automatic detector sensitivity testing (NFPA 72 compliant)
- Automatic device type-code verification
- Point trouble identification
- Waterflow selection per module point



- Alarm verification selection per detector point
- Maintenance alert warns when smoke detector dust accumulation is excessive
- One-person audible or silent walk test with walk-test log and printout
- System alarm verification selection per detector point
- PAS (Positive Alarm Sequence) and Pre-signal per point (NFPA 72 compliant)
- Up to 16 ANN-BUS annunciators- 8 per each ANN-Bus
- Remote Acknowledge, Alarm Silence, Reset and Drill via addressable modules or remote annunciator
- Upload/Download of program and data via USB with optional FS-Tools Programming Utility

#### SLC COMMUNICATION LOOP

- Supports LiteSpeed™ and CLIP protocols
- SLC operates up to 10,000 ft. (3,000 m) in LiteSpeed mode with twisted, unshielded wire
- Single addressable SLC loop which meets NFPA Class B and Class A requirements
- 198 addressable device capacity (99 addressable detectors and 99 modules)
- Compatible with Fire•Lite's addressable devices (refer to the *SLC Wiring Manual*)

#### NOTIFICATION APPLIANCE CIRCUITS (NACS)

- Four independently programmable output circuits. Circuits can be configured for the following outputs:

– **Style Y** (Class B)

– **Style Z** (Class A)

- Silence Inhibit and Autosilence timer options
- Continuous, March Time, Temporal, or California code for main circuit board NACs with two-stage capability
- Selectable strobe synchronization per NAC
- 2.5 A special application, 250mA regulated, total power for NACs

**NOTE:** Maximum or total 24VDC system power shared between all NAC circuits and the ANN-BUS is 2.7 A

## PROGRAMMING AND SOFTWARE

- Autoprogramming (learn mode) reduces installation time
- Custom English labels (per point) may be manually entered or selected from an internal library file
- Two programmable Form-C relay outputs
- 99 software zones
- Continuous fire protection during online programming
- Program Check automatically catches common errors not linked to any zone or input point
- **OFFLINE PROGRAMMING:** Create the entire program in your office using FS-Tools, a Windows®-based software package, and upload/download system programming locally. Offline programming requires an ethernet connection. FS-Tools is available on [www.firelite.com](http://www.firelite.com).

## User interface

### LED INDICATORS

- Fire Alarm (red)
- CO Alarm (red)
- AC Power (green)
- Supervisory (yellow)
- Trouble (yellow)
- Ground fault (yellow)
- Battery fault (yellow)
- Disabled (yellow)
- Maintenance (yellow)
- Communication (yellow)
- Alarm Silenced (yellow)
- F1-F4 Programmable Function Keys (yellow)

### KEYPAD

- 16 key alpha-numeric pad
- Acknowledge
- Alarm Silence
- Drill (Manual Evacuate)
- Four (4) programmable function keys
- Reset (lamp test)

## PRODUCT LINE INFORMATION

**ES-200X:** Addressable Fire Alarm Control Panel with one SLC loop. Includes main circuit board with display, pre-installed communicator, chassis with transformer, backbox with door, plastic bag containing screws, cables, key, etc. (For ES-200XC, refer to DF-60958.)

**FS-Tools:** Programming software for Windows®-based PC computer. Available for download at [www.firelite.com](http://www.firelite.com).

**CELL-CAB-FL/CELL-MOD:** Optional GSM communicators.

**IPOTS-COM:** Dual technology (POTS and IP) communicator. (replacement board)

**DP-ES-R:** Optional dress panel for the ES-200X.

**TR-CE:** Optional trim ring for semi-flush mounting.

**BB-2F:** Optional cabinet for one or two modules.

**BB-6F:** Optional cabinet for up to six modules mounted on CHS-6 chassis.

**BB-26:** Battery backbox, holds up to two 25 AH batteries and CHG-75.

**BB-55F:** Battery box, houses two 55 AH batteries

**CHS-6:** Chassis, mounts up to six multi-modules in a BB-6F cabinet.

**CHG-75:** Battery charger for lead-acid batteries with a rating of 25 to 75 AH.

**CHG-120F:** Remote battery charging system for lead-acid batteries with a rating of 55 to 120 AH. Requires additional BB-55F for mounting.

**BAT Series:** Batteries, see data sheet DF-52397.

**PRN Series:** UL listed compatible event printer. Uses tractor-fed paper.

## OPTIONAL MODULES

**4XTMF Reverse Polarity Transmitter Module:** Provides a supervised output for local energy municipal box transmitter, alarm and trouble. Includes a disable switch and disable trouble LED.

**PWRMOD24 Power Expander Module:** Optional power module. Increases alarm power output to 6 amps.

## COMPATIBLE ANNUNCIATORS

**ANN-80:** Remote LCD annunciator mimics the information displayed on the FACP LCD display. Recommended wire type is unshielded.

**ANN-100:** Remote LCD annunciator mimics the information displayed on the FACP LCD display. Recommended wire type is unshielded. For use in FM applications only.

**ANN-I/O:** LED Driver Module provides connections to a user supplied graphic annunciator. (See DF-52430.)

**ANN-LED:** Annunciator Module provides three LEDs for each zone: Alarm, Trouble, and Supervisory. Ships with red enclosure. (See DF-60241.)

**ANN-RLED:** Provides alarm (red) indicators for up to 30 input zones or addressable points. (See DF-60241.)

**ANN-RLY:** Relay Module provides 10 programmable Form-C relays. Can be mounted inside the cabinet. (See DF-52431.)

**ANN-S/PG:** Serial/Parallel Printer Gateway module provides a connection for a serial or parallel printer. (See DF-52429.)

## ADDRESSABLE DEVICES

*All feature a polling LED and rotary switches for addressing.*

**SD365:** Addressable low-profile photoelectric smoke detector. LiteSpeed only.

**SD365-IV:** Addressable low-profile photoelectric smoke detector. Ivory. LiteSpeed and CLIP mode.

**SD365T:** Addressable low-profile photoelectric smoke detector with thermal sensor. LiteSpeed only.

**SD365T-IV:** Addressable low-profile photoelectric smoke detector with thermal sensor. Ivory. LiteSpeed and CLIP mode.

**SD365R:** Remote test capable addressable photoelectric smoke detector for use with DNR(W) duct detector housing. LiteSpeed only.

**SD365R-IV:** Remote test capable addressable photoelectric smoke detector for use with DNR(W) duct detector housing. Ivory. LiteSpeed and CLIP mode.

**H365:** Low-profile 135°F fixed thermal sensor. LiteSpeed only.

**H365-IV:** Low-profile 135°F fixed thermal sensor. Ivory. LiteSpeed and CLIP mode.

**H365R:** Low-profile, intelligent, rate-of-rise thermal sensor. LiteSpeed only.

**H365R-IV:** Low-profile, intelligent, rate-of-rise thermal sensor. Ivory. LiteSpeed and CLIP mode.

**H365HT:** Low-profile intelligent 190°F/88°C fixed thermal sensor. LiteSpeed only.

**H365HT-IV:** Low-profile intelligent 190°F/88°C fixed thermal sensor. Ivory. LiteSpeed and CLIP mode.

## Legacy Devices

**CP355:** Addressable low-profile ionization smoke detector.

**SD355:** Addressable low-profile photoelectric smoke detector.

**SD355T:** Addressable low-profile photoelectric smoke detector with thermal sensor.

**SD355R:** Remote test capable addressable photoelectric smoke detector for use with DNR(W) duct detector housing.

**SD355CO:** Addressable, low-profile device that provides fire, heat, and carbon monoxide (CO) detection.

**H355:** Fast-response, low-profile heat detector.

**H355R:** Fast-response, low-profile heat detector with rate-of-rise option.

**H355HT:** Fast-response, low-profile heat detector that activates at 190°F/88°C.

**AD355:** Low-profile, intelligent, “Adapt” multi-sensor detector (B350LP base included).

**B200S:** Programmable, addressable sounder base.

**B200SR:** Addressable sounder base.

**BEAM355:** Intelligent beam smoke detector.

**BEAM355S:** Intelligent beam smoke detector with integral sensitivity test.

**D355PL:** InnovairFlex low-flow non-relay duct-detector housing; includes SD355R.

**DNR:** InnovairFlex low-flow non-relay duct-detector housing. (Order SD355R/SD365R separately.)

**DNRW:** InnovairFlex low-flow non-relay duct-detector housing, with NEMA-4 rating. Watertight. (Order SD355R/SD365R separately.)

### **Addressable Modules**

**MMF-300:** Addressable Monitor Module for one zone of normally-open dry-contact initiating devices. Mounts in standard 4.0" (10.16 cm.) box. Includes plastic cover plate and end-of-line resistor. Module may be configured for either a Style B (Class B) or Style D (Class A) IDC.

**MDF-300:** Dual Monitor Module. Same as MMF-300 except it provides two Style B (Class B) only IDCs.

**MMF-301:** Miniature version of MMF-300. Excludes LED and Style D option. Connects with wire pigtails. May mount in device backbox.

**MMF-302:** Similar to MMF-300. Addressable Monitor Module for one zone of conventional two-wire detectors. Requires resettable 24 VDC power. Refer to the *Device Compatibility Document* for listed compatible devices and quantity limitation.

**CMF-300:** Addressable Control Module for one Style Y/Z (Class B/A) zone of supervised polarized Notification Appliances. Mounts directly to a 4.0" (10.16 cm.) electrical box. NAC option requires external 24 VDC to power notification appliances.

**CRF-300:** Addressable relay module containing two isolated sets of Form-C contacts, which operate as a DPDT switch. Mounts directly to a 4.0" (10.16 cm.) box, surface mount using the SMB500.

**BG-12LX:** Addressable manual pull station with interface module mounted inside.

**I300:** This module isolates the SLC loop from short circuit conditions (required for Style 6 or 7 operation).

**ISO-6:** Six-fault isolator module. Mount one or two modules in a BB-2F cabinet (optional). Mount up to six modules on a CHS-6 chassis in a BB-6F cabinet.

**SMB500:** Used to mount all modules except the MMF-301 and M301.

**MMF-300-10:** Ten-input monitor module. Mount one or two modules in a BB-2F cabinet (optional). Mount up to six modules on a CHS-6 chassis in a BB-6F cabinet.

**MMF-302-6:** Six-zone interface module. Mount one or two modules in a BB-2F cabinet (optional). Mount up to six modules on a CHS-6 chassis in a BB-6F cabinet.

**CMF-300-6:** Six-circuit supervised control module. Mount one or two modules in a BB-2F cabinet (optional). Mount up to six modules on a CHS-6 chassis in a BB-6F cabinet.

**CRF-300-6:** Six-relay control module (Form-C relays). Mount one or two modules in a BB-2F cabinet (optional). Mount up to six modules on a CHS-6 chassis in a BB-6F cabinet.

## **SWIFT Wireless Devices**

**W-GATE:** LiteSpeed Wireless Gateway

**W-SD355:** LiteSpeed intelligent, wireless photo detector.

**W-H355R:** LiteSpeed intelligent wireless rate of rise (135°) heat detector.

**W-SD355T:** Intelligent wireless photo/heat detector.

**W-H355:** LiteSpeed intelligent wireless fixed-temperature (135°) heat detector.

**W-MMF:** LiteSpeed Intelligent wireless monitor module.

**W-CRF:** LiteSpeed Intelligent wireless relay module.

**W-BG12LX:** LiteSpeed Intelligent wireless pull station.

**WAV-RL, WAV-WL, WAV-CRL, WAV-CWL:** LiteSpeed Intelligent AV bases.

**W-USB:** Wireless USB radio/antenna dongle that plugs into the USB port of a PC running SWIFT Tools.

**SWIFT Tools:** Programming and diagnostic utility for the Wireless Gateway and devices. Available for download from firelite.com.

**NOTE:** For more information on Compatible Addressable Devices for use with the ES-200X, see the following data sheets (document numbers): SD365 Series (DF-61010), H365 Series (DF-61011), AD355 (DF-52386), BG-12LX (DF-52013), CMF-300-6 (DF-52365), CRF-300-6 (DF-52374), CMF/CRF Series (DF-52130), CP355 (DF-52383), H355 Series (DF-52385), I300 (DF-52389), ISO-6 (DF-60485), MMF-300 Series/MDF-300 (DF-52121), MMF-300-10 (DF-52347), MMF-302-6 (DF-52356), SD355/SD355T (DF-52384), and SLC Wiring Manual (51309).

**NOTE:** Legacy 300 Series detection devices such as the CP300/CP350, SD300(T)/SD350(T) and older modules such as the M300, M301, M302, C304, and BG-10LX are not compatible with LiteSpeed polling. If the SLC contains one of these devices, polling must be set for standard CLIP protocol. Please consult factory for further information on previous 300 Series devices.

## **ADDRESSABLE DEVICE ACCESSORIES**

**End-of-Line Resistor Assembly (R-47K and R-3.9K):** The 47k ohm assembly supervises the MMF-300, MDF-300, MMF-301, and CMF-300 module circuits. The 3.9k ohm assembly supervises the MMF-302 module circuit. These resistors are included with each module.

**Power Supervision Relay:** Supervises the power to 4-wire smoke detectors and notification appliances.

## **Wiring Requirements**

While shielded wire is not required, it is recommended that all SLC wiring be twisted-pair to minimize the effects of electrical interference. Refer to the panel manual for wiring details.



# SYSTEM SPECIFICATIONS

## System Capacity

- Intelligent Signaling Line Circuits..... 1
- Addressable device capacity ..... 198
- Programmable software zones ..... 99
- Annunciators..... 16

## Electrical Specifications

**AC Power:** Operates in either 120 or 240 VAC, 50/60 Hz, 3.25 A, auto-sensing- no switch required. Wire size: minimum 14 AWG (2.00 mm<sup>2</sup>) with 600 V insulation. Nonpower-limited, supervised.

**Battery:** Two 12 V 18 AH lead-acid batteries. Battery Charger Capacity: 7-18 AH (ES-200X cabinet holds maximum of two 18 AH batteries.)

**Communication Loop:** Supervised and power-limited.

**Notification Appliance Circuits:** Terminal Block provides connections for four NACs, Style Y (Class B) or Style Z (Class A). Special Application power. Power-limited, supervised circuitry. Maximum signaling current per circuit: 2.5 amps special application, 250mA regulated. End-of-Line Resistor: 4.7k ohm, ½ watt (P/N 71252 UL listed) for Style Y (Class B) NAC; system capable of 1.9 kΩ - 22 kΩ ELR range. Refer to the *Fire•Lite Device Compatibility Document* for listed compatible devices.

**Two Programmable Relays and One Fixed Trouble Relay:** Contact rating: 2.0 A @ 30 VDC (resistive), 0.5 A @ 30 VAC (resistive). Form-C relays, non-power-limited, non-supervised.

## Cabinet Specifications

**Door:** 19.26" (48.92 cm.) high x 16.82" (42.73 cm.) wide x 0.72" (1.82 cm.) deep. **Backbox:** 19.00" (48.26 cm.) high x 16.65" (42.29 cm.) wide x 5.25" (13.34 cm.) deep. **Trim Ring (TR-CE):** 22.00" (55.88 cm.) high x 19.65" (49.91 cm.) wide.

## Shipping Specifications

**Weight:** 26.9 lbs. (12.20 kg.) **Dimensions:** 20.00" (50.80 cm.) high x 22.5" (57.15 cm.) wide x 8.5" (21.59 cm.) deep.

## Temperature and Humidity Ranges

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

## NFPA Standards

The ES-200X complies with the following NFPA 72 Fire Alarm Systems requirements:

- **LOCAL** (Automatic, Manual, Waterflow and Sprinkler Supervisory).
- **AUXILIARY** (Automatic, Manual and Waterflow) (requires 4XTMF).
- **REMOTE STATION** (Automatic, Manual and Waterflow) (Where a DACT is not accepted, the alarm, trouble and supervisory relays may be connected to UL 864 listed transmitters. For reverse polarity signaling of alarm and trouble, 4XTMF is required.)
- **PROPRIETARY** (Automatic, Manual and Waterflow).
- **CENTRAL STATION** (Automatic, Manual and Waterflow, and Sprinkler Supervised).
- **OT, PSDN** (Other Technologies, Packet-switched Data Network)
- **IBC 2012, IBC 2009, IBC 2006, IBC 2003, IBC 2000** (Seismic).
- **CBC 2007** (Seismic)

## Agency Listings and Approvals

The listings and approvals below apply to the basic ES-200X control panel. In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL:** S624
- **FM approved**
- **CSFM:** 7165-0075:500
- **FDNY:** COA #6261

**NOTE:** See DF-60958 for ULC-listed model.

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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 more information, contact Fire•Lite Alarms. Phone: (800) 627-3473, FAX: (877) 699-4105.  
www.firelite.com



Country of Origin: USA

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



# LISTING SERVICE

**LISTING No.** 7165-0075:0500

Page 1 of 2

**CATEGORY:** 7165 -- FIRE ALARM CONTROL UNIT (COMMERCIAL)

**LISTEE:** FIRE-LITE ALARMS INC. One Fire-Lite Place, Northford, CT 06410-1653  
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309  
Email: [megan.sisson@honeywell.com](mailto:megan.sisson@honeywell.com)

**DESIGN:** Models ES-50X and **ES-200X Addressable Fire Alarm Control** Units. Automatic, manual, waterflow, sprinkler supervisory, local, remote station (PPU), and central station (PPU) services. The ES-50X is a compact version of the ES-200X. The ES-50X has 50 addressable device capability and 2 Notification Appliance Circuits with a 3.0 amps total 24VDC output in Alarm. The ES-200X has 198 addressable device capability and 4 Notification Appliance Circuits with 3.0amps total 24VDC output in Alarm expandable to 6.0amps with Model PWRMOD24. The Model IPOTS-COM provides Phone and IP communication. \*The CELL-MODE has the option to be configured by a compatible control unit for the following pathways: Cellular only without a backup path, primary Cellular communication path, or secondary Cellular communication path.

Models ES-50X and ES-200X system components are as follows:

IPOTS-COM	POTS and IP Communicator
4XTMF	Transmitter Module
ANN-80	Remote Annunciator Module
ANN-100	Remote Annunciator Module
ANN-I/O	LED Driver Module
ANN-S/PG	Serial/Parallel Interface Module
ANN-RLY	Form-C Relay Module
ANN-LED	Annunciator Module
ANN-RLED	Annunciator Module
CELL-MOD	GSM Communicator
DP-ES-R	Dress Panel

Model ES-200X system components are as follows:

PWRMOD24 NAC Power Expander Module

Refer to the listee's data sheet for additional detailed product description and operational considerations.

**RATING:** 120/240Vac 50/60Hz

\*Rev 10-01-19 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, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO, M.E., F.P.E., Program Coordinator**  
*Fire Engineering Division*

- 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 fire alarm control units, emergency alarm system control units and process management equipment for use with separately listed compatible initiating and indicating devices. Refer to Manufacturers Installation Instruction Manual for details.
- NOTE:** For Fire Alarm Verification Feature (Delay of fire alarm), the maximum Retard/Reset/Restart period must be adjusted to 30 seconds or less.

\*Rev 10-01-19 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, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO, M.E., F.P.E., Program Coordinator**  
*Fire Engineering Division*



# ECC-50/100(E)

## Emergency Command Center



### Emergency Communications

#### General

Fire-Lite's ECC-50/100 and ECC-50/100E are multipurpose emergency voice evacuation panels for fire applications, mass notification applications, or both. The Primary Operating Consoles (POCs) deliver 50 or 100 watts of audio power for distribution to up to eight speaker circuits (i.e. zones). The ECC-50/100(E) comes standard with a single speaker circuit and a built-in 25Vrms, 50 watt amplifier. A secondary 50 watt amplifier (ECC-50W-25/70V) can be added for single speaker circuit backup or to increase system capacity to two speaker circuits and an additional 50 watts of audio power. An optional ECC-CE6 module added to the ECC-50/100(E) will upgrade the system to a maximum of eight speaker circuit outputs. All speaker output circuits can be wired in either Style Y (Class B) or Style Z (Class A) configuration. The ECC-50/100(E) has fourteen field programmable messages (up to 60 seconds each), built-in field configurable pre- and post-announce tone generators and a fully supervised Notification Appliance Circuit (NAC) with 2.0 amps of synchronized NAC power. The ECC-50/100(E) includes three built-in Form-C relay contacts, (AC power, trouble and MNS active) a NAC follower input for triggering the on board NAC circuit and 500mA special application power. A built-in power supply with switch mode technology delivers operational power to the panel and an onboard battery charger supports charging up to 26AH batteries (ECC cabinet holds up to 18AH batteries).

For fire protection applications, the ECC-50/100(E) is an adjunct (slave) to any UL listed FACP, providing reverse polarity or contact closure; can be used as a stand-alone unit for non-fire applications. For seamless integration between fire and mass notification, the ECC-50/100(E) can be directly activated via serial communication between the ES-200X, MS-9600(UD)LS, or MS-9200UDLS. Activation of the ECC-50/100(E) via other FACPs uses the eight on board Command Input Circuits (CMDs). Two of the eight CMD circuits (CMD 1 & CMD 2) can be individually field programmed for activation by an FACP Notification Appliance Circuit reverse polarity and all eight can be activated by a contact closure. In addition, the ECC-50/100(E) can be activated from a building's Private Branch Exchange (PBX) with the integral night ring feature.

All ECC-50/100(E) programming is done by using a simple, built-in programming utility accessed from any laptop. For added flexibility, the ECC-50/100(E) supports both 25Vrms and 70.7Vrms speaker output operation. By adding a 70V transformer conversion module (ECC-XRM-70V) or an additional 70.7 volt secondary amplifier (ECC-50W-25/70V) the system supports 70.7 volt speaker devices.

The ECC-50/100(E) can expand in order to accommodate larger or more complex installations. To add more control and increase system capacity, any combination of up to eight external remote consoles (including the ECC-LOC, ECC-RPU, and ECC-RM) and up to eight distributed audio amplifiers (including the ECC-50DA(E), ECC-50BDA and ECC-125-DA(E)) can be connected on the external data bus and audio riser data bus to create a fully integrated command center. A fully loaded system supports up to 1100 watts of total audio power and up to 24 speaker circuit outputs.

#### TYPICAL APPLICATIONS

- Schools
- Healthcare Facilities
- Factories
- Theaters
- Military facilities
- Restaurants
- Auditoriums
- Places of Worship
- Office Buildings
- Dormitories



#### Features

- UL Listed to UL 2572 Communication (Control Units Mass Notification Systems) and UL 864 (emergency voice evacuation for fire)
- Modular design for system flexibility and easy expansion
- Removable terminal blocks for ease of servicing and module replacement
- 50 watts of 25V audio power (expandable to 100 watts) RMS
- 2 amp Notification Appliance Circuit (NAC) output, sync generator, or follower for System Sensor, Wheelock or Gentex protocols
- Optional 70.7VRMS conversion transformer available for the primary amplifier. (Note that speaker wiring continues to be supervised in standby, alarm and when background music is playing with this optional transformer installed)
- Eight Command Input Circuits to activate messages 1 to 8:
  - CMD1 and CMD2 are field selectable to be activated from 12 or 24 VDC Notification Appliance Circuits (reverse polarity) or contact closures
  - CMD3-CMD8 are activated by contact closures
- Speaker Circuits
  - Single Style Y (Class B) or Style Z (Class A) speaker Circuit
  - Two Style Y (Class B) or Style Z (Class A) speaker circuits (with optional ECC-50W-25/70V Audio Amplifier installed)
  - Eight Style Y (Class B) or Style Z (Class A) speaker circuits (with optional ECC-50W-25/70V and ECC-CE6 installed)
- 520Hz square wave tones available, which can be uploaded to the ECC-50/100 to meet NFPA Low Frequency requirements (Refer to the Device Compatibility Document 15384 for listed compatible speakers.)
- ECC-50/100(E) can be controlled by an FACP via the ANN/ACS (EIA-485) link. Compatible FACPs include the ES-200X, MS-9600(UD)LS, and MS-9200UDLS

- Certified for seismic applications when used with the appropriate seismic mounting kit
- Integral supervised microphone
- Microphone time-out feature which reverts back to prerecorded message if emergency page exceeds the programmed time
- 14 recorded messages
- Field-selectable message and custom message recording capability using the local microphone, a USB port, or an external audio input
- External Audio Input can be used for background music
- Up to 60 second message duration for all messages
- Integral tone generators field selectable for multiple tone types
- Powered by integral AC power supply or batteries during AC fail
- Programmable delay of immediate, 2 hours or 6 hours reporting of AC Loss
- Piezo sounder for local trouble
- 100 event history log
- Three Form-C relays:
  - AC Power Loss Relay - TB1
  - System Trouble Relay - TB2
  - MNS Active - TB3
- 500mA (0.5A) Special Application (auxiliary power) output for addressable modules when interfaced with compatible addressable FACPs and End-of-Line power supervision relays
- System Status LEDs (*Refer to “Controls and Indicators” in product manual LS10001-000FL-E.*)
- Integral Dress Panel
- Optional TR-CE semi-flush trim ring
- Any combination of up to eight (8) external remote consoles:
  - Optional ECC-RM Remote Microphone (includes cabinet) See DF-60760.
  - Optional ECC-RPU Remote Page Unit (includes cabinet) See DF-60761.
  - Optional ECC-LOC Local operator console (includes cabinet) See DF-60762.
- Any combination of up to eight (8) distributed audio amplifiers:
  - Optional ECC-50DA(E) distributed amplifier, 50 watts. See DF-60763.
  - Optional ECC-125DA(E) distributed amplifier, 125 watts. See DF-60763.
  - Optional ECC-50BDA distributed amplifier with backup, 100 watts. See DF-60760.

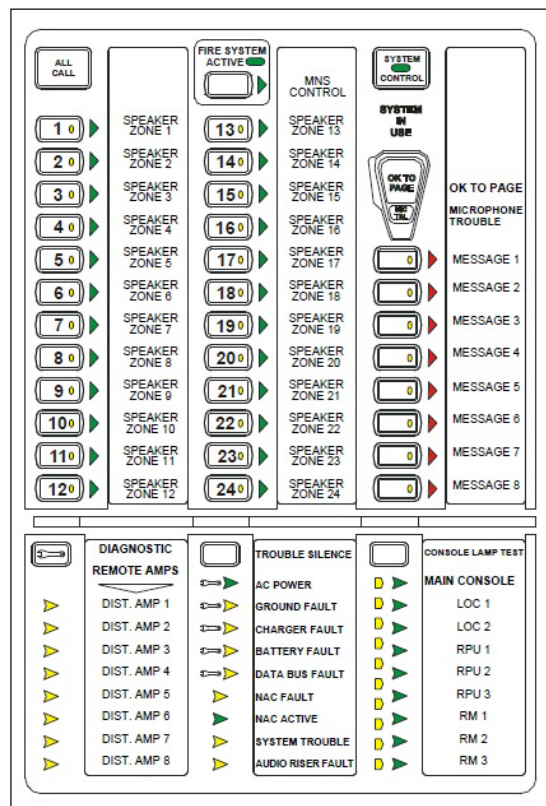
## Optional Internal Expansion Modules

**ECC-CE6:** Circuit Expander Module provides connections for up to six Style Z (Class A) or Style Y (Class B) speaker circuits. Circuits are configured through the web-based programming utility.

**ECC-50W-25V:** 25V, 50 watt audio amplifier module. Adding a second speaker circuit increases the total ECC-50/100 power output to 100 watts or can also be used as a backup amplifier.

**ECC-50W-70V:** 70V, 50 watt audio amplifier module. Adding a second speaker circuit increases the total ECC-50/100 power output to 100 watts or can also be used as a backup amplifier.

**ECC-XRM-70V:** 70V Transformer Conversion Module. Converts the ECC-50/100(E) primary amplifier to a 70V output. This transformer mounts directly to the ECC-50/100(E) main control board by two metal brackets.



## Control and Indicators

### PUSH BUTTON CONTROLS

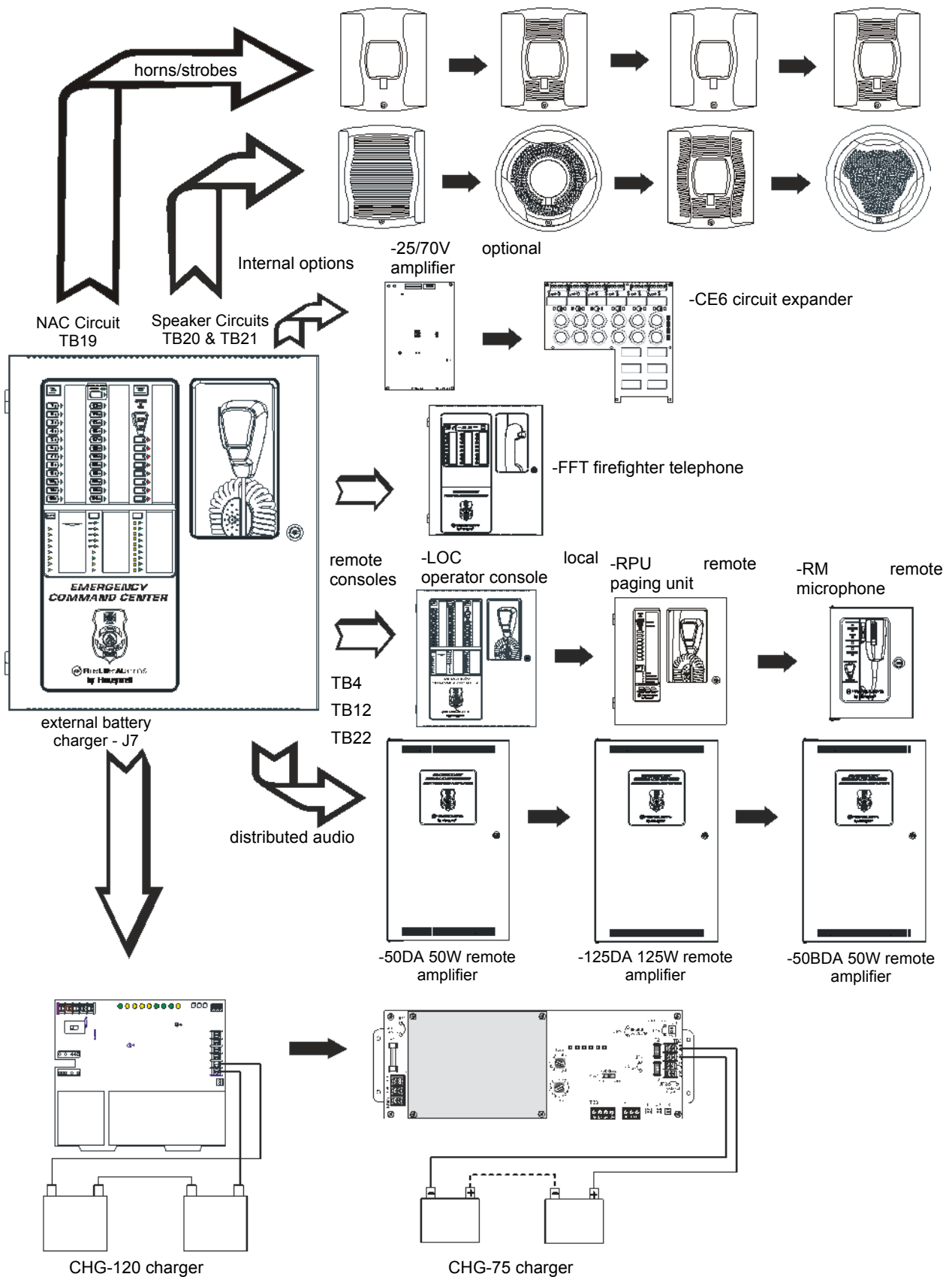
- All Call
- MNS Control
- System Control
- Speaker Select 1-24
- Message Select 1-14
- Diagnostic Select
- Trouble Silence
- Console Lamp Test

### LED Status Indicators (visible with door closed)

- Fire System Active (green)
- MNS Control (green)
- System Control (green)
- System in Use (green)
- Speaker Zone 1-24 Active (green)
- Speaker Zone 1-24 Fault (yellow)
- OK to Page (green)
- Microphone Trouble (yellow)
- Message 1-8 Active (red)
- Message 1-8 Fault (yellow)
- Remote Amplifier 1-8 Fault (yellow)
- LOC/RPU/RM 1-8 Fault (yellow)
- LOC/RPU/RM 1-8 Active (green)
- Main Console Fault (yellow)
- AC Power (green)
- Ground Fault (yellow)
- Charger Fault (yellow)
- Battery Fault (yellow)
- Data Bus Fault (yellow)
- NAC Fault (yellow)
- NAC Active (green)
- System Trouble (yellow)
- Audio Riser Fault (yellow)

### LED Indicators (visible with door and dress panel open)

- Speaker Volume Control Fault (yellow)
- Option Card Fault (yellow)
- Amplifier Over Current Fault (yellow)



## Product Line Information

**ECC-50/100:** (Primary Operating Console) 50 Watt, 25VRMS single speaker zone emergency voice evacuation system, integral microphone, built in tone generator and 14 recordable messages.

**ECC-50/100E:** Export version (Primary Operating Console) 50 Watt, 25VRMS single speaker zone emergency voice evacuation system, integral microphone, built in tone generator and 14 recordable messages. (240 VAC, 50Hz).

**ECC-CE6:** Speaker Circuit/Zone Expander Module.

**ECC-50W-25V:** 25V, 50 watt audio amplifier module. Adding a second speaker circuit increases the total ECC-50/100 power output to 100 watts or can also be used as a backup amplifier.

**ECC-50W-70V:** 70V, 50 watt audio amplifier module. Adding a second speaker circuit increases the total ECC-50/100 power output to 100 watts or can also be used as a backup amplifier.

**ECC-XRM-70V:** 70V Transformer Conversion Module. Converts the ECC-50/100(E) primary amplifier to a 70V output. This transformer mounts directly to the ECC-50/100(E) main control board by two metal brackets.

**ECC-LOC:** Local Operator Console (Complete user interface). *Please refer to the data sheet DF-60762 for more information.*

**ECC-RPU:** Remote Page Unit Hand held microphone, 14 message buttons. *Please refer to the data sheet DF-60761 for more information.*

**ECC-RM:** Remote Microphone only. *Please refer to the data sheet DF-60760 for more information.*

**ECC-50DA:** Distributed (Remote) Audio Amplifier, 50 watts. *Please refer to the data sheet DF-60763 for more information.*

**ECC-50DAE:** Export version. Distributed (Remote) Audio Amplifier, 50 watts. (240 VAC, 50Hz). *Please refer to the data sheet DF-60763 for more information.*

**ECC-125DA:** Distributed (Remote) Audio Amplifier, 125 watts. *Please refer to the data sheet DF-60763 for more information.*

**ECC-125DAE:** Export version. Distributed (Remote) Audio Amplifier, 125 watts. (240 VAC, 50Hz). *Please refer to the data sheet DF-60763 for more information.*

**ECC-50BDA:** Distributed (Remote) Audio Amplifier with back up, 50 watts/100 watts at 25Vrms or 70Vrms. *Please refer to the data sheet DF-60763 for more information.*

**ECC-50WBU:** Expander card for ECC-50BDA remote amplifier for 100 watt primary / 50 watt back up operation. *Please refer to the data sheet DF-60763 for more information.*

**ECC-CE4:** Distributed Audio Speaker Circuit/Zone expander module.

**ECC-FFT:** Fire Fighter Telephone System. *Please refer to the data sheet DF-60765 for more information.*

**ECC-RTZM:** Remote Telephone Zone Module. *Allows for secure access to the ECC via cell phone or remote telephone means; not UL listed. Please refer to the data sheet DF-60785 for more information.*

**SEISKIT-COMMENC:** Seismic kit for the ECC-50/100. Includes battery bracket for two 12 AH or 18 AH batteries.

**FPJ-F:** Remote Phone Jack.

**FHS-F:** Fire Fighters Remote Handset.

**FHSC-RF:** Fire Fighters Handset Cabinet Recessed.

**FHSC-SF:** Fire Fighters Handset Cabinet Surface Mount.

**MMF-301:** Addressable Mini-Monitor Module.

**I300:** SLC Line Isolation Module.

**TR-CE:** Optional Trim Ring.

**THUMBLTCH:** Optional Thumb Latch. (Non UL-Listed).

**CHG-75:** 25 to 75 ampere-hours (AH) External Battery Charger.

**CHG-120F:** 25-120 ampere-hours (AH) External Battery Charger.

**ECC-MICROPHONE:** Replacement Microphone only.

**BAT-1270:** Battery, 12 volt, 7.0 AH (Two required).

**BAT-12120:** Battery, 12 volt, 12.0 AH (Two required).

**BAT-12180:** Battery, 12 volt, 18.0 AH (Two required).

## Wiring Requirements

See product manual, part number LS10001-000FL-E for detailed wiring requirements.

### Total System Capacity: (ECC-50/100(E) only)

- Total Built-in Audio Power: 50 Watts.
- Total Expandable Audio Power: 100 Watts.
- Total Built-in Speaker Circuits: 2.
- Total Expandable Speaker Circuits: 8.
- Audio Message Max Time Duration: 60 seconds.
- External Audio Input: 1.

### Total System Capacity: (Fully Loaded System)

- Total Distributed Audio Power: 1100 Watts.
- Total Speaker Circuits Per System: 24.
- Total Remote Consoles Supported: 8.
- Total Distributed Audio Amplifiers Supported: 8.

## Electrical Specifications

### PRIMARY (AC) POWER (TB15)

**ECC-50/100:** 120 VAC, 60 Hz, 3.5 amps.

**ECC-50/100E:** 240 VAC, 50 Hz, 2.0 amps.

*Wire size: minimum #14 AWG (2.00mm<sup>2</sup>) with 600 V insulation.*

### SECONDARY POWER (BATTERY) CHARGING CIRCUIT (J7)

- Supports lead-acid batteries only.
- Float charge voltage at 27.3V
- Maximum charge current: 1.0 Amp
- Maximum battery charge capability: 2.8 Amps, 26AH (ECC cabinet holds max. 18AH battery).
- Minimum Battery size: 12 Amp Hour.

### AC LOSS RELAY CONTACT RATING (TB3)

- 2.0 amps @ 30 VDC (resistive), 0.5 amps @ 30 VAC (resistive).

### FORM C - TROUBLE RELAY CONTACT RATING (TB2)

- 2.0 amps @ 30 VDC (resistive), 0.5 amp @ 30 VAC (resistive).

### MNS ACTIVE RELAY CONTACT RATING (TB1)

- 2.0 amps @ 30 VDC (resistive), 0.5 amps @ 30 VAC (resistive).

### NOTIFICATION APPLIANCE CIRCUIT (NAC) OUTPUT RATING (TB19)

- One (1) Style Y (Class B) or Style Z (Class A) circuit.
- Power-limited circuitry, (Class 2) supervised.
- Nominal operating voltage: 24 VDC.
- Maximum signaling current for special application power: 2.0A.
- Maximum signaling current for regulated power: 200mA.
- Maximum wiring impedance: 1Ω.
- Current limit: fuse-less, electronic, power-limited.



- End-Of-Line Resistor: 4.7 K $\Omega$ , ½ watt, (P/N 71252) required for Style Y (Class B) operation.

*Refer to the Device Compatibility Document 15384 for listed compatible devices.*

#### **NAC FOLLOWER OUTPUT REMOTE SYNC (TB18)**

- Connections for FACP NAC synchronization trigger signal.
- Output terminals: pass-through to other system components.
- Trigger input voltage: 9 to 32 VDC, 24 VDC rated.
- Input current draw in Alarm condition: 10 mA at rated voltage.

#### **SPECIAL APPLICATION POWER (AUX. POWER) (TB17)**

- 500 mA @ 24 VDC.
- Used for powering addressable modules and associated End-of-Line power supervision relays.

*Power-limited circuitry. Refer to the Device Compatibility Document 15384 for a list of compatible devices.*

#### **SPEAKER VOLUME CONTROL OVERRIDE (TB23)**

- Style Y (Class B) or Style Z (Class A) circuit.
- Special application power.
- Power-limited circuitry, supervised.
- Nominal operating voltage: 24 VDC.
- Maximum signaling current: 0.25 amps.
- Current limit: fuse-less, electronic, power-limited.
- End-Of-Line Resistor: 4.7 K $\Omega$ , ½ watt, (P/N 71252) required for Style Y (Class B) operation.

#### **SPEAKER CIRCUITS**

- Primary Speaker Circuit (TB20)
- Secondary Speaker Circuit (TB21) (with optional amplifier only).
  - Circuit can be wired Style Y (Class B) or Style Z (Class A).
  - Power-limited circuitry.
  - Normal Operating Voltage: 25 VRMS @ 2 amps max and maximum Load Impedance of 12.5 $\Omega$  (70.7 VRMS @ 700 mA max. with maximum load Impedance of 100 $\Omega$  operation possible by plugging optional ECC-XRM-70V conversion transformer into J12 of the main control board).
  - Output Power: 50 watts (10 watts when background music is employed).
  - Frequency Range: 400Hz - 4,000Hz.
  - Maximum total capacitance for each speaker circuit: 250  $\mu$ F.
  - End-of-Line Resistor required for Style Y circuit: 15 K $\Omega$ , 1 watt (P/N: ELR-15K).

#### **COMMAND INPUT CIRCUITS (ALARM POLARITIES SHOWN)**

CMD1 - TB4 Terminals 3(+) & 4(-) are input terminals and Terminals 1(-) and 2(+) are output terminals which provide feed through of the NAC circuits to NAC devices down stream.

CMD2 - TB5 Terminals 3(+) & 4(-) are input terminals and Terminals 1(-) and 2(+) are output terminals which provide feed through of the NAC circuits to NAC devices downstream.

CMD3 - TB6 Terminals 1(+) & 2(-) are input terminals for contact closure only.

CMD4 - TB6 Terminals 3(+) & 4(-) are input terminals for contact closure only.

CMD5 - TB7 Terminals 1(+) & 2(-) are input terminals for contact closure only.

CMD6 - TB7 Terminals 3(+) & 4(-) are input terminals for contact closure only.

CMD7 - TB8 Terminals 1(+) & 2(-) are input terminals for contact closure only.

CMD8 - TB8 Terminals 3(+) & 4(-) are input terminals for contact closure only.

- Power-limited and supervised circuitry.
- Normal Operating Voltage Range: 10.5 VDC - 29 VDC; (Maximum Voltage: 29 VDC).
- NAC Reverse Polarity Current (requires End-of-Line Resistor from NAC): 1.6 mA maximum.
- Contact Closure Operation Current (requires 4.7K $\Omega$ , ½ watt End-of-Line Resistor P/N 27072): 6.6 mA maximum.
- Maximum Wiring Impedance CMD1 - CMD8 (Contact Closure Operation): 200 $\Omega$ .

**NOTE:** *When the system is programmed for Mass Notification, CMD1 and CMD2 will be programmed for Reverse Polarity only. See manual P/N LS10001-000FL-E for more details.*

#### **MAXIMUM INPUT IMPEDANCE:**

- CMD1 & CMD2 (Reverse Polarity Operation): 20K $\Omega$ .
- CMD1 - CMD8 (Contact Closure Operation): 4.75K $\Omega$ .

#### **NIGHT RING INPUT - TB16, TERMINALS 1 (+) & 2 (-)**

- Contact closure input.
- Isolated, non-supervised.
- Operation current: 3.8 mA, maximum.
- Maximum wiring impedance: 30K $\Omega$ .
- Minimum isolation withstand voltage: 1500 VRMS.

#### **EXTERNAL OPERATOR INTERFACE POWER OUTPUT (TB24)**

- Non-resettable power for external operator interface components.
- Power-limited circuitry, non-supervised.
- Nominal operating voltage: 24 VDC.
- Maximum output current: 0.80 amps.
- Current limit: fuse-less, electronic, power-limited circuit.

#### **EXTERNAL DATA BUS (EIA-485) (TB12)**

- Data connections for external operator interface components.
- Redundant transceiver circuitry for Class A operability.
- Power-limited circuitry, supervised.
- Maximum wiring impedance: 13.2 $\Omega$

#### **FACP DATA BUS (EIA-485) (TB13)**

- Dedicated connection to FACP serial bus.
- Output terminals: pass-through to other system components.
- Isolated, supervised.
- Minimum isolation withstand voltage: 1500 VRMS.
- Maximum wiring impedance: 40 $\Omega$  (ANN-BUS), 26 $\Omega$  (ACS-BUS).
- External Audio Riser (TB22).
- Style Y (Class B) or Style Z (Class A) audio connections to external operator interface components.
- Power-limited circuitry, supervised.
- Audio signal level: 3.85 V, maximum.
- Frequency range: 400 Hz - 4 KHz RMS.
- Frequency range (ECC-50/125DA): 800Hz - 2KHz RMS.

## Electrical Specifications Display Board

### EXTERNAL AUDIO INPUT (TB5)

- Input Impedance: 8.5K $\Omega$  nominal @1KHz
- Input Voltage: 700 mV rms maximum
- Input Current: 0.1 mA maximum @ 700 mV

**NOTE:** Some laptops/personal computers only provide an audio output for headphones. It may be necessary to adjust the headphone output level for proper recording of voice messages.

## ECC-CE6 Circuit Expander Module Specifications

- Power-limited circuitry.
- Up to six (6) circuits on the ECC-CE6 can be wired as Style Y (Class B) or Style Z (Class A).
- Normal Operating Voltage for Speaker Circuits: 25 VRMS @ 2.0 amps max. (Maximum Load Impedance of 12.5 $\Omega$ ).
- 70.0 VRMS @ 700 mA max. with maximum Load Impedance of 100 $\Omega$  operation possible for the primary circuit by plugging in an optional ECC-XRM-70V conversion transformer into J12 of the main control board. The same operation is possible for the optional 50W amplifier by selecting the ECC-50W-70V model.
- Speaker circuit wiring is supervised during standby, background music, and alarm.
- Output Power: 50 watts total; Frequency Range: 400Hz - 4,000Hz.
- Maximum total capacitance: 250  $\mu$ F. (Note that the total capacitance for the speaker outputs must not exceed the maximum of 250  $\mu$ F.)
- End-of-Line Resistor required for Style Y (Class B) speaker circuit: 15 K $\Omega$ , 1 watt (P/N: ELR-15K) TB13 on the main control board: ACS/ANN (EIA-485) electrically isolated link to FACP provides programmed speaker control.

## Cabinet Specifications

- Backbox: 19.0"(48.26 cm) high x 16.65"(42.29 cm) wide x 5.20"(13.23 cm) deep.
- Door: 19.26" (48.92 cm) high x 16.82"(42.73 cm) wide x 0.12"(0.30 cm) deep.
- Trim Ring (TR-CE): 22.00" (55.88 cm) high x 19.65" (49.91 cm) wide.

## Shipping Specifications

Base Unit Weight: 27.85 lbs (12.63 kg).

## Temperature and Humidity ranges

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93%  $\pm$  2% RH (noncondensing) at 32°C  $\pm$  2°C (90°F  $\pm$  3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

## Agency Listings and Approvals

The listings and approvals below apply to the basic ECC-50/100(E) control panel. In some cases, certain modules may not be listed by certain approval agencies or listing may be in process. Consult factory for latest listing status.

- UL/ULC Listed: S2424
- CSFM: 6911-0075:0226
- NYC Fire Dept. Certificate of Approval: #6152
- FM Approved

## Standards and Codes

The ECC-50/100(E) complies with the following UL Standards, NFPA 72, International Building Codes, and California Building Codes.

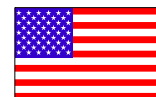
- UL 864
- UL 2572
- UFC 4-021-01
- IBC 2012, IBC 2009, IBC 2006, IBC 2003, IBC 2000 (Seismic)
- CBC 2007 (Seismic)

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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 Fire-Lite Alarms. Phone: (800) 627-3473, FAX: (877) 699-4105.  
www.firelite.com



Country of Origin: USA

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



# LISTING SERVICE

**LISTING No.** 6911-0075:0226 Page 1 of 1

**CATEGORY:** 6911 -- VOICE COMMUNICATION SYSTEMS CONTROL UNITS

**LISTEE:** FIRE-LITE ALARMS INC. One Fire-Lite Place, Northford, CT 06410-1653  
Contact: Pete Sennett (203) 484-7161 Fax (203) 484-7309  
Email: pete.sennett@Honeywell.com

**DESIGN:** Models **ECC-50/100** and ECC-50/100E. These are 50-watt audio emergency voice evacuation panels expandable to 100-watt for fire applications, mass notification applications, or both. Refer to listee's data sheet for additional detailed product description and operational considerations. System components:  
\*ECC-LOC: Local Operator Console  
ECC-MCB; Main Control Board  
ECC-DKVCB; Display Board  
ECC-50W-25V; Amplifier Module 25 VRMS  
ECC-50W-70V; Amplifier Module 70 VRMS  
ECC-CE6; Speaker Circuit Expander Module  
ECC-XRM-70V; Transformer Module 70.7 VRMS

**RATING:** Primary Operating: 120 V, 60 Hz, 3.5 A or 240 V, 50 Hz, 2 A

**INSTALLATION:** In accordance with listee's printed installation instructions, applicable codes & 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 voice communication systems for use with separately listed compatible fire alarm control units to provide emergency voice evacuation signals. Refer to listee's Installation Instruction Manual for details.

\*12-27-2016 dc



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Date Issued: **July 01, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division

# CELL-CAB-FL(C) and CELL-MOD(C)

## Cellular Fire Alarm Communicators



### Communicators

#### General

The CELL-CAB-FL(C) and CELL-MOD(C) are cellular communicator options for Fire-Lite Endurance Series addressable fire alarm control panels (FACPs).

These GSM communicators provide cellular communication as an alternate method of central station reporting. Combined with the FACP's onboard communicator, they provide dual path cellular and IP reporting capability, while eliminating the need and cost of separate dialer capture modules and special programming. Battery backup from the control panel maximizes overall system efficiency.

Small in size, easy to install, with a programmable supervision time of 1-60 minutes, these communicator models can be positioned remotely from the fire alarm control panel via 4-wire serial bus for optimum reception. The CELL-CAB-FL(C) and CELL-MOD(C) are UL 864 and NFPA 72 fire code compliant for sole, primary, or backup communications. They work with AlarmNet® to provide a UL-listed connection to the central station.

The CELL-CAB-FL(C) includes a GSM communicator within a metal cabinet enclosure with lock and key and includes an external antenna. The CELL-MOD(C) houses the GSM communicator in a plastic enclosure and has an option for an external antenna.

#### Compatibility

The CELL-CAB-FL(C) and CELL-MOD(C) are compatible with the following Endurance Series FACPs:

- ES-50X(C): 50 point addressable FACP
- ES-200X(C): 198 point addressable FACP

#### Features

- Communicate directly with Endurance Series panels
- Easy installation - no need for special programming or separate dialer module
- Battery backup provided by the panel to increase system efficiency and decrease cost
- Provide dual-path cellular and IP reporting capability
- UL 864 and NFPA 72 code compliant for sole, primary, and backup communications
- Easily managed accounts through on-line management tools
- Remote mounting up to 6,000 feet (1,828.8m)
- Quality of Service (QOS) diagnostics via AlarmNet convey vital communicator information such as when messages are received, signal strength, and message path used
- Programmable supervision time from 1-60 minutes
- Provide full data reporting using Contact ID format



CELL-MOD(C)



CELL-CAB-FL(C)



# SYSTEM SPECIFICATIONS

## PHYSICAL

**CELL-CAB-FL(C):** 10.38"W x 10.165"H x 3.176"D  
(26.37cm x 25.82 cm x 8.07cm)

**CELL-MOD(C):** 7.809"W x 5.982"H x 1.5"D  
(19.83cm x 15.19cm x 3.81cm)

### Shipping Weight:

- CELL-MOD: 1.3 lbs (589.7 g)
- CELL-CAB-FL: 5.2 lbs (2.36 Kg)

**Color:** Red

## ENVIRONMENTAL

**Operating Temperature:** 32°F to 120°F (0°C to 49°C)

**Humidity:** 10 to 93% relative humidity (non-condensing)

## ELECTRICAL

**Standby Current:** 55mA

**Alarm Current:** 100mA

## RADIO TRANSCEIVER

- 3G Cellular Radio
- UMTS WCDMA FDD 850/1900MHz
- FCC part 15, 22, 24, and 68 compliant

## COMMUNICATION PROTOCOLS

- HSPA+ (4G) and HSPA (HSDPA & HSUPA) (3G)

## ORDERING INFORMATION

**CELL-CAB-FL:** Cellular module housed in metal cabinet with lock and key. Includes external antenna

**CELL-CAB-FLC:** Cellular module housed in metal cabinet with lock and key. Includes external antenna. For use in Canadian applications with Canadian model FACP's.

**CELL-MOD:** Cellular module housed in plastic enclosure. (External antenna sold separately)

**CELL-MODC:** Cellular module housed in plastic enclosure. (External antenna sold separately), For use in Canadian applications with Canadian model FACP's.

**CELL-ANTENNA:** 3dB gain external/remote antenna

**ES-50X:** 50 point addressable FACP with pre-installed IPOTS-COM communicator

**ES-50XC:** 50 point addressable FACP with pre-installed IPOTS-COM communicator, for use in Canadian applications

**ES-200X:** 198 point addressable FACP with pre-installed IPOTS-COM communicator

**ES-200XC:** 198 point addressable FACP with pre-installed IPOTS-COM communicator, for use in Canadian applications

**IPOTS-COM:** Dual technology (POTS and IP) communicator (replacement board) for the Endurance Series panels

## APPROVALS

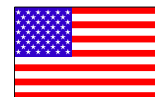
- **UL:** S3511 (CELL-MOD), S2424 (CELL-CAB-FL)
- **ULC:** S3511 (CELL-MODC), S2424 (CELL-CAB-FLC)
- **CSFM:** 7300-0075:0504
- **FCC ID:** CFS8DLPHS8-US

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[www.firelite.com](http://www.firelite.com)



Country of Origin: USA

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



## LISTING SERVICE

**LISTING No.** 7300-1645:0199 Page 1 of 1

**CATEGORY:** 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

**LISTEE:** ADEMCO INC. 2 Corporate Center Drive, Melville, NY 11747  
Contact: Issa Khouryawad (516) 577-2312 Fax (516) 577-3540  
Email: issa.khouryawad@Honeywell.com

**DESIGN:** Models iPGSM-COM, iPGSM-DP, **iPGSM-4G** and IGSMCFP4G Internet and Digital Cellular Fire Communicators. Units are suitable for residential and commercial applications. \*Model iPGSM-COM utilizes IP as the primary communication path, with cellular as the backup path. Models iPGSM-DP and iPGSM-4G also have the option for IP Only or Cellular only without a backup path. Refer to listee's data sheet for detailed product description and operational considerations.

**INSTALLATION:** In accordance with listee's printed installation instructions, applicable codes & 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 a control unit accessory for use with separately listed compatible commercial and residential fire alarm control units. \*Model IGSMCFP4G is intended for use with specific Honeywell Security control units that employ the ECP bus. Refer to listee's installation Instruction Manual for details.

**NOTE:** Burglary and other non-fire functions were not examined.

iPGSM-COM, iPGSM-DP formerly listed in 7300-1645:0183.

\*Rev 01-02-19 gt



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Date Issued: **July 01, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division

# ANN-80

## 80-Character Serial LCD Annunciator



### Annunciators

#### General

The ANN-80 annunciator is a compact, backlit, 80-character LCD fire annunciator that mimics the Fire Alarm Control Panel (FACP) display. It provides system status indicators for AC Power, Alarm, Trouble, Supervisory, and Alarm Silenced conditions. The ANN-80 and the FACP communicate over a two-wire serial interface employing the ANN-Bus communication format. Connected devices are powered, via two additional wires, by either the host FACP or a remote UL-listed, filtered power supply. The ANN-80 is red; for white, order ANN-80-W.

The ANN-80 displays English-language text of system point information including device type, zone, independent point alarm, trouble or supervisory status, as well as any custom alpha labels programmed into the control panel. It includes control switches for remote control of critical system functions. (A keyswitch prevents unauthorized operation of the control switches.)

Up to eight ANN-80s may be connected to the ANN-Bus of each FACP. No programming is required, which saves time during system commissioning.

#### Features

- Listed to UL Standard 864, 9th Edition
- Backlit 80-character LCD display (20 characters x 4 lines)
- Mimics all display information from the host panel
- Control switches for System Acknowledge, Signal Silence, Drill, and Reset
- Control switches can be independently enabled or disabled at the FACP
- Keyswitch enables/disables control switches and mechanically locks annunciator enclosure
- Keyswitch can be enabled or disabled at the FACP
- Enclosure supervised for tamper
- System status LEDs for AC Power, Alarm, Trouble, Supervisory, and Alarm Silence
- Local sounder can be enabled or disabled at the FACP
- ANN-80 connects to the ANN-Bus terminal on the FACP and requires minimal panel programming
- Displays device type identifiers, individual point alarm, trouble, supervisory, zone, and custom alpha labels
- Time-and date display field
- Surface mount directly to wall or to single, double, or 4" square electrical box
- Semi-flush mount to single, double, or 4" square electrical box. Use ANN-SB80KIT for angled view mounting
- Can be remotely located up to 6,000 feet (1,800 m) from the panel
- Backlight turns off during AC loss to conserve battery power but will turn back on if an alarm condition occurs
- May be powered by 24 VDC from the host FACP or by remote power supply (requires 24 VDC)
- Up to eight ANN-80s can be connected on the ANN-Bus

#### Controls and Indicators

- AC Power
- Alarm
- Trouble



- Supervisory
- Alarm Silenced

#### Specifications

- **Operating voltage range:** 18 VDC to 28 VDC
- **Current consumption @ 24 VDC nominal** (filtered and non-resettable): 40 mA maximum
- **Ambient temperature:** 32°F to 120°F (0°C to 49°C)
- **Relative humidity:** 93% ± 2% RH (non-condensing) at 32°C ± 2°C (90°F ± 3°F)
- 5.375" (13.65 cm.) high x 6.875" (17.46 cm.) wide x 1.375" (3.49 cm.) deep
- For use indoors in a dry location
- All connections are power-limited and supervised

#### The ANN-Bus

##### POWERING THE DEVICES ON THE ANN-BUS FROM AUXILIARY POWER SUPPLY

The ANN-Bus can be powered by an auxiliary power supply when the maximum number of ANN-Bus devices exceeds the ANN-Bus power requirements. See the FACP manual for more information.

##### ANN-BUS DEVICE ADDRESSING

Each ANN-Bus device requires a unique address (ID Number) in order to communicate with the FACP. A maximum of 8 devices can be connected to the FACP ANN-Bus communication circuit. See the FACP manual for more information.

##### WIRE REQUIREMENTS: COMMUNICATIONS CIRCUIT

The ANN-80 connects to the FACP ANN-Bus communications circuit. To determine the type of wire and the maximum wiring distance that can be used with FACP ANN-Bus accessory modules, it is necessary to calculate the total worst case current draw for all modules on a single 4-conductor bus. The total worst case current draw is calculated by adding the individual worst case currents for each module.

**NOTE:** For total worst case current draw on a single ANN-Bus refer to appropriate FACP manual.

### **WIRE REQUIREMENTS: POWER CIRCUIT**

- 14 to 18 AWG (0.75 - 2.08 mm<sup>2</sup>) wire for 24 VDC power circuit is acceptable. Power wire distance limitation is set by 1.2 volt maximum line drop from source to end of circuit.
- All connections are power-limited and supervised.
- A maximum of eight ANN-80 modules may be connected to this circuit.

### **Ordering Options**

**ANN-80:** Red 80 character LCD Annunciator.

**ANN-80-W:** White, 80 character LCD Annunciator.

**ANN-SB80KIT-R:** Red surface mount backbox with angled wedge.

**ANN-SB80KIT-W:** White surface mount backbox with angled wedge.

### **Agency Listings and Approvals**

The listings and approvals below apply to the ANN-80. In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

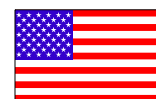
- **UL:** S2424
- **FM approved**
- **CSFM:** 7120-0075:0211
- **MEA:** 442-06-E

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[www.firelite.com](http://www.firelite.com)



Country of Origin: USA

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
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## LISTING SERVICE

**LISTING No.** 7120-0075:0211

Page 1 of 1

**CATEGORY:** 7120 -- ANNUNCIATORS

**LISTEE:** FIRE-LITE ALARMS INC. One Fire-Lite Place, Northford, CT 06410-1653  
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309  
Email: megan.sisson@honeywell.com

**DESIGN:** Model **ANN-80** and \*ANN-80W remote fire annunciators. Unit is a 80-character, supervised backlit LCD fire annunciator. Communication between the control panel and the annunciator is accomplished over a two-wire serial interface employing the ANN-BUS protocol. 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 & ordinances and in manner acceptable to the authority having jurisdiction.

**MARKING:** Listee's name, product number, electrical rating and UL label.

**APPROVAL:** Listed as an annunciators for use separately listed compatible fire alarm control units. Refer to Manufacturers Installation Manual for details.

\*Rev. 04-28-08 bh



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Date Issued: **July 01, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division



BY SPACE AGE ELECTRONICS

# TC Series

## Terminal Cabinets



### FEATURES

- 16 gauge cold rolled steel construction
- Available in four sizes
- Durable red powder coat
- “FIRE ALARM TERMINAL CABINET” in white indelible lettering
- Lift-a-way hinge door
- Interior labeling of terminal strips
- Field identification label inside cover
- Terminal points rated for 12 gauge wire
- Terminal strip rated for 20 amp max 250V (Class B/UL) 300V (CSA)

Offering easy identification of fire alarm wiring junctions for troubleshooting and maintenance of system wiring, the TC Series houses 18 to 128 high barrier termination points in a variety of durable enclosure sizes.

### SPECIFICATIONS

The TC Series Terminal Cabinets are constructed of 16 gauge cold rolled steel and finished with a durable red powder coat. The front cover is engineered with a removable formed lift-a-way hinge and displays “FIRE ALARM TERMINAL CABINET” in white screened indelible lettering. The interior of the box has field identification labels on the inside cover corresponding to the terminal strip’s labeling inside the back box. The cabinets include 18 to 120 high barrier termination points rated for 12 gauge wire. Terminal strips are rated for 20 amp max 250V (Class B/UL) 300V (CSA).

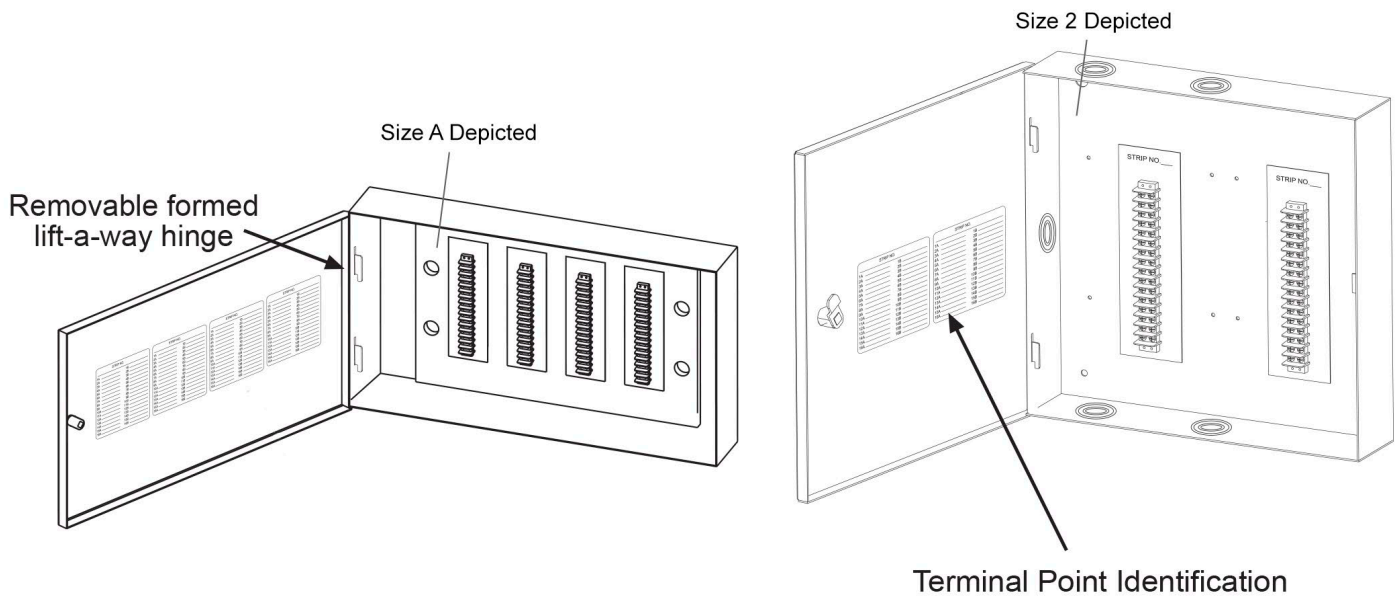
### CUSTOM COLORS AND BRANDING AVAILABLE





## ORDERING INFORMATION

P/N#	Size	Termination Pts.	Width	Height	Depth	Lock
SSU00635	1	18	6 1/2"	8 5/8"	2 1/2"	Thumb Screw
SSU00536	1	18	6 1/2"	8 5/8"	2 1/2"	Keyed
SSU00645	2	32	14"	14"	3 1/4"	Keyed
SSU00651	A	64	23 1/2"	13"	5 1/2"	Keyed
SSU00653	D	128	23 1/2"	23 1/2"	5 1/2"	Keyed



## AGENCY APPROVALS

**UOXX.S2580** UL Listed Control Unit Accessories

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
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FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



## LISTING SERVICE

**LISTING No.** 7300-0553:0110 Page 1 of 1

**CATEGORY:** 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

**LISTEE:** SPACE AGE ELECTRONICS 58 Chockett Road, Sterling, MA 01564  
Contact: Robert Scholl (508) 485-0966 Fax (508) 485-4740  
Email: bobs@1sae.com

**DESIGN:** Models TC2-32, **TC1-18**, TCX/A 64, TCX/D 128, ACE/A, AC2, ACE/D, IF-2, IF1, IFX/A and IFX/D enclosures. Models ACE-11, ACE-12 and ACE-13, \*ACE2424, \*ACE 3036, \*ACE 2436, \*ACE 3048 document cabinets. 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 and UL label.

**APPROVAL:** Listed as fire alarm equipment enclosures and document cabinets for use with listee's fire alarm equipment. Refer to listee's Installation Instruction Manual for details.

02-09-16 dc



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Date Issued: **July 01, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division



# BG-12LX

## Addressable Manual Pull Station



### Addressable Devices

#### General

The Fire-Lite BG-12LX is a state-of-the-art, dual-action (i.e., requires two motions to activate the station) pull station that includes an addressable interface (mounted inside) for Fire-Lite's addressable fire alarm control panels (FACPs). Because the BG-12LX is addressable, the control panel can display the exact location of the activated manual station. This leads fire personnel quickly to the location of the alarm.

#### Features

- Maintenance personnel can open station for inspection and address setting without causing an alarm condition.
- Built-in bicolor LED, which is visible through the handle of the station, flashes in normal operation and latches steady red when in alarm.
- Handle latches in down position and the word "ACTIVATED" appears to clearly indicate the station has been operated.
- Captive screw terminals wire-ready for easy connection to SLC loop (accepts up to 12 AWG/3.25 mm<sup>2</sup> wire).
- Can be surface mounted (with SB-10 or SB-I/O) or semi-flush mounted. Semi-flush mount to a standard single-gang, double-gang, or 4" (10.16 cm) square electrical box.
- Smooth dual-action design.
- Meets ADAAG controls and operating mechanisms guidelines (Section 4.1.3[13]); meets ADA requirement for 5 lb. maximum activation force.
- Highly visible.
- Attractive shape and textured finish.
- Key reset.
- Includes Braille text on station handle.
- Optional trim ring (BG12TR).
- Meets UL 38, Standard for Manually Actuated Signaling Boxes.

#### Construction

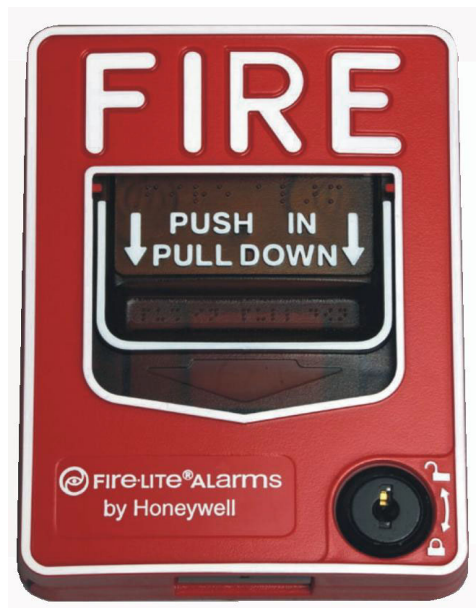
Shell, door, and handle are molded of durable polycarbonate material with a textured finish.

#### Specifications

- **Shipping Weight:** 9.6 oz. (272.15 g)
- **Normal operating voltage:** 24 VDC.
- **Maximum SLC loop voltage:** 28.0 VDC.
- **Maximum SLC standby current:** 375  $\mu$ A.
- **Maximum SLC alarm current:** 5 mA.
- **Temperature Range:** 32°F to 120°F (0°C to 49°C)
- **Relative Humidity:** 10% to 93% (noncondensing)
- **For use indoors in a dry location**

#### Installation

The BG-12LX will mount semi-flush into a single-gang, double-gang, or standard 4" (10.16 cm) square electrical outlet box, or will surface mount to the model SB-10 or SB-I/O surface backbox. If the BG-12LX is being semi-flush mounted, then the optional trim ring (BG12TR) may be used. The BG12TR is



FL PullStation.jpg

usually needed for semi-flush mounting with 4" (10.16 cm) or double-gang boxes (not with single-gang boxes).

#### Operation

Pushing in, then pulling down on the handle causes it to latch in the down/activated position. Once latched, the word "ACTIVATED" (in bright yellow) appears at the top of the handle, while a portion of the handle protrudes from the bottom of the station. To reset the station, simply unlock the station with the key and pull the door open. This action resets the handle; closing the door automatically resets the switch.

Each manual station, on command from the control panel, sends data to the panel representing the state of the manual switch. Two rotary decimal switches allow address settings (1 – 159 with Breakaway Tab removed for MS-9600 Series, 1 – 99 and MS-9200UDLS, 1 – 50 for MS-9050UD).

#### Architectural/Engineering Specifications

Manual Fire Alarm Stations shall be non-coded, with a key-operated reset lock in order that they may be tested, and so designed that after actual Emergency Operation, they cannot be restored to normal except by use of a key. An operated station shall automatically condition itself so as to be visually detected as activated. Manual stations shall be constructed of red-colored polycarbonate material with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in white letters, 1.00 inches (2.54 cm) or larger. Stations shall be suitable for surface mounting on matching backbox SB-10 or SB-I/O; or semi-flush mounting on a standard single-gang, double-gang, or 4" (10.16 cm) square electrical box, and shall be installed

within the limits defined by the Americans with Disabilities Act (ADA) or per national/local requirements. Manual Stations shall be Underwriters Laboratories listed.

Manual stations shall connect with two wires to one of the control panel SLC loops. The manual station shall, on command from the control panel, send data to the panel representing the state of the manual switch. Manual stations shall provide address setting by use of rotary decimal switches.

## Product Line Information

**BG-12LX:** Dual-action addressable pull station. Includes key locking feature. (Listed for Canadian and non-Canadian applications.)

**SB-10:** Surface backbox; metal.

**SB-I/O:** Surface backbox; plastic.

**BG12TR:** Optional trim ring.

**17003:** Keys, set of two.

## Agency Listings and Approvals

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/ULC Listed:** S711 (listed for Canadian and non-Canadian applications).
- **MEA:** 67-02-E.
- **CSFM:** 7150-0075:0184.
- **FM Approved.**

**Patented:** U.S. Patent No. D428,351; 6,380,846; 6,314,772; 6,632,108.

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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.



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CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
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FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



## LISTING SERVICE

**LISTING No.** 7150-0075:0184

Page 1 of 1

**CATEGORY:** 7150 -- FIRE ALARM PULL BOXES

**LISTEE:** FIRE-LITE ALARMS INC. One Fire-Lite Place, Northford, CT 06410-1653  
Contact: Pete Sennett (203) 484-7161 Fax (203) 484-7309  
Email: pete.sennett@Honeywell.com

**DESIGN:** Models BG-12, BG-12S, BG-12NC, BG-12W, BG-12LW, BG-12WP, BG-12LWP, BG-12L, **BG-12LX**, BG-12LA, BG-12PS, BG-12LSP, BG-12SP, BG-12LR, BG-12LRA, BG-12LAO, BG-12LAOB, BG-12-LO, BG-12LOB, BG-12LPS, BG-12LPSP, BG-12SL, UT-PS1 and UT-PS2 fire alarm pull boxes. The BG-12 series is a dual action pull station that has normally open switch contacts. 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 and UL label.

**APPROVAL:** Listed as fire alarm boxes for use with separately listed compatible fire alarm control units. Models BG-12WP, BG-12W, BG-12LW and BG-12LWP are intended for outdoor use when installed with Model WP-10 back box. Models BG-LAOB and BG-12LOB are intended for outdoor use when installed with Model WBB or WP-10 back box.

\* These manual pull boxes meet the requirements of UL Standard 38, 1999 Edition and California amendments.

**XLF:** 7150-0028:0199

\*Updated 08-17-09 fm



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, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division



# Selectable Output Chimes and Chime/Strobes

*System Sensor L-Series selectable-output chimes and chime/strobes are rich with features guaranteed to cut installation times and maximize profits with lower current draw and modern aesthetics.*



## Features

- Updated modern aesthetics
- Plug-in design with minimal intrusion into the back box
- Mounting plate shorting spring feature checks wiring continuity before device installation
- Captive mounting screw
- Tamper-resistant construction
- Field-selectable candela settings:
  - Wall: 15, 30, 75, 95, 110, 135, 185
  - Ceiling: 15, 30, 75, 95, 115, 150, 177
- Automatic selection of 12- or 24-volt operation at 15 and 30 candela
- Rotary switch for tone and volume selections
- Five selectable tones with high and low volume settings
- Electrically compatible with legacy SpectrAlert and SpectrAlert Advance devices
- Wall models listed for wall mounting only, ceiling models listed for ceiling mounting only

The **System Sensor L-Series** product line of wall and ceiling-mount chimes and chime strobes include a variety of features that increase their application versatility while simplifying the installation. With white and red plastic housings, System Sensor L-Series can meet virtually any application requirement.

Selectable-output chimes and chime/strobes are private mode notification appliances used to alert trained personnel to investigate possible emergency situations and to take appropriate action. Security guard and nurse workstations are ideal locations for chime products.

All devices feature plug-in design with minimal intrusion into the back box, making the installation fast and foolproof while virtually eliminating costly and time-consuming ground faults.

Installers can easily adapt devices to a wide range of application requirements using field-selectable candela settings, automatic selection of 12-or-24 volt operation, and a rotary switch for chime tones and two volume selections.

## Agency Listings



## L-Series Specifications

### Architect/Engineer Specifications

#### General

System Sensor L-Series chimes and chime strobes shall mount to a standard 4 x 4 x 1½-inch back box, 4-inch octagon back box, single-gang 2 x 4 x 1⅞-inch back box, or double-gang back box. A universal mounting plate shall be used for mounting products. The notification appliance circuit wiring shall terminate at the universal mounting plate. Also, System Sensor L-Series 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 8.5 and 17.5 volts; 24-volt rated notification appliance circuit outputs shall operate between 16.5 and 33 volts. Indoor L-Series products shall operate between 32 and 120 degrees Fahrenheit from a regulated DC, or full-wave rectified, unfiltered power supply. Chime strobes shall have field-selectable candela settings of 15, 30, 75, 95, 110, 135, and 185 for wall units and 15, 30, 75, 95, 115, 150, and 177 for ceiling units.

#### Chime Strobe Combination

The chime strobe shall be a System Sensor L-Series Model \_\_\_\_\_ listed to UL 1638 and UL 464. The chime strobe shall 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 chime shall have two audibility options and an option to switch between temporal three pattern, non-temporal(continuous) pattern, 1 second chime pattern, 1/4 second chime pattern, 5 second whoop chime pattern. These options are set by a multiple position switch.

#### Synchronization Module

The module shall be a System Sensor Sync•Circuit \_\_\_\_\_ listed to UL 464 and shall be approved for fire protective service. The module shall synchronize strobes at 1Hz and all available chime tones. Also, while operating the strobes, the module shall silence the chimes on chime/strobe models over a single pair of wires. The module shall mount to a 4 11/16 x 4 11/16 x 2 1/8-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

<b>Standard Operating Temperature</b>	32°F to 120°F (0°C to 49°C)
<b>Humidity Range</b>	10 to 93% non-condensing
<b>Strobe Flash Rate</b>	1 flash per second
<b>Nominal Voltage</b>	Regulated 12VDC or regulated 24DC/FWR <sup>1</sup>
<b>Operating Voltage Range<sup>2</sup></b>	8 to 17.5V (12V nominal) or 16 to 33V (24V nominal)
<b>Operating Voltage Range with MLD3</b>	8.5 to 17.5V (12V nominal) or 16.5 to 33V (24V nominal)
<b>Input terminal wire gauge</b>	12 to 18 AWG
<b>Chime strobe dimensions (including lens)</b>	5.6 in L x 4.7 in W x 1.91 in D (143 mm L x 119 mm W x 49 mm D)
<b>Chime dimensions</b>	5.6 in L x 4.7 in W x 1.25 in D (143 mm L x 119 mm W x 32 mm D)
<b>Ceiling Chime strobe dimensions (including lens)</b>	6.8" Dia. x 2.47" D (173.5mm Dia. x 62.7mm D)
<b>SBBRL (red wall surface mount back box)</b>	5.6 in L x 4.7 in W x 4.3 in D (142 mm L x 119 mm W x 109 mm D)
<b>SBBWL (white wall surface mount back box)</b>	5.6 in L x 4.7 in W x 4.3 in D (142 mm L x 119 mm W x 109 mm D)
<b>SBBCRL (red ceiling surface mount back box)</b>	6.9" Dia. x 2.5" D (175.8mm Dia. x 63.5mm)
<b>SBBCWL (white ceiling surface mount back box)</b>	6.9" Dia. x 2.5" D (175.8mm Dia. x 63.5mm)

#### Notes:

1. Full Wave Rectified (FWR) voltage is a non-filtered, time varying power source that is used on some power supply and panel outputs.
2. CHS products will operate at 12 V nominal only for 15 and 30 cd.

## UL Current Draw Data

UL Max. Chime Current Draw (mA RMS)				
Sound Pattern	dB	8–17.5 Volts	16–33 Volts	
		DC	DC	FWR
1 Second Chime	High	5	8	9
1 Second Chime	Low	5	8	9
¼ Second Chime	High	6	10	10
¼ Second Chime	Low	5	9	9
Temporal Chime	High	7	10	10
Temporal Chime	Low	6	9	9
5 Second Whoop	High	12	15	16
5 Second Whoop	Low	7	10	11
Coded	High	12	15	16 *

\*This data represents coding at 3 chimes per second. Actual current draw will vary depending upon coding selected.

### UL Max. Chime/Strobe Current Draw (mA RMS) Wall

DC Input	8–17.5 Volts		16–33 Volts		75	95	110	135	185
	15	30	15	30					
1 Second Chime	90	154	51	71	115	136	161	202	238
1 Second Chime	89	154	50	70	116	136	154	199	242
¼ Second Chime	90	154	52	72	117	137	168	201	242
¼ Second Chime	89	153	49	70	115	136	165	199	241
Temporal Chime	88	153	49	69	112	137	168	201	246
Temporal Chime	88	152	47	68	111	136	167	196	241
5 Second Whoop	91	154	52	70	113	132	176	206	243
5 Second Whoop	87	149	46	66	108	130	170	202	240
<b>16–33 Volts</b>									
FWR Input	15	30	75	95	110	135	185		
1 Second Chime	70	90	160	176	197	233	275		
1 Second Chime	67	88	158	175	191	232	271		
¼ Second Chime	69	93	159	175	198	233	272		
¼ Second Chime	68	93	154	169	196	232	270		
Temporal Chime	65	90	145	170	189	228	283		
Temporal Chime	64	89	142	170	188	219	282		
5 Second Whoop	70	93	145	168	187	223	278		
5 Second Whoop	62	84	137	159	180	216	272		

### UL Max. Chime/Strobe Current Draw (mA RMS) Ceiling

DC Input	8–17.5 Volts		16–33 Volts		75	95	115	150	177
	15	30	15	30					
1 Second Chime	95.5	165	47	69	117	137	165	202	238
1 Second Chime	93	162	47	68	116	137	165	200	238
¼ Second Chime	94	161	48	70	117	138	166	202	237
¼ Second Chime	93	157	48	69	116	137	164	199	236
Temporal Chime	93	163	48	69.5	116	138	165	199	238
Temporal Chime	92	160	47	68.5	116	136	164	198	237
5 Second Whoop	98	169	54	77	124	146	173	206	245
5 Second Whoop	95	166	49	71	117	144	168	202	239
<b>16–33 Volts</b>									
FWR Input	15	30	75	95	115	150	177		
1 Second Chime	63	90	147	169	184	212	245		
1 Second Chime	63	88	147	169	183	212	244		
¼ Second Chime	65	90	149	170	184	213	246		
¼ Second Chime	64	89	148	168	184	213	244		
Temporal Chime	64	89	148	169	184	212	245		
Temporal Chime	63	88	147	169	183	212	245		
5 Second Whoop	75	100	155	178	193	221	255		
5 Second Whoop	68	91	148	170	186	217	248		

## Tone Selection

Chime tone selection is accomplished by using the rotary switch on the back of the product.

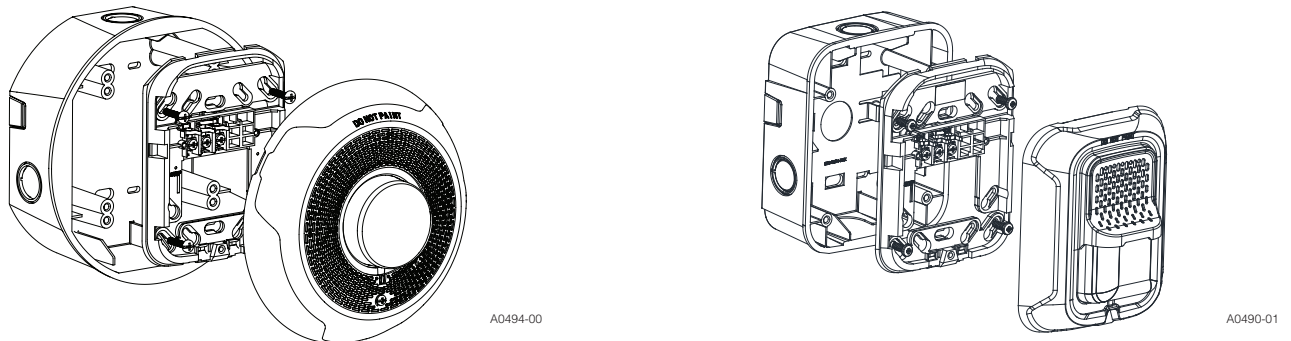
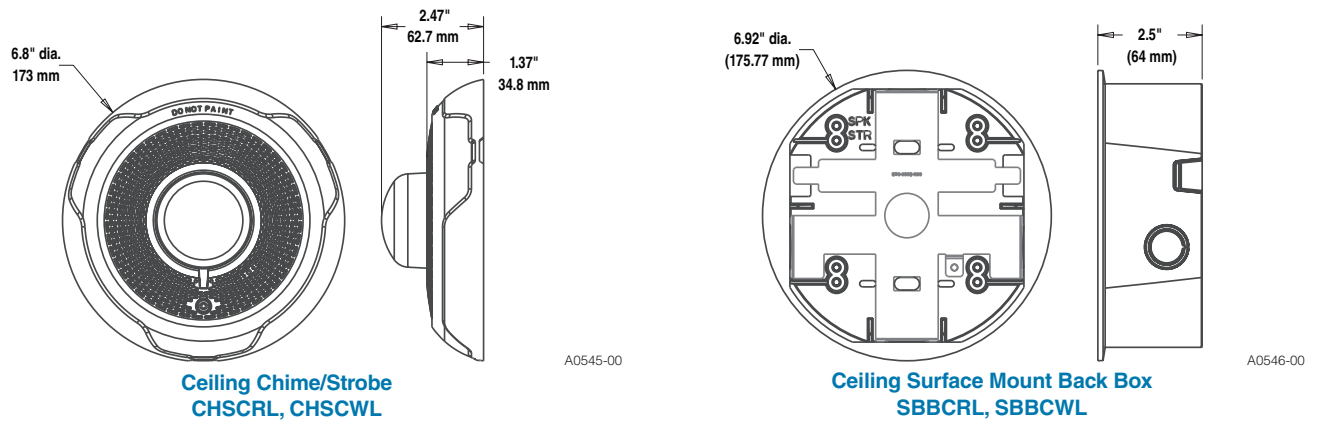
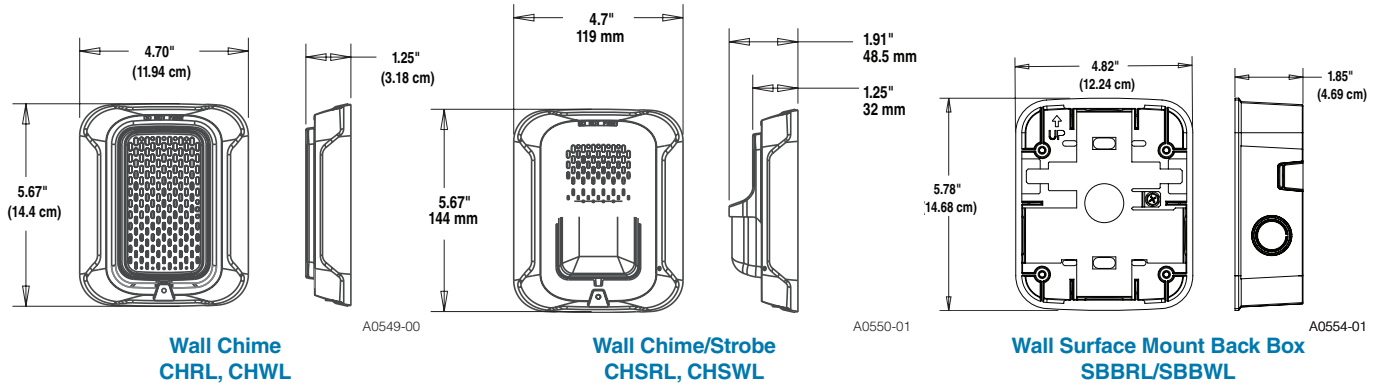
The current draw and sound measurements for various chime tone settings are listed below.

Chime Patterns			Chime and Chime/Strobe Output (dBA)				
Setting	Repetition Rate	dB Level	Switch Position	Sound Pattern	dB	8–17.5 Volts DC	16–33 Volts DC FWR
1	1 Second Chime	High	1	1 Second Chime	High	61	62 62
2	1 Second Chime	Low	2	1 Second Chime	Low	56	55 55
3	¼ Second Chime	High	3	¼ Second Chime	High	67	70 70
4	¼ Second Chime	Low	4	¼ Second Chime	Low	61	61 61
5	Temporal Chime	High	5	Temporal Chime	High	64	66 66
6	Temporal Chime	Low	6	Temporal Chime	Low	59	60 60
7	5 Second Whoop	High	7	5 Second Whoop	High	76	78 78
8	5 Second Whoop	Low	8	5 Second Whoop	Low	62	64 64
9	Coded**	High	9	Coded**	High	57	51 57

\*\*For chime only.



## L-Series Dimensions



Ceiling Mount Chime/Strobe with Ceiling Surface Mount Back Box

Wall Mount Chime/Strobe with Wall Surface Mount Back Box

## L-Series Ordering Information

Model	Description
CHRL	Chime, Wall, Red
CHWL	Chime, Wall, White
CHSRL	Chime Strobe, Wall, Red
CHSWL	Chime Strobe, Wall, White
CHSRL	Chime Strobe, Ceiling, Red
CHSCWL	Chime Strobe, Ceiling, White
<b>Accessories</b>	
SBBRL	Surface Mount Back Box, Wall, Red
SBBWL	Surface Mount Back Box, Wall, White
SBBCRL	Surface Mount Back Box, Ceiling, Red
SBBCWL	Surface Mount Back Box, Ceiling, White



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 for current product information, including the latest version of this data sheet.  
 AVDS86902 • 11/02/2017

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



# LISTING SERVICE

**LISTING No.** 7135-1653:0503

Page 1 of 2

**CATEGORY:** 7135 -- AUDIBLE DEVICES

**LISTEE:** System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174  
Contact: Megan Sisson (630) 762-5362 Fax (203) 484-7309  
Email: [megan.sisson@honeywell.com](mailto:megan.sisson@honeywell.com)

**DESIGN:** System Sensor Indoor 2-wire and \*4-wire Models:  
HWL, HRL, HGWL and HGRL Horns;  
CHWL and CHRL Chimes;  
P2RL, P2WL, P2GRL, P2GWL, P2RL-P, P2WL-P, P2RL-SP, P2WL-SP, \*P4RL and \*P4WL  
Wall Horn Strobes;  
PC2RL, PC2WL, \*PC4RL and \*PC4WL Ceiling Horn Strobes;  
CHSRL and **CHSWL** Wall Chime Strobes;  
CHSCRL and CHSCWL Ceiling Chime Strobes;

**Wall Bezel Parts:**

BZR-F, BZR-AL, BZR-AG, BZR-EV, BZR-P, BZR-SP, BZR-PG,  
BZW-F, BZW-AL, BZW-AG, BZW-EV, BZW-P, BZW-SP, BZW-PG,  
BZGR-F, BZGR-AL, BZGR-AG, BZGR-EV, BZGR-P, BZGR-SP, BZGR-PG,  
BZGW-F, BZGW-AL, BZGW-AG, BZGW-EV, BZGW-P, BZGW-SP and BZGW-PG,

**Ceiling Bezel Parts:**

BZRC-F, BZRC-AL, BZRC-AG, BZRC-EV, BZRC-P, BZRC-SP, BZRC-PG,  
BZWC-F, BZWC-AL, BZWC-AG, BZWC-EV, BZWC-P, BZWC-SP and BZWC-PG.

**Color Lens:**

LENS-A2, LENS-B2, LENS-G2, LENS-R2, LENS-AC2, LENS-BC2, LENS-GC2 and LENS-RC2.

**Wall Trim Rings:**

\*TR-2 and \*TR-2W

**Ceiling Trim Rings:**

\*TRC-2 and \*TRC-2W.

**Wall Surface Mounted Back Boxes:**

SBBRL, SBBGRL, SBBWL and SBBGWL,

**Ceiling Surface Mounted Back Boxes:**

Revision 08-21-2017 dcc



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, 2019

**Listing Expires** June 30, 2020

**Authorized By:** DAVID CASTILLO, Program Coordinator  
Fire Engineering Division





# Outdoor Selectable-Output Horns, Strobes, and Horn Strobes for Wall Applications

*SpectrAlert® Advance outdoor audible visible products are rich with features that cut installation times and maximize profits.*

## Features

- Weatherproof per NEMA 4X, IP56
- Listed to UL 1638 (strobe) and UL 464 (horn)
- Compatible with System Sensor synchronization protocol and legacy SpectrAlert products
- Field-selectable candela settings: 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, and 185
- Automatic selection of 12- or 24-volt operation at 15 and 15/75 candela
- Rotary switch for horn tone and three volume selections
- Horn rated at 88+ dBA at 16 volts
- Rated from -40°F to 151°F
- Universal mounting plate with an onboard shorting spring that tests wiring continuity before devices are installed
- Plug-in design with minimal intrusion into the back box
- Tamper-resistant construction
- Listed for ceiling or wall mounting

## Agency Listings



S4011 (chimes, horn strobes, horns)  
S3593 (outdoor and alert strobes)



3023572



MEA452-05-E



7300-1653-187 (outdoor strobes)  
7125-1653-188 (horn strobes,  
chime strobes)  
7135-1653-189 (horns, chimes)



**SpectrAlert Advance** offers the broadest line of outdoor horns, strobes, and horn strobes in the industry. With white or red plastic housings, wall or ceiling mounting options, and plain or FIRE-printed devices, SpectrAlert Advance can meet virtually any application requirement, including indoor, outdoor, wet, and dry applications in temperatures from -40°F to 151°F.

Like the entire SpectrAlert Advance line, outdoor horns, strobes, and horn strobes for wall applications include a variety of features that increase application flexibility and simplify installation. First, field-selectable settings, including candela, automatic selection of 12- or 24-volt operation, horn tones, and three volume options enable installers to easily adapt devices to meet requirements.

Next, SpectrAlert Advance devices use a universal mounting plate for both wall and ceiling applications. This mounting plate includes an onboard shorting spring that ensures wiring continuity before devices are installed, so installers can verify proper wiring without mounting the devices and exposing them to potential construction damage. Once the plates are mounted, all SpectrAlert Advance devices utilize a plug-in design with a single captured screw to speed installation and virtually eliminate costly ground faults.

Outdoor devices ship with weatherproof plastic back boxes (metal back boxes are available separately) that accommodate in-and-out wiring for daisy chaining devices. Plastic back boxes feature removable side flanges and improved resistance to saltwater corrosion. Knock-outs located on the back eliminate the need to drill holes for screw-in mounting. Plastic and metal weatherproof back boxes come with 3/4-inch top and bottom conduit entries and 3/4-inch knock-outs at the back. A screw-in NPT plug with an O-ring gasket for a watertight seal is included with each back box.

# 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

<b>Operating Temperature</b>	–40°F to 151°F (–40°C to 66°C)
<b>Strobe Flash Rate</b>	1 flash per second
<b>Nominal Voltage</b>	Regulated 12 DC/FWR or regulated 24 DC/FWR <sup>1</sup>
<b>Operating Voltage Range<sup>2</sup></b>	8 to 17.5 V (12 V nominal) or 16 to 33 V (24 V nominal)
<b>Input Terminal Wire Gauge</b>	12 to 18 AWG
<b>Wall-Mount Dimensions (including lens)</b>	5.6" L x 4.7" W x 2.5" D (142 mm L x 119 mm W x 64 mm D)
<b>Horn Dimensions</b>	5.6" L x 4.7" W x 1.3" D (142 mm L x 119 mm W x 33 mm D)
<b>Wall-Mount Weatherproof Back Box Dimensions (SA-WBB)</b>	5.7" L x 5.1" W x 2.0" D (145 mm L x 130 mm W x 51 mm D)

### 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						
	15	15/75	15	15/75	30	75	95	110	115
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.

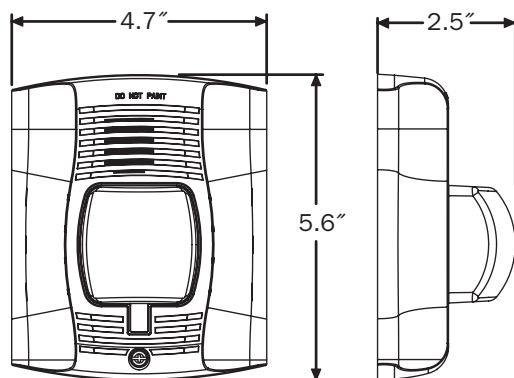
Strobe Output (cd)	
Listed Candela	Candela rating at –40°F
15	Do not use below 32°F
15/75	
30	
75	44
95	70
110	110
115	115
135	135
150	150
177	177
185	185

## Horn Tones and Sound Output Data

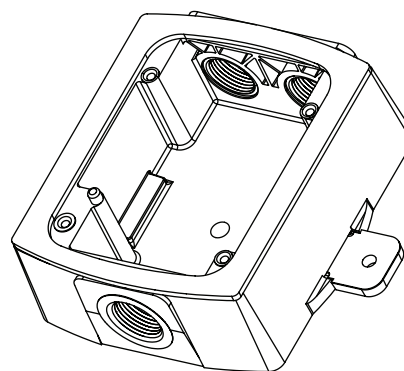
Horn and Horn Strobe Output (dBA)										
Switch Position	Sound Pattern	dB	8–17.5 Volts		16–33 Volts		24-Volt Nominal			
							Reverberant		Anechoic	
			DC	FWR	DC	FWR	DC	FWR	DC	FWR
1	Temporal	High	78	78	84	84	88	88	99	98
2	Temporal	Medium	74	74	80	80	86	86	96	96
3	Temporal	Low	71	73	76	76	83	80	94	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.

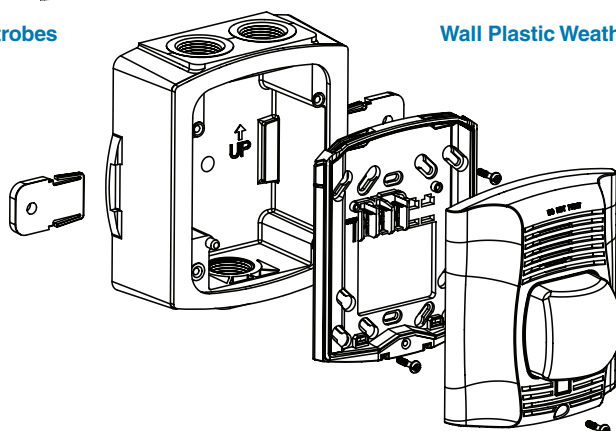
## SpectrAlert Advance Diagrams



Wall-Mount Horn Strobes



Wall Plastic Weatherproof Back Box



Wall-Mount Horn Strobe with Plastic Weatherproof Back Box

## SpectrAlert Advance Ordering Information

Model	Description
<b>Wall Horn Strobes</b>	
P2RK*†	2-Wire Horn Strobe, Standard cd, Red, Outdoor (includes plastic weatherproof back box)
P2RHK*†	2-Wire Horn Strobe, High cd, Red, Outdoor (includes plastic weatherproof back box)
P2WK*†	2-Wire Horn Strobe, Standard cd, White, Outdoor (includes plastic weatherproof back box)
P2WHK*†	2-Wire Horn Strobe, High cd, White, Outdoor (includes plastic weatherproof back box)
P4RK†	4-Wire Horn Strobe, Standard cd, Red, Outdoor (includes plastic weatherproof back box)
P4WK	4-Wire Horn Strobe, Standard cd, White, Outdoor (includes plastic weatherproof back box)
P2RHK-120	2-Wire Horn Strobe, High cd, Red, Outdoor, 120 V (includes plastic weatherproof back box)
<b>Wall Strobes</b>	
SRK*†	Strobe, Standard cd, Red, Outdoor (includes plastic weatherproof back box)
SRHK*†	Strobe, High cd, Red, Outdoor (includes plastic weatherproof back box)
SWK*†	Strobe, Standard cd, White, Outdoor (includes plastic weatherproof back box)
SWHK*†	Strobe, High cd, White, Outdoor (includes plastic weatherproof back box)
<b>Horns</b>	
HRK†	Horn, Red, Outdoor (includes plastic weatherproof back box)
<b>Accessories</b>	
SA-WBB	Red, Metal Weatherproof Back Box
SA-WBBW	White, Metal Weatherproof Back Box

### 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), only 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. **When replacing standard outdoor units both the device and back box must be replaced.**



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](http://systemsensor.com)  
for current product information, including the latest version of this data sheet.  
AVDS01201 • 3/12

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 (630) 762-5362 Fax (203) 484-7309  
Email: [megan.sisson@honeywell.com](mailto: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" suffice 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



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, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division

# SD365CO

## Multi-Criteria Fire/CO Detector



### General Description

SD365CO is a plug-in, addressable device that provides both fire and carbon monoxide (CO) detection. The detector combines four separate sensing elements in one unit 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 the 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).
- Carbon Monoxide sensors detect this by-product of fire for accurate fire detection.
- 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.

The fire/CO detector meets both UL 268 and UL 521 listing requirements for fire detection as well as the 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 SD365CO. 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 horns, horn strobes, and chimes — when connected to a power supply or Fire Alarm Control Panel (FACP) output capable of generating the System Sensor synchronization pulses.

### Features

- Unique ability to detect all four major elements of a fire
- Separate CO detection signal
- Highest nuisance alarm immunity
- Automatic drift compensation for smoke and CO sensors
- Uses only one address on the SLC
- RealTest® CO testing capability
- UL 268, UL 521, and UL 2075 listed
- Separate audible signal for fire or CO alarm when used with a B200S series base
- 10-year CO cell with end-of-life warning
- New modern profile
- Expanded color options



SD365CO Multi-Criteria Fire/CO Detector  
installed in B200S-LF-WH sounder base

### Specifications

#### PHYSICAL

- 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)
- Color: White
- 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 are as follows:

Parts Per Million	Detector Response Time
70 ± 5ppm	60 – 240 min.
150 ± 5ppm	10 – 50 min.
400 ± 10ppm	4 – 15 min.



## Standards

Per UL standard 2075, the SD365CO has been tested to the sensitivity limits defined in UL Standard 2034.

UL Standard: UL 268

## Agency Listings and Approvals

The listings and approvals below apply to the SD365CO. 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: S1059

CSFM: 7272-0075:0507

## Ordering Information

SD365CO: Advanced multi-criteria fire/CO detector, LiteSpeed®, 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.

For more information, contact Fire•Lite Alarms Phone: (800) 627-3473, FAX: (877) 699-4105.  
www.firelite.com

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.** 7272-0075:0507

Page 1 of 1

**CATEGORY:** 7272 -- SMOKE DETECTOR-SYSTEM TYPE-PHOTOELECTRIC

**LISTEE:** FIRE-LITE ALARMS INC. One Fire-Lite Place, Northford, CT 06410-1653  
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309  
Email: [megan.sisson@honeywell.com](mailto:megan.sisson@honeywell.com)

**DESIGN:** Model **SD365CO** Multi-criteria photoelectric smoke detector with complementary heat detector, complementary electrochemical carbon monoxide (CO) detector, and supplemental infrared flame sensor, analog addressable.  
Models AD365, AD365-IV Multi-criteria photoelectric smoke detector with complementary heat detector, and supplemental infrared flame sensor, analog addressable.  
Model CSD365, Multi-criteria photoelectric smoke detector with complementary electrochemical carbon monoxide (CO) detector, analog addressable.  
Refer to listee's printed data sheet for additional detailed product description and operational considerations

**RATING:** 24 VDC

**INSTALLATION:** In accordance with the 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 an Automatic Smoke Detector with supplemental heat detection and CO detection, for use with:  
System Sensor (S911) - Models B200S, B200S-WH, B200S-IV, B200SR, B200SR-WH, B200SR-IV, (CSFM Listing 7300-1653:0213)  
\*B200S-LF, \*B200S-LF-IV, \*B200S-LF-WH, B200SR-LF, B200SR-LF-WH, B200SR-LF-IV, (CSFM Listing 7300-1653:0238), B210LP, B300-6, B300-6-IV, B300-6-IS, B300-6-IS-W, B300-6-IS-IV, B501, B501-WHITE, B501-IV, B501-BL, (CSFM Listing 7300-1653:0109)  
B224BI, B224BI-WH, B224BI-IV, B224RB, B224RB-WH, B224RB-IV, (CSFM Listing 7300-1653:0126).

Silent Knight (S6173) - Model IDP-6AB (CSFM Listing 7300-0559:0159).

Fire-Lite (S1059) - Model B350LP (CSFM Listing 7300-0075:0192).

\*Rev 08-02-19 gt



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Date Issued: **July 01, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division



# H365 Series

## Addressable Heat Detectors



### Addressable Devices

The Fire-Lite® Alarms H365(A), H365R(A), and H365HT(A) addressable plug-in thermal detectors are designed for both performance and aesthetics and are a direct replacement for the H355 Series. A new modern, sleek, contemporary design and advanced thermal technologies make the H365(A) Series ideal for both system operation and building design.

Exclusively for use with Fire-Lite's addressable fire alarm control panels, the H365(A) Series point ID capability allows each detector's address to be set with rotary, decimal address switches, providing exact detector location for emergency personnel to quickly locate a fire during its early stages, potentially saving precious rescue time while also reducing property damage. Two LEDs on each sensor light to provide a local, visible sensor indication.

The H365(A) Series includes fixed temperature, rate-of-rise and high heat fixed temperature detectors that provide effective, intelligent property protection for a variety of applications. Detectors are available for both LiteSpeed™ and CLIP applications as designated.

## Features

### SLC LOOP:

- Two-wire SLC loop connection
- Unit uses base for wiring

### ADDRESSING:

- Addressable by device
- Rotary, decimal addressing  
(Refer to the *Fire-Lite panel manuals* for device capacity.)

### ARCHITECTURE:

- Designed to meet UL 268 7th Edition
- Sleek, low-profile, stylish design
- State-of-the-art thermistor technology for fast response
- Integral communications and built-in device-type identification
- Built-in tamper resistant feature
- Built-in functional test switch activated by external magnet

### OPERATION:

- Fixed temperature model (H365(A)) factory preset to 135°F (57°C)
- Rate-of-rise model (H365R(A)), 15°F (8.3°C) per minute
- High-temperature model (H365HT(A)) factory preset to 190°F (88°C)
- 360°-field viewing angle of the two visual alarm indicators, LEDs blink red in Normal condition and turn on steady red in Alarm
- LEDs blink every time the unit is polled

### MECHANICALS:

- Sealed against back pressure
- SEMS screws for wiring of the separate base
- Designed for direct-surface or electrical-box mounting
- Plugs into separate base for ease of installation and maintenance
- Separate base allows interchange of photoelectric, ionization and thermal sensors

### OTHER SYSTEM FEATURES:

- Remote test feature from the panel
- Walk test with address display
- Low standby current



### OPTIONS:

- Remote LED output connection to optional RA100Z remote LED annunciator

## Installation

H365 Series plug-in intelligent thermal detectors use a detachable base to simplify installation, service and maintenance. Installation instructions are shipped with each detector.

Mount detector 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 *DF-60059*.

**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 only. When using relay or sounder bases, consult the *I300(A)* installation sheet *I56-3626* for device limitations between isolator modules and isolator bases.

## Applications

Use thermal detectors for protection of property. For further information, refer to *I56-6525*, Applications Manual for System Smoke Detectors, which provides detailed information on detector spacing, placement, zoning, wiring, and special applications.

## Construction

These detectors are constructed of fire-resistant plastic. The H365 Series plug-in intelligent thermal detectors are designed to commercial standards and offer an attractive appearance.

## Operation

Each H365 Series detector uses one of the panel's addresses (total limit is panel dependent) on the Fire-LiteJCI 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 H365 Series offers features and performance that represent the latest in thermal detector technology.

## Product Line Information

**NOTE:** “-IV” suffix indicates CLIP and LiteSpeed device.

**NOTE:** “A” suffix indicates Canadian version.

**H365:** White, low-profile intelligent 135°F fixed thermal sensor, LiteSpeed only

**H365A:** Same as H365 but with ULC listing

**H365-IV:** Ivory, low-profile intelligent 135°F fixed thermal sensor, LiteSpeed and CLIP

**H365A-IV:** Same as H365-IV but with ULC listing

**H365R:** White, low-profile intelligent rate-of-rise thermal sensor, LiteSpeed only

**H365RA:** Same as H365R but with ULC listing

**H365R-IV:** Ivory, low-profile intelligent rate-of-rise fixed thermal sensor, LiteSpeed and CLIP

**H365RA-IV:** Same as H365R-IV but with ULC listing

**H365HT:** White, low-profile intelligent 190°F fixed thermal sensor, LiteSpeed only

**H365HTA:** Same as H365H but with ULC listing

**H365HT-IV:** Ivory, low-profile intelligent 190°F thermal sensor, LiteSpeed and CLIP

**H365HTA-IV:** Same as H365H-IV but with ULC listing

### INTELLIGENT BASES

**NOTE:** For details on intelligent bases, see DF-60059.

**B300-6:** White, 6” base, standard flanged low-profile mounting base (CSFM: 7300-1653:0109)

**B300-6-IV:** Ivory, 6” base, standard flanged low-profile mounting base (CSFM: 7300-1653:0109)

**B300A-6:** Same as B300-6, ULC listed

**B300A-6-IV:** Ivory, 6” standard flanged low-profile mounting base, ULC listed

**B300-6-BP:** Bulk pack of B300-6, package contains 10

**B501-WHITE:** White, 4” standard European flangeless mounting base. UL/ULC listed (CSFM: 7300-1653:0109)

**B501-BL:** Black, 4” standard European flangeless mounting base. UL/ULC listed (CSFM: 7300-1653:0109)

**B501-IV:** Ivory color, 4” standard European flangeless mounting base. UL/ULC listed (CSFM: 7300-1653:0109)

**B501-WHITE-BP:** Bulk pack of B501-WHITE contains 10

**B224RB-WH:** White, relay base (CSFM: 7300-1653:0216)

**B224RB-IV:** Ivory, relay base (CSFM: 7300-1653:0216)

**B224RBA-WH:** White, relay base, ULC listing

**B224RBA-IV:** Ivory, relay base, ULC listing

**B224BI-WH:** White, isolator detector base (CSFM: 7300-1653:0216)

**B224BI-IV:** Ivory isolator detector base (CSFM: 7300-1653:0216)

**B224BIA-WH:** White, isolator detector base, ULC listing

**B224BIA-IV:** Ivory isolator detector base, ULC listing

**B200S-WH:** White, Intelligent addressable sounder base capable of producing sound output in high or low volume with ANSI Temporal 3, ANSI Temporal 4, continuous tone, marching tone, and custom tone. Uses FlashScan protocol. (CSFM: 7300-1653:0213)

**B200S-IV:** Ivory, Intelligent addressable sounder base capable of producing sound output in high or low volume with ANSI Temporal 3, ANSI Temporal 4, continuous tone, marching tone, and custom tone. Uses FlashScan protocol. (CSFM: 7300-1653:0213)

**B200SA-WH:** Same as B200S-WH, ULC listing

**B200SA-IV:** Same as B200S-IV, ULC listing

**B200SCOA-WH:** White, Intelligent, programmable sounder base in English/French (required in Canada for ULC applications with CO Series detector applications)

**B200SCOA-IV:** Ivory Intelligent, programmable sounder base in English/French (required in Canada for ULC applications with CO Series detector applications, ULC listing)

**B200S-LF-WH:** White, Low Frequency Intelligent, programmable sounder base. Produces a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent; designed to meet the NFPA 72 sleeping space requirement. (CSFM: 7300-1653:0238)

**B200S-LF-IV:** Ivory, Low Frequency Intelligent, programmable sounder base. Produces a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent; designed to meet the NFPA 72 sleeping space requirement. (CSFM: 7300-1653:0238)

**B200SR-WH:** White, Intelligent sounder base capable of producing sound output with ANSI Temporal 3 or continuous tone. Intended for retrofit applications. (CSFM: 7300-1653:0213)

**B200SR-IV:** Ivory, Intelligent sounder base capable of producing sound output with ANSI Temporal 3 or continuous tone. Intended for retrofit applications. (CSFM: 7300-1653:0213)

**B200SRA-WH:** Same as B200SR-WH with, ULC listing

**B200SRA-IV:** Same as B200SR-IV in Ivory color, ULC listing

**B200SR-LF-WH:** White, Low Frequency Intelligent, programmable sounder base. Produces a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent; designed to meet the NFPA 72 sleeping space requirement. Intended for retrofit applications. (CSFM: 7300-1653:0238)

**B200SR-LF-IV:** Ivory, Low Frequency Intelligent, programmable sounder base. Produces a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent; designed to meet the NFPA 72 sleeping space requirement. Intended for retrofit applications. (CSFM: 7300-1653:0238)

### MOUNTING KITS AND ACCESSORIES

**TR300:** White, replacement flange for B210LP(A) base

**TR300-IV:** Ivory, replacement flange for B210LP(A) base

**RA100Z(A):** Remote LED annunciator. 3-32 VDC. Mounts to a U.S. single-gang electrical box. For use with B501(A) and B300-6(A).

**M02-04-00:** Test magnet

**M02-09-00:** Test magnet with telescoping handle

**CK300:** Color Kit (includes cover and trim ring), white, 10-pack

**CK300-IV:** Color Kit (includes cover and trim ring), ivory, 10-pack

**CK300-BL:** Color Kit (includes cover and trim ring), black, 10-pack

# SYSTEM SPECIFICATIONS

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**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 DF-60983*

**Shipping weight:** 3.4 oz. (95 g)

**Operating temperature range:**

- H365, H365R Series: –4°F to 100°F (–20°C to 38°C)
- H365H Series: –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)

**Mounting:** B300-6(A) flanged base, included

See “**Product Line Information: Intelligent Bases,**” if using a different base.

## 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”)

## Listings and Approvals

Listings and approvals below apply to the H365 Series detectors. In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- UL/ULC Listing: S2517
- FM Approved
- CSFM: 7272-0075:0501

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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 more information, contact Fire•Lite Alarms. Phone: (800) 627-3473, FAX: (877) 699-4105.  
www.firelite.com

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.** 7270-0075:0501

Page 1 of 1

**CATEGORY:** 7270 -- HEAT DETECTOR

**LISTEE:** FIRE-LITE ALARMS INC. One Fire-Lite Place, Northford, CT 06410-1653  
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309  
Email: megan.sisson@honeywell.com

**DESIGN:** Models **H365**, H365HT (fixed temperature) and H365R (fixed temperature with Rate-of-Rise) electronic heat detectors. Suffix -IV for ivory color and -BL for black color. Refer to listee's data sheet for additional detailed product description and operational considerations.

**RATING:** Model H365 (fixed temperature): 135°F.  
Model H365HT (fixed temperature): 190°F.  
Model H365R (fixed temperature with rate of rise): 135°F.

**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 Notifier base B710LP (CSFM#7300-0028:173); System Sensor bases B510, B210LP, B300-6, B300-6-IS (CSFM#7300-1653:0109); B224BI, B224RB (CSFM#7300-1653:0126); B200S, B200SR (CSFM#7300-1653:0213); B200S-LF, B200SR-LF (CSFM#7300-1653:238); and separately listed compatible fire alarm control units. Refer to listee's Installation Instructions Manual for details.

**XLF:** 7270-0028:0502

02-01-18 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, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division

# SD365 Series

## Addressable Photoelectric Smoke Detectors



### Addressable Devices

The Fire•Lite® Alarms SD365(A), SD365R(A), and SD365HT(A) intelligent plug-in smoke detectors are designed for both performance and aesthetics, and are direct replacements for the SD355 Series. 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.

Exclusively for use with Fire•Lite's addressable fire alarm control panels, the SD365(A) Series point ID capability allows each detector's address to be set with rotary, decimal address switches, providing exact detector location for emergency personnel to quickly locate a fire during its early stages, potentially saving precious rescue time while also reducing property damage. Two LEDs on each sensor light to provide a local, visible sensor indication.

The SD365(A) Series also offers 135°F (57°C) fixed temperature thermal sensing on the SD365T(A) and a remote test capable detector on the SD365R(A) for use with DNR(A)/DNRW duct smoke detector housings.

## Features

### SLC LOOP:

- Two-wire SLC loop connection
- Unit uses base for wiring
- Compatible with LiteSpeed™ and CLIP protocol systems
- Stable communication technique with noise immunity

### ADDRESSING:

- Addressable by device
- Rotary, decimal addressing  
(Refer to the *Fire•Lite panel manuals* for device capacity.)

### ARCHITECTURE:

- Sleek, low-profile, stylish design
- Unique single-source design to respond quickly and dependably to a broad range of fires
- Integral communications and built-in device-type identification
- Built-in tamper resistant feature
- Remote test feature from the panel
- Walk test with address display (an address on 121 will blink the detector LED: 12-[pause]-1 (*LiteSpeed systems only*))
- Built-in functional test switch activated by external magnet
- Removable cover and insect-resistant screen for simple field cleaning
- Expanded color options

### OPERATION:

- Designed to meet UL 268 7th Edition
- Factory preset at 1.5% nominal sensitivity for panel alarm threshold level
- LED "blinks" when the unit is polled (communicating with the fire panel) and latches in alarm.
- Low standby current

### MECHANICALS:

- Sealed against back pressure
- SEMS screws for wiring of the separate base
- Designed for direct-surface or electrical-box mounting



- Plugs into separate base for ease of installation and maintenance
- Separate base allows interchange of photoelectric, ionization and thermal sensors

### OPTIONS:

- Optional relay, isolator, and sounder bases

## Installation

SD365 Series plug-in intelligent smoke detectors use a detachable base to simplify installation, service and maintenance. Installation instructions are shipped with each detector.

Mount detector 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 *DF-60059*.

**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 only. When using relay or sounder bases, consult the *I300(A) installation sheet I56-3626* for device limitations between isolator modules and isolator bases.

## Construction

These detectors are constructed of fire-resistant plastic. The SD365 Series plug-in intelligent smoke detectors are designed to commercial standards and offer an attractive appearance.

## Operation

Each SD365 Series detector uses one of the panel's addresses (total limit is panel dependent) on the Fire•Lite 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 SD365 Series offers features and performance that represent the latest in smoke detector technology.

## Detector Sensitivity Test

Each detector can have its sensitivity tested (required per NFPA 72, Chapter 14 on *Inspection, Testing and Maintenance*) when installed/connected to an Fire•Lite addressable fire alarm control panel. The results of the sensitivity test can be printed for record keeping.



## Product Line Information

**NOTE:** “-IV” suffix indicates CLIP and LiteSpeed device.

**NOTE:** “A” suffix indicates Canadian version.

**SD365:** White, low-profile intelligent photoelectric sensor, LiteSpeed only

**SD365A:** Same as SD365 but with ULC listing

**SD365-IV:** Ivory, low-profile intelligent photoelectric sensor

**SD365A-IV:** Same as SD365-IV but with ULC listing

**SD365T:** White, same as **SD365** but includes a built-in 135°F (57°C) fixed-temperature thermal device, LiteSpeed only

**SD365TA:** Same as SD365T but with ULC listing

**SD365T-IV:** Ivory, same as SD365T but includes a built-in 135°F (57°C) fixed-temperature thermal device

**SD365TA-IV:** Same as SD365T-IV but with ULC listing

**SD365R:** White, low-profile intelligent photoelectric sensor, remote test capable, for use with DNR/DNRW, LiteSpeed only

**SD365RA:** Same as SD365R but with ULC listing, for use with DNRA

**SD365R-IV:** Ivory, low-profile intelligent photoelectric sensor, remote test capable, for use with DNR/DNRW

**SD365RA-IV:** Same as SD365R-IV but with ULC listing, for use with DNRA

### INTELLIGENT BASES

**NOTE:** For details on intelligent bases, see DF-60059.

**B300-6:** White, 6" base, standard flanged low-profile mounting base (CSFM: 7300-1653:0109)

**B300-6-IV:** Ivory, 6" base, standard flanged low-profile mounting base (CSFM: 7300-1653:0109)

**B300A-6:** Same as B300-6, ULC listed

**B300A-6-IV:** Ivory, 6" standard flanged low-profile mounting base, ULC listed

**B300-6-BP:** Bulk pack of B300-6, package contains 10

**B501-WHITE:** White, 4" standard European flangeless mounting base. UL/ULC listed (CSFM: 7300-1653:0109)

**B501-BL:** Black, 4" standard European flangeless mounting base. UL/ULC listed (CSFM: 7300-1653:0109)

**B501-IV:** Ivory color, 4" standard European flangeless mounting base. UL/ULC listed (CSFM: 7300-1653:0109)

**B501-WHITE-BP:** Bulk pack of B501-WHITE contains 10

**B224RB-WH:** White, relay base (CSFM: 7300-1653:0216)

**B224RB-IV:** Ivory, relay base (CSFM: 7300-1653:0216)

**B224RBA-WH:** White, relay base, ULC listing

**B224RBA-IV:** Ivory, relay base, ULC listing

**B224BI-WH:** White, isolator detector base (CSFM: 7300-1653:0216)

**B224BI-IV:** Ivory isolator detector base (CSFM: 7300-1653:0216)

**B224BIA-WH:** White, isolator detector base, ULC listing

**B224BIA-IV:** Ivory isolator detector base, ULC listing

**B200S-WH:** White, Intelligent addressable sounder base capable of producing sound output in high or low volume with ANSI Temporal 3, ANSI Temporal 4, continuous tone, marching tone, and custom tone. Uses FlashScan protocol. (CSFM: 7300-1653:0213)

**B200S-IV:** Ivory, Intelligent addressable sounder base capable of producing sound output in high or low volume with ANSI Temporal 3, ANSI Temporal 4, continuous tone, marching tone, and custom tone. Uses FlashScan protocol. (CSFM: 7300-1653:0213)

**B200SA-WH:** Same as B200S-WH, ULC listing

**B200SA-IV:** Same as B200S-IV, ULC listing

**B200SCOA-WH:** White, Intelligent, programmable sounder base in English/French (required in Canada for ULC applications with CO Series detector applications)

**B200SCOA-IV:** Ivory Intelligent, programmable sounder base in English/French (required in Canada for ULC applications with CO Series detector applications, ULC listing)

**B200S-LF-WH:** White, Low Frequency Intelligent, programmable sounder base. Produces a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent; designed to meet the NFPA 72 sleeping space requirement. (CSFM: 7300-1653:0238)

**B200S-LF-IV:** Ivory, Low Frequency Intelligent, programmable sounder base. Produces a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent; designed to meet the NFPA 72 sleeping space requirement. (CSFM: 7300-1653:0238)

**B200SR-WH:** White, Intelligent sounder base capable of producing sound output with ANSI Temporal 3 or continuous tone. Intended for retrofit applications. (CSFM: 7300-1653:0213)

**B200SR-IV:** Ivory, Intelligent sounder base capable of producing sound output with ANSI Temporal 3 or continuous tone. Intended for retrofit applications. (CSFM: 7300-1653:0213)

**B200SRA-WH:** Same as B200SR-WH with, ULC listing

**B200SRA-IV:** Same as B200SR-IV in Ivory color, ULC listing

**B200SR-LF-WH:** White, Low Frequency Intelligent, programmable sounder base. Produces a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent; designed to meet the NFPA 72 sleeping space requirement. Intended for retrofit applications. (CSFM: 7300-1653:0238)

**B200SR-LF-IV:** Ivory, Low Frequency Intelligent, programmable sounder base. Produces a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent; designed to meet the NFPA 72 sleeping space requirement. Intended for retrofit applications. (CSFM: 7300-1653:0238)

### MOUNTING KITS AND ACCESSORIES

**TR300:** White, replacement flange for B210LP(A) base

**TR300-IV:** Ivory, replacement flange for B210LP(A) base

**RA100Z(A):** Remote LED annunciator. 3-32 VDC. Mounts to a U.S. single-gang electrical box. For use with B501(A) and B300-6(A).

**M02-04-00:** Test magnet

**M02-09-00:** Test magnet with telescoping handle

**CK300:** Color Kit (includes cover and trim ring), white, 10-pack

**CK300-IV:** Color Kit (includes cover and trim ring), ivory, 10-pack

**CK300-BL:** Color Kit (includes cover and trim ring), black, 10-pack

# SYSTEM SPECIFICATIONS

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## 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 DF-60983*

**Shipping weight:** 3.4 oz. (95 g)

## Operating temperature range:

- SD365: 32°F to 122°F (0°C to 50°C)
- SD365T Series: 32°F to 100°F (0°C to 38°C)
- SD365R Series 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

Fire•Lite 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](http://www.systemsensor.com).

## Listings and Approvals

Listings and approvals below apply to the SD365 Series detectors. In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- UL/ULC Listing: S1059
- FM Approved
- CSFM: 7272-0075:0502

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[www.firelite.com](http://www.firelite.com)

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.** 7272-0075:0502

Page 1 of 1

**CATEGORY:** 7272 -- SMOKE DETECTOR-SYSTEM TYPE-PHOTOELECTRIC

**LISTEE:** FIRE-LITE ALARMS INC. One Fire-Lite Place, Northford, CT 06410-1653  
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309  
Email: megan.sisson@honeywell.com

**DESIGN:** Models **SD365**, SD365R and SD365T analog addressable, photoelectric smoke detectors for open area and duct installations. Model SD365T has a complementary heat detector. All models are similar except for population/depopulation of components on the Printed Wiring Board for the intended features. All above models may be followed by two digit Suffix indicating the color of the detector enclosure: no suffix for white, -IV for ivory, -BL for black. Refer to listee's Installation and Maintenance Instruction for additional detailed product description and operational considerations.

**RATING:** 24 VDC.

**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 photoelectric smoke detectors. Detectors are for use with separately listed System Sensor base Models \*B501, \*B210LP (CSFM Listing 7300-1653:0109), \*B350LP (CSFM Listing 7300-0075:0192), B200S and B200SR (CSFM Listing 7300-1653:0213), B200S-LF and B200SR-LF (CSFM Listing 7300-1653:0238), B300-6 and B300-6-IS bases (CSFM Listing 7300-1653:0109), System Sensor duct detector housings Models DNR and DNRW (CSFM listing 3240-1653:0209), Fire-Lite duct detector housing Model D355PL (CSFM listing 3240-0075:0221) and separately listed compatible fire alarm control units. Refer to manufacturer's Installation Manual for details. \*All models comply with the applicable requirements in ANSI/UL 268, Smoke Detectors for Fire Alarm Systems, 7th Edition, January 11, 2016.

**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 fire may include cigarettes burning in the couch 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 include paper burning in a waste container or a grease fire in the kitchen.

**XLF:** 7272-0028:0503

\*Revision 12-17-19 VWW



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Date Issued: **July 01, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO, M.E., F.P.E.**  
*Fire Engineering Division*



# CRF-300(A)

## Relay Module



### Addressable Devices

### General

The **CRF-300(A)** Addressable Relay Module provides the system with a dry-contact output for activating a variety of auxiliary devices, such as fans, door holders, dampers, control equipment, etc. Addressability allows the dry contact to be activated through panel programming, on a select basis.

LiteSpeed™ is a communication protocol developed by Fire•Lite Engineering that greatly enhances the speed of communication between analog intelligent devices. Intelligent devices communicate in a grouped fashion. If one of the devices within the group has new information, the panel CPU stops the group poll and concentrates on single points. The net effect is response speed greater than five times that of other designs.

### Features

- Built-in type identification automatically identifies these devices to the control panel.
- Internal circuitry and relay powered directly by two-wire SLC loop.
- Integral LED “blinks” green each time a communication is received from the control panel and turns on in steady red when activated.
- High noise immunity (EMF/RFI).
- Wide viewing angle of LED.
- SEMS screws with clamping plates for wiring ease.
- Direct-dial entry of address: 01– 159 for MS-9600(A) series panels, 01 – 99 on MS-9200UDLS(A) and MS-9050UD(A).

### Applications

The CRF-300(A) may be programmed to operate dry contacts for door holders, Air Handling Unit shutdown, etc., and to reset four-wire smoke detector power.

### Construction

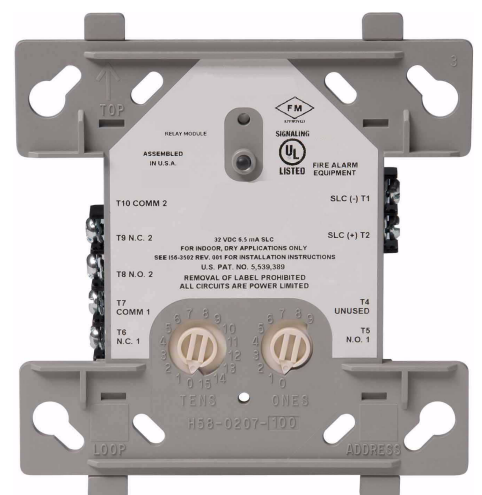
- The face plate is made of off-white heat-resistant plastic.
- Controls include two rotary switches for direct-dial entry of address setting.
- The CRF-300(A) is configured for a single Class B (Style Y) or Class A (Style Z) Notification Appliance Circuit.
- The CRF-300(A) provides two Form-C dry contacts that switch together.

### Operation

Each CRF-300(A) uses one of the addresses on a SLC loop. It responds to regular polls from the control panel and reports its type and status, including the open/normal/short status of its Notification Appliance Circuit (NAC). The LED blinks with each poll received. On command, it activates its internal relay.

**NOTE:** Open/short supervision is suspended with the CRF-300.

Rotary switches set a unique address for each module. The address may be set before or after mounting. The built-in TYPE CODE (not settable) will identify the module to the control panel, so as to differentiate between a control module and a relay module.



CRF-300(A)

### Specifications

**Normal operating voltage:** 15 to 32 VDC.

**Maximum SLC current draw:** 6.5 mA (LED on).

**Average operating current:** 230  $\mu$ A direct poll (CLIP mode), 255  $\mu$ A group poll (LiteSpeed mode) with LED flashing.

**EOL resistance:** not used.

**Temperature range:** 32°F to 120°F (0°C to 49°C).

**Humidity range:** 10% to 93% non-condensing.

**Dimensions:** 4.5" (11.43 cm) high x 4" (10.16 cm) wide x 1.25" (3.175 cm) deep. Mounts to a 4" (10.16 cm) square x 2.125" (5.398 mm) deep box.

### Relay Contact Ratings

Load Description	Application	Maximum Voltage	Current Rating
Resistive	Non-Coded	30 VDC	3.0 A
Resistive	Coded	30 VDC	2.0 A
Resistive	Non-Coded	110 VDC	0.9 A
Resistive	Non-Coded	125 VAC	0.9 A
Inductive (L/R=5ms)	Coded	30 VDC	0.5 A
Inductive (L/R=2ms)	Coded	30 VDC	1.0 A
Inductive (PF=0.35)	Non-Coded	125 VAC	0.5 A

## Agency Listings and Approvals

In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL:** S2424
- **ULC:** S2424
- **FM approved**
- **CSFM:** 7300-0075:185
- **MEA:** 72-01-E

## Product Line Information

**CRF-300(A):** Intelligent addressable relay module.

: Intelligent addressable relay module, ULC listed model.

**SMB500:** Optional surface-mount backbox.

**NOTE:** For installation instructions, see document I56-1190-005 and refer to the SLC Wiring Manual, document 51309.

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For more information, contact Fire•Lite Alarms. Phone: (800) 627-3473, FAX: (877) 699-4105.  
[www.firelite.com](http://www.firelite.com)

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



## LISTING SERVICE

**LISTING No.** 7300-0075:0185 Page 1 of 1

**CATEGORY:** 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

**LISTEE:** FIRE-LITE ALARMS INC. One Fire-Lite Place, Northford, CT 06410-1653  
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309  
Email: megan.sisson@honeywell.com

**DESIGN:** Models MDF-300, MMF-301, MMF-300, MMF-302, MCF-300 monitor modules; Models CRF-300 and CMF-300 control modules; and MMF-302-6 six zone interface signaling device module. 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, 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 control unit accessories for use with listee's separately listed electrically compatible fire alarm control units.

**NOTE:**

\*Rev. 05-06-05 JW



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Date Issued: **July 01, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division

# MMF-300(A) Series, MDF-300

## Addressable Monitor Modules



### Addressable Devices

#### General

Four different monitor modules are available for Fire•Lite's intelligent control panels to suit a variety of applications. Monitor modules are used to supervise a circuit of dry-contact input devices, such as conventional heat detectors and pull stations, or monitor and power a circuit of two-wire smoke detectors (MMF-302(A)).

**MMF-300(A)** is a standard-sized module (typically mounts to a 4" [10.16 cm] square box) that supervises either a Style D (Class A) or Style B (Class B) circuit of dry-contact input devices.

**MMF-301(A)** is a miniature monitor module a mere 1.3" (3.302 cm) H x 2.75" (6.985 cm) W x 0.65" (1.651 cm) D that supervises a Style B (Class B) circuit of dry-contact input devices. Its compact design allows the MMF-301(A) to be mounted in a single-gang box behind the device it monitors.

**MMF-302(A)** is a standard-sized module used to monitor and supervise compatible two-wire, 24 volt, smoke detectors on a Style D (Class A) or Style B (Class B) circuit.

**MDF-300(A)** is a standard-sized dual monitor module used to monitor and supervise two independent two-wire Style B (Class B) dry-contact initiating device circuits (IDCs) at two separate, consecutive addresses in intelligent, two-wire systems.

LiteSpeed™ is a communication protocol developed by Fire•Lite Engineering that greatly increases the speed of communication between analog intelligent devices. Intelligent devices communicate in a grouped fashion. If one of the devices within the group has new information, the panel CPU stops the group poll and concentrates on single points. The net effect is response speed greater than five times that of other communication protocols.

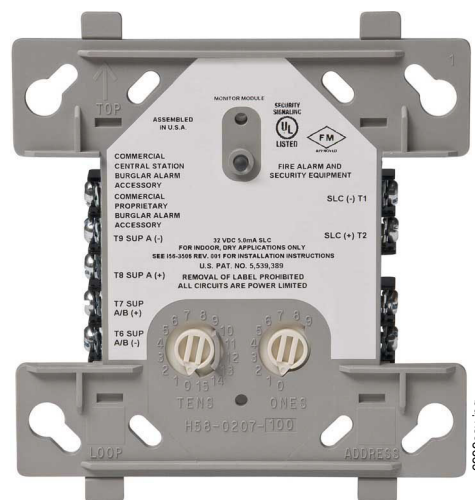
#### MMF-300(A) Monitor Module

- Built-in type identification automatically identifies this device as a monitor module to the control panel.
- Powered directly by two-wire SLC loop. No additional power required.
- High noise (EMF/RFI) immunity.
- SEMS screws with clamping plates for ease of wiring.
- Direct-dial entry of address: 01 – 159 on MS-9600 series panels, 01 – 99 on other compatible systems.
- LED flashes during normal operation and latches on steady to indicate alarm.

The MMF-300(A) Monitor Module is intended for use in intelligent, two-wire systems, where the individual address of each module is selected using the built-in rotary switches. It provides either a two-wire or four-wire fault-tolerant Initiating Device Circuit (IDC) for normally-open-contact fire alarm and supervisory devices. The module has a panel-controlled LED indicator. The MMF-300(A) can be used to replace M300(A) modules in existing systems.

#### MMF-300(A) APPLICATIONS

Use to monitor a zone of four-wire smoke detectors, manual fire alarm pull stations, waterflow devices, or other normally-open dry-contact alarm activation devices. May also be used to monitor normally-open supervisory devices with special



MMF-300(A) (Type H)

supervisory indication at the control panel. Monitored circuit may be wired as an NFPA Style B (Class B) or Style D (Class A) Initiating Device Circuit. A 47K Ohm End-of-Line Resistor (provided) terminates the Style B circuit. No resistor is required for supervision of the Style D circuit.

#### MMF-300(A) OPERATION

Each MMF-300(A) uses one of the available module addresses on an SLC loop. It responds to regular polls from the control panel and reports its type and the status (open/normal/short) of its Initiating Device Circuit (IDC). A flashing LED indicates that the module is in communication with the control panel. The LED latches steady on alarm (subject to current limitations on the loop).

#### MMF-300(A) SPECIFICATIONS

**Nominal operating voltage:** 15 to 32 VDC.

**Maximum current draw:** 5.0 mA (LED on).

**Average operating current:** 375  $\mu$ A (LED flashing), 1 communication every 5 seconds, 47k EOL.

**Maximum IDC wiring resistance:** 1500 Ohms.

**Maximum IDC Voltage:** 11 Volts.

**EOL resistance:** 47K Ohms.

**Temperature range:** 32°F to 120°F (0°C to 49°C).

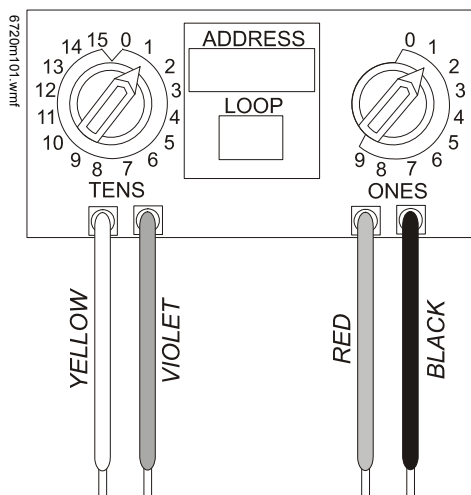
**Humidity range:** 10% to 93% noncondensing.

**Dimensions:** 4.5" (11.43 cm) high x 4" (10.16 cm) wide x 1.25" (3.175 cm) deep. Mounts to a 4" (10.16 cm) square x 2.125" (5.398 cm) deep box.

#### MMF-301(A) Mini Monitor Module

- Built-in type identification automatically identifies this device as a monitor module to the panel.
- Powered directly by two-wire SLC loop. No additional power required.
- High noise (EMF/RFI) immunity.

- Tinned, stripped leads for ease of wiring.
- Direct-dial entry of address: 01 – 159 on MS-9600 series panels, 01 – 99 on other compatible systems



The MMF-301(A) Mini Monitor Module can be installed in a single-gang junction directly behind the monitored unit. Its small size and light weight allow it to be installed without rigid mounting. The MMF-301(A) is intended for use in intelligent, two-wire systems where the individual address of each module is selected using rotary switches. It provides a two-wire initiating device circuit for normally-open-contact fire alarm devices. The MMF-301(A) can be used to replace M301(A) modules in existing systems.

#### **MMF-301(A) APPLICATIONS**

Use to monitor a single device or a zone of four-wire smoke detectors, manual fire alarm pull stations, waterflow devices, or other normally-open dry-contact devices. May also be used to monitor normally-open supervisory devices with special supervisory indication at the control panel. Monitored circuit/device is wired as an NFPA Style B (Class B) Initiating Device Circuit. A 47K Ohm End-of-Line Resistor (provided) terminates the circuit.

#### **MMF-301(A) OPERATION**

Each MMF-301(A) uses one of the available module addresses on an SLC loop. It responds to regular polls from the control panel and reports its type and the status (open/normal/short) of its Initiating Device Circuit (IDC).

#### **MMF-301(A) SPECIFICATIONS**

**Nominal operating voltage:** 15 to 32 VDC.

**Average operating current:** 350  $\mu$ A, 1 communication every 5 seconds, 47k EOL; 600  $\mu$ A Max. (Communicating, IDC Shorted).

**Maximum IDC wiring resistance:** 1500 Ohms.

**Maximum IDC Voltage:** 11 Volts.

**Maximum IDC Current:** 450  $\mu$ A.

**EOL resistance:** 47K Ohms.

**Temperature range:** 32°F to 120°F (0°C to 49°C).

**Humidity range:** 10% to 93% noncondensing.

**Dimensions:** 1.3" (3.302 cm) high x 2.75" (6.985 cm) wide x 0.65" (1.651 cm) deep.

**Wire length:** 6" (15.24 cm) minimum.

### **MMF-302(A) Interface Module**

- Supports compatible two-wire smoke detectors.

- Supervises IDC wiring and connection of external power source.
- High noise (EMF/RFI) immunity.
- SEMS screws with clamping plates for ease of wiring.
- Direct-dial entry of address: 01 – 159 on MS-9600 series panels, 01 – 99 on other compatible systems.
- LED flashes during normal operation.
- LED latches steady to indicate alarm on command from control panel.

The MMF-302(A) Interface Module is intended for use in intelligent, addressable systems, where the individual address of each module is selected using built-in rotary switches. This module allows intelligent panels to interface and monitor two-wire conventional smoke detectors. It transmits the status (normal, open, or alarm) of one full zone of conventional detectors back to the control panel. All two-wire detectors being monitored must be UL compatible with the module. The MMF-302(A) can be used to replace M302(A) modules in existing systems.

#### **MMF-302 (A) APPLICATIONS**

Use the MMF-302(A) to monitor a zone of two-wire smoke detectors. The monitored circuit may be wired as an NFPA Style B (Class B) or Style D (Class A) Initiating Device Circuit. A 3.9 K Ohm End-of-Line Resistor (provided) terminates the end of the Style B or D (class B or A) circuit (maximum IDC loop resistance is 25 Ohms). Install ELR across terminals 8 and 9 for Style D application.

#### **MMF-302(A) OPERATION**

Each MMF-302(A) uses one of the available module addresses on an SLC loop. It responds to regular polls from the control panel and reports its type and the status (open/normal/short) of its Initiating Device Circuit (IDC). A flashing LED indicates that the module is in communication with the control panel. The LED latches steady on alarm (subject to current limitations on the loop).

#### **MMF-302(A) SPECIFICATIONS**

**Nominal operating voltage:** 15 to 32 VDC.

**Maximum current draw:** 5.1 mA (LED on).

**Maximum IDC wiring resistance:** 25 Ohms.

**Average operating current:** 270  $\mu$ A, 1 communication and 1 LED flash every 5 seconds, 3.9k eol.

**EOL resistance:** 3.9K Ohms.

**External supply voltage (between Terminals T10 and T11):**

- DC voltage: 24 volts power limited.
- Ripple voltage: 0.1 Vrms maximum.
- Current: 90 mA per module maximum.

**Temperature range:** 32°F to 120°F (0°C to 49°C).

**Humidity range:** 10% to 93% noncondensing.

**Dimensions:** 4.5" (11.43 cm) high x 4" (10.16 cm) wide x 1.25" (3.175 cm) deep. Mounts to a 4" (10.16 cm) square x 2.125" (5.398 cm) deep box.

### **MDF-300(A) Dual Monitor Module**

The MDF-300(A) Dual Monitor Module is intended for use in intelligent, two-wire systems. It provides two independent two-wire initiating device circuits (IDCs) at two separate, consecutive addresses. It is capable of monitoring normally open contact fire alarm and supervisory devices. The module has a single panel-controlled LED.

**NOTE:** The MDF-300(A) provides two Style B (Class B) IDC circuits ONLY. Style D (Class A) IDC circuits are NOT supported in any application.

#### **MDF-300(A) SPECIFICATIONS**

**Normal operating voltage range:** 15 to 32 VDC.

**Maximum current draw:** 6.4 mA (LED on).

**Average operating current:** 750  $\mu$ A (LED flashing).

**Maximum IDC wiring resistance:** 1,500 Ohms.

**Maximum IDC Voltage:** 11 Volts.

**Maximum IDC Current:** 240  $\mu$ A

**EOL resistance:** 47K Ohms.

**Temperature range:** 32° to 120°F (0° to 49°C).

**Humidity range:** 10% to 93% (non-condensing).

**Dimensions:** 4.5" (11.43 cm) high x 4" (10.16 cm) wide x 1.25" (3.175 cm) deep. Mounts to a 4" (10.16 cm) square x 2.125" (5.398 cm) deep box.

#### **MDF-300(A) AUTOMATIC ADDRESSING**

The MDF-300(A) automatically assigns itself to two addressable points, starting with the original address. For example, if the MDF-300(A) is set to address "26", then it will automatically assign itself to addresses "26" and "27".

**NOTE:** "Ones" addresses on the MDF-300(A) are 0, 2, 4, 6, or 8 only. Terminals 6 and 7 use the first address, and terminals 8 and 9 use the second address.

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#### **CAUTION:**

Avoid duplicating addresses on the system.

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**MDF-300(A):** Monitor module, dual, two independent Class B circuits.

**SMB500:** Optional surface-mount backbox.

**NOTE:** See installation instructions and refer to the SLC Wiring Manual, PN 51309.

### **Architects'/Engineers' Specifications**

Specifications of these devices and all FireLite products are available from FireLite.

## **Installation**

MMF-300(A), MMF-302(A), and MDF-300(A) modules mount directly to a standard 4" (10.16 cm) square, 2.125" (5.398 cm) deep, electrical box. They may also be mounted to the SMB500 surface-mount box. Mounting hardware and installation instructions are provided with each module. All wiring must conform to applicable local codes, ordinances, and regulations. These modules are intended for power-limited wiring only.

The MMF-301(A) module is intended to be wired and mounted without rigid connections inside a standard electrical box. All wiring must conform to applicable local codes, ordinances, and regulations.

## **Agency Listings and Approvals**

In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL:** S2424.
- **ULC:** S2424.
- **FM Approved.**
- **CSFM:** 7300-0075:0185.
- **MEA:** 72-01-E.

## **Product Line Information**

**NOTE:** "A" suffix indicates ULC-listed model.

**MMF-300(A):** Monitor module.

**MMF-301(A):** Monitor module, miniature.

**MMF-302(A):** Monitor module, two-wire detectors.

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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 more information, contact Fire•Lite Alarms. Phone: (800) 627-3473, FAX: (877) 699-4105.  
[www.firelite.com](http://www.firelite.com)



CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



## LISTING SERVICE

**LISTING No.** 7300-0075:0185 Page 1 of 1

**CATEGORY:** 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

**LISTEE:** FIRE-LITE ALARMS INC. One Fire-Lite Place, Northford, CT 06410-1653  
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309  
Email: megan.sisson@honeywell.com

**DESIGN:** Models MDF-300, MMF-301, MMF-300, MMF-302, MCF-300 monitor modules; Models CRF-300 and CMF-300 control modules; and MMF-302-6 six zone interface signaling device module. 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, 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 control unit accessories for use with listee's separately listed electrically compatible fire alarm control units.

**NOTE:**

\*Rev. 05-06-05 JW



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, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division



# D355PL(A)/DNRW InnovairFlex

## Intelligent Non-Relay Photoelectric Duct Smoke Detector



Addressable Devices

### General

The Fire-Lite InnovairFlex™ D355PL(A) intelligent non-relay photoelectric duct smoke detector and DNRW watertight non-relay photoelectric duct smoke detector feature a pivoting housing that fits both square and rectangular footprints capable of mounting to a round or rectangular duct.

DNRW duct smoke detector, with its NEMA-4 rating, is listed as a watertight, UV resistant enclosure providing protection against falling dirt, rain, and windblown dust, splashing and hose directed water, allowing operators to use the detector in the most extreme environments.

These units sense smoke in the most challenging conditions, operating in airflow speeds of 100 to 4,000 feet per minute (0.5 to 20.32 m/s), temperatures of -4°F to 158°F (-20°C to 70°C), and a humidity range of 0 to 95 percent (non-condensing.)

An improved cover design isolates the sensor head, which allows for ease of maintenance. A cover tamper feature indicates a trouble signal for a removed or improperly installed sensor cover. The Fire-Lite InnovairFlex housing provides a 3/4-inch conduit knockout and ample space to facilitate easy wiring and mounting of a relay module.

The Fire-Lite InnovairFlex duct smoke detector can be customized to meet local codes and specifications without additional wiring. The new InnovairFlex product line is compatible with all previous Innovair™ models, including remote test accessories.

### Features

- Photoelectric, integrated low-flow technology
- Air velocity rating from 100 ft/min to 4,000 ft/min (0.5 m/s to 20.32 m/s)
- Versatile mounting options: square or rectangular configuration
- Broad ranges for operating temperature (-4°F to 158°F, -20°C to 70°C) and humidity (0% to 95% non-condensing)
- Patented sampling tube installs from front or back of the detector with no tools required
- Cover tamper signal
- Increased wiring space with a newly added 3/4" conduit knockout
- Available space within housing to accommodate mounting of a relay module
- Easily accessible code wheels on sensor head (sold separately)
- Clear cover for convenient visual inspection
- Remote testing capability
- Requires com line power only
- Accommodates the installation of an addressable relay module, sold separately, (CRF-300) for applications requiring a Form-C relay

### Specifications

**Size: (Rectangle)** 14.38 in (37 cm) Length; 5 in (12.7 cm) Width; 2.5 in (6.6 cm) Depth

**Size: (Square)** 7.75 in (19.7 cm) Length; 9 in (22.9 cm) Width; 2.5 in (6.35 cm) Depth

**Weight:** 1.6 lb (0.73 kg)

**Operating Temperature Range:** -4°F to 158°F (-20°C to 70°C)

**Storage Temperature Range:** -22°F to 158°F (-30°C to 70°C)



**Operating Humidity Range:** 0% to 95% relative humidity (non-condensing)

**Air Duct Velocity:** 100 to 4,000 ft/min (0.5 to 20.32 m/s)

### Accessories

Fire-Lite provides system flexibility with a variety of accessories, including two remote test stations and different means of visible and audible system annunciation. As with our duct smoke detectors, all duct smoke detectors accessories are UL listed.

D355PLs and DNRWs with a date code of 0013 or higher do not require external 24VDC for remote test applications when used with a remote-test-capable detector.

### ACCESSORY CURRENT LOADS AT 24 VDC

Device	Standby	Alarm
RA100Z	0mA	12 mA Max
RTS151/RTS151KEY	0mA	12mA Max

### Agency Listings and Approvals

Consult product manual for lists of compatible UL-Listed devices. In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL:** S1059
- **ULC:** S1059
- **CSFM:** 3240-0075:0221
- **FM approved**

### Product Line Information

**NOTE:** "A" suffix indicates ULC listed model.

**D355PL:** Intelligent non-relay photoelectric low flow smoke detector housing. Includes SD355R Detector.

**DNRW:** Watertight intelligent non-relay photoelectric low flow duct smoke detector housing. Does not include detector head.

**SD355R(A):** Remote test capable addressable low-profile photoelectric smoke detector

**SD355(A):** Addressable low-profile photoelectric smoke detector

**DCOIL:** Remote test coil. Required for older DNR(W) duct detector housing

**DST1(A):** Metal sampling tube duct width up to 1 ft (0.3m)

**DST1.5(A):** Metal sampling tube duct widths up to 1 ft to 2 ft (0.3 to 0.6 m)

**DST3(A):** Metal sampling tube duct widths up to 2 ft to 4 ft (0.6 to 1.2 m)

**DST5(A):** Metal sampling tube duct widths up to 4 ft to 8 ft (1.2 to 2.4 m)

**DST10(A):** Metal sampling tube duct widths up to 8 ft to 12 ft (2.4 to 3.7 m)

**DH400OE-1:** Weatherproof enclosure

**ETX:** Metal exhaust tube duct, width 1 ft (0.3 m)

**M02-04-00:** Test magnet

**P48-21-00:** End cap for metal sampling tubes

**RA100Z(A):** Remote annunciator alarm LED

**RTS151(A):** Remote test station

**RTS151KEY(A):** Remote test station with key lock

## Important Notes

- DNRW duct detector housings with a date code of 0013 or higher do not require a DCOIL or auxiliary 24 VDC for remote test applications when used with a remote test capable detector.
- DNRW duct detector housings with a date code of 0012 or earlier require a DCOIL and auxiliary 24 VDC power for remote test applications.

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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 Fire•Lite Alarms. Phone: (800) 627-3473, FAX: (877) 699-4105.  
[www.firelite.com](http://www.firelite.com)

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.** 3240-0075:0221 Page 1 of 1

**CATEGORY:** 3240 -- DUCT SMOKE DETECTOR HOUSING/BASE

**LISTEE:** FIRE-LITE ALARMS INC. One Fire-Lite Place, Northford, CT 06410-1653  
Contact: Megan Sisson (203) 484-6544 Fax (203) 484-7309  
Email: megan.sisson@honeywell.com

**DESIGN:** Model \*D355PL analog photoelectric duct smoke detector housing. Unit consists of a duct detector housing, exhaust tubes, and separately listed Fire-Lite Alarms' Model SD355 or SD355R detector heads (OSFM Listing No. 7272-0075:194). 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 instruction, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

**MARKING:** Listee's name, model number, rating, air velocity and UL label.

**APPROVAL:** Listed as conventional photoelectric duct smoke detector housing for use with separately listed fire alarm control units. Refer to listee's Installation Instruction Manual for details.

**XLF:** 3240-1653:0209

01-02-18 gt



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Date Issued: **July 01, 2019**

Listing Expires **June 30, 2020**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division