

PROJECT MANUAL



POOL BUILDING MODERNIZATION

NEVADA UNION HIGH SCHOOL

Grass Valley, California

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D. Structural Engineer:

1. Dave Hodder
2. S5152



E. Civil Engineer:

1. Bryan McAlister
2. C058570



FILE NUMBER: 34-C3

IDENTIFICATION STAMP
DIVISION OF THE STATE ARCHITECT

02- 116957

AC MR FLS GC SS PVL
DATE: 10/11/2018

- F. Fire Protection:
1. Weili Yu
2. FP 1585



END OF DOCUMENT 000100

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FOR THE

NEVADA JOINT UNION HIGH SCHOOL DISTRICT

FOR

**POOL BUILDING MODERNIZATION / RENOVATION INCLUDING
ADA ENHANCEMENTS THROUGHOUT, BOILER/PIPING
REPLACEMENT, AND NEW ADA RAMP**

AT

NEVADA UNION HIGH SCHOOL

11761 Ridge Road

Grass Valley, CA 95945

DSA Application No. 02-116957

NEVADA JOINT UNION HIGH SCHOOL DISTRICT

11645 Ridge Road

Grass Valley, CA 95945

530-273-3351

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NOTICE INVITING BIDS

NEVADA JOINT UNION HIGH SCHOOL DISTRICT

NOTICE IS HEREBY GIVEN that the Nevada Joint Union High School District, acting by and through its Governing Board, hereinafter referred to as “District”, will receive prior to **3:00 p.m. on Monday, November 19, 2018** sealed bids for the award of a Contract for the following:

DSA APPLICATION NO. 02-116957

POOL BUILDING MODERNIZATION / RENOVATION INCLUDING ADA ENHANCEMENTS THROUGHOUT, BOILER/PIPING REPLACEMENT, AND NEW ADA RAMP

All bids shall be made and presented only on the forms presented by the District. Bids shall be received in the **NJUHSD District Office at 11645 Ridge Road, Grass Valley, California 95945** and shall be opened and publicly read aloud at the above stated time and place. Any bids received after the time specified above or after any extensions due to material changes shall be returned unopened.

The Contract Time is One Hundred Twenty Four (124) days.

Engineers’ Estimate: \$1.7M

CONTRACTOR should consult the General Conditions, Supplementary Conditions, and General Requirements regarding Milestones and Liquidated Damages.

Prequalification of Bidders

POOL BUILDING MODERNIZATION / RENOVATION INCLUDING ADA ENHANCEMENTS THROUGHOUT, BOILER/PIPING REPLACEMENT, AND NEW ADA RAMP

As a condition of bidding for this Project, and in accordance with California Public Contract Code section 20111.5, prospective bidders are required to submit to the District a completed set of prequalification documents on forms provided by the District. These documents will be the basis for determining which bidders are qualified to bid on this Project.

Bids will not be accepted if a Contractor has not been prequalified. Prequalification documents are available from the Nevada Joint Union High School District Website at www.NJUHSD.com, top tab Measure B. Prequalification documents must be submitted on or before **November 2, 2018**. Contractors will be notified by e-mail of their prequalification rating within a reasonable period of time after submission of their prequalification documents, but not less than five (5) business days prior to the bid opening date.

If this Project includes work that will be performed by mechanical, electrical or plumbing (“MEP”) subcontractors (contractors that **hold** C-4, C-7, C-10, C-16, C-20, C-34, C-36, C-38, C-42, C-43 or C-46 licenses), such MEP subcontractors must also be prequalified. A list of prequalified MEP subcontractors will be made available by the District to all bidders at least five business days prior to the bid opening date. It is the responsibility of the bidder to ensure that all MEP subcontractors **holding** any of the licenses listed above are properly prequalified before submitting a bid. This prequalification requirement applies even if the subcontractor will perform, or is designated to perform, work that does not require one of the licenses listed above, but the subcontractor **holds** one of the licenses listed above.

There are No Additive or Deductive Bid Alternates

Miscellaneous Information

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

The bid documents are available at the **Nevada County Contractors’ Association** (www.nccabuildingpros.com), 149 Crown Point Circle #A, Grass Valley, CA 95945; the **Placer County Contractors Association** (www.placerbx.com), 10656 Industrial Ave #160, Roseville, CA 95678; affiliates of the **Federation of California Builders Exchanges** (www.calbx.com); **Dodge Data & Analytics**, 300 American Metro Blvd. Suite 185, Hamilton, NJ 08619 (www.construction.com); Construction Bidboard (www.ebidboard.com); or ordered from **The Real Graphic Source** (at contractor’s expense) by calling 530-273-8835. Additionally, bid documents may be downloaded from the District’s website, www.njuhsd.com, under top tab Measure B.

There will be a **mandatory** Pre-Bid Conference / Job Walk on **Friday, October 26, 2018 at 10:00 a.m.** (meet at the front steps of the Administration Building). Any Contractor bidding on the Project who fails to attend the entire mandatory job walk and conference will be deemed a non-responsive bidder and will have its bid returned unopened.

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

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

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

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

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

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

Each bidder's bid must be accompanied by one of the following forms of bidder's security: (1) cash; (2) a cashier's check made payable to the District; (3) a certified check made payable to the District; or (4) a bidder's bond executed by a California admitted surety as defined in Code of Civil Procedure section 995.120, made payable to the District in the form set forth in the Contract Documents. Such bidder's security must be in an amount not less than ten percent (10%) of the maximum amount of bid as a guarantee that the bidder will enter into the proposed Contract, if the same is awarded to such bidder, and will provide the required Performance and Payment Bonds, insurance certificates and any other required documents. In the event of failure to enter into said Contract or provide the necessary documents, said security will be forfeited.

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

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

The Contractor and all subcontractors shall furnish certified payroll records as required pursuant Labor Code section 1776 directly to the Labor Commissioner in accordance with Labor Code section 1771.4 on at least on a monthly basis (or more frequently if required by the District or the Labor Commissioner) and in a format prescribed by the Labor Commissioner. Monitoring

and enforcement of the prevailing wage laws and related requirements will be performed by the Labor Commissioner/ Department of Labor Standards Enforcement (DLSE).

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

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

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

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

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

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

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

NEVADA JOINT UNION HIGH SCHOOL
DISTRICT

INSTRUCTIONS TO BIDDERS

1. Preparation of Bid Form. Proposals under these specifications shall be submitted on the blank forms furnished herewith at the time and place stated in the Notice Inviting Bids. All blanks in the bid form must be appropriately filled in, and all proposed prices must be stated clearly and legibly in both words and numerals. All bids must be signed by the bidder in permanent blue ink and submitted in sealed envelopes, bearing on the outside, the bidder's name, address, telephone number, and California Contractor's License number, and the name of the Project for which the bid is submitted. The District reserves the right to reject any bid if all of the above information is not furnished. It is each bidder's sole responsibility to ensure its bid is timely delivered and received at the location designated as specified above. Any bid received at the designated location after the scheduled closing time for receipt of bids shall be returned to the bidder unopened.

2. Bid Security. Each bid must be accompanied by one of the following forms of bidder's security: (1) cash; (2) a cashier's check made payable to the District; (3) a certified check made payable to the District; or (4) a bidder's bond executed by a California admitted surety as defined in Code of Civil Procedure section 995.120, made payable to the District, in the form set forth in the Contract Documents. Such bidder's security must be in an amount not less than ten percent (10%) of the maximum amount of such bidder's bid as a guarantee that the bidder will enter into the Contract, if the same is awarded to such bidder, and will provide the required Performance and Payment Bonds, insurance certificates and any other required documents. In the event that a bidder is awarded the Contract and such bidder fails to enter into said Contract or provide the surety bond or bonds within five (5) calendar days after award of the Contract to bidder, said security will be forfeited.

3. Signature. The bid form, all bonds, all designations of subcontractors, the Contractor's Certificate, the Agreement, and all Guarantees must be signed in permanent blue ink in the name of the bidder and must bear the signature in longhand of the person or persons duly authorized to sign the bid.

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

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

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

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

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

4. Modifications. Changes in or additions to the bid form, recapitulations of the work bid upon, alternative proposals, or any other modification of the bid form which is not specifically called for in the Contract Documents may result in the District's rejection of the bid as not being responsive to the Notice Inviting Bids. **No oral or telephonic modification of any bid submitted will be considered.**

5. Erasures, Inconsistent or Illegible Bids. The bid submitted must not contain any erasures, interlineations, or other corrections unless each such correction creates no inconsistency and is suitably authenticated by affixing in the margin immediately opposite the correction the signature or signatures of the person or persons signing the bid. In the event of inconsistency between words and figures in the bid price, words shall control figures. In the event that the District determines that any bid is unintelligible, inconsistent, or ambiguous, the District may reject such bid as not being responsive to the Notice Inviting Bids.

6. Examination of Site and Contract Documents. Each bidder shall visit the site of the proposed work and become fully acquainted with the conditions relating to the construction and labor so that the facilities, difficulties, and restrictions attending the execution of the work under the Contract are fully understood. Bidders shall thoroughly examine and be familiar with the drawings and specifications and all other documents and requirements that are attached to and/or contained in the Project Manual or other documents issued to bidders. The failure or omission of any bidder to receive or examine any Contract Documents, form, instrument, addendum, or other document or to visit the site and become acquainted with conditions there existing shall not relieve any bidder from obligations with respect to the bid or to the contract. The submission of a bid shall be taken as prima facie evidence of compliance with this Section. Bidders shall not, at any time after submission of the bid, dispute, complain, or assert that there were any misunderstandings with regard to the nature or amount of work to be done.

7. Withdrawal of Bids. Any bid may be withdrawn, either personally or by written request, at any time prior to the scheduled closing time for receipt of bids. The bid security for bids withdrawn prior to the scheduled closing time for receipt of bids, in accordance with this paragraph, shall be returned upon demand therefor.

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

8. Agreements, Insurance and Bonds. The Agreement form which the successful bidder, as Contractor, will be required to execute, and the forms and amounts of surety bonds and insurance endorsements which Contractor will be required to be furnished at the time of execution of the Agreement, are included in the bid documents and should be carefully examined by the bidder. The number of executed copies of the Agreement, the Performance Bond, and the Payment Bond

required is two (2). Payment and Performance bonds must be executed by an admitted surety insurer as defined in Code of Civil Procedure 995.120.

9. Interpretation of Plans and Documents/Pre-Bid Clarification. If any prospective bidder is in doubt as to the true meaning of any part of the Contract Documents, or finds discrepancies in, or omissions, a written request for an interpretation or correction thereof may be submitted to the District. The bidder submitting the request shall be responsible for its prompt delivery. **Any interpretation or correction of the Contract Documents will only be made by Addendum duly issued, and a copy of such Addendum will be made available for each contractor receiving a set of the Contract Documents.** No person is authorized to make any oral interpretation of any provision in the Contract Documents, nor shall any oral interpretation be binding on the District. If discrepancies on drawings, specifications or elsewhere in the Contract Documents are not covered by addenda, bidder shall include in their bid methods of construction and materials for the higher quality and complete assembly. Each request for clarification shall be submitted in writing, via email, to only the following persons:

TO: Andrew Pawlowski, Project Architect; ajp@sitelinearch.com
CC: Paul Palmer, Director of Planning & Construction; ppalmer@njuhsd.com

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

10. Bidders Interested in More Than One Bid. No person, firm, or corporation shall be allowed to make, or file, or be interested in more than one prime bid for the same work unless alternate bids are specifically called for. A person, firm, or corporation that has submitted a proposal to a bidder, or that has quoted prices of materials to a bidder, is not thereby disqualified from submitting a proposal or quoting prices to other bidders or making a prime proposal.

11. Award of Contract. The Contract will be awarded to the lowest responsive responsible bidder by action of the governing Board. The District reserves the right to reject any or all bids, or to waive any irregularities or informalities in any bids or in the bidding. In the event an award is made to bidder, and such bidder fails or refuses to execute the Contract and provide the required documents within five (5) calendar days after award of the Contract to bidder, the District may award the Contract to the next lowest responsible and responsive bidder or release all bidders. **Each bid must conform and be responsive to the Contract Documents as defined in the General Conditions.**

12. Bid Protest Procedure. Any bidder may file a bid protest. The protest shall be filed in writing with the District's Director of Planning and Construction not more than five (5) business days after the date of the bid opening. An e-mail address shall be provided and by filing the protest, protesting bidder consents to receipt of e-mail notices for purposes of the protest and protest related

questions and protest appeal, if applicable. The protest shall specify the reasons and facts upon which the protest is based.

a. Resolution of Bid Controversy: Once the bid protest is received, the apparent lowest responsible bidder will be notified of the protest and the evidence presented. If appropriate, the apparent low bidder will be given an opportunity to rebut the evidence and present evidence that the apparent low bidder should be allowed to perform the Work. If deemed appropriate by the District, an informal hearing will be held. District will issue a written decision within fifteen (15) calendar days of receipt of the protest, unless factors beyond the District's reasonable control prevent such resolution. The decision on the bid protest will be copied to all parties involved in the protest.

b. Appeal: If the protesting bidder or the apparent low bidder is not satisfied with the decision, the matter may be appealed to the District Superintendent or their designee, within three (3) business days after receipt of the District's written decision on the bid protest. The appeal must be in writing and sent via overnight registered mail with all accompanying information relied upon for the appeal and an e-mail address from which questions and responses may be provided to:

Nevada Joint Union High School District Superintendent
11645 Ridge Road, Grass Valley, CA 95945

c. Appeal Review: The District Superintendent or their designee shall review the decision on the bid protest from the Director of Planning and Construction and issue a written response to the appeal, or if appropriate, appoint a Hearing Office to conduct a hearing and issue a written decision. The written decision of the Superintendent (or their designee) or the Hearing Officer shall be rendered within fifteen (15) calendar days and shall state the basis for the decision. The decision concerning the appeal will be final and not subject to any further appeals.

d. Reservation of Rights to Proceed with Project Pending Appeal. The District reserves the right to proceed to award the Project and commence construction pending an Appeal. If there is State Funding or a critical completion deadline, the District may choose to shorten the time limits set forth in this Section if written notice is provided to the protesting party. E-mailed notice with a written confirmation sent by First Class Mail shall be sufficient to constitute written notice. If there is no written response to a written notice shortening time, the District may proceed with the award.

e. Finality. Failure to comply with this Bid Protest Procedure shall constitute a waiver of the right to protest and shall constitute a failure to exhaust the protesting bidder's administrative remedies.

13. Alternates. If alternate bids are called for, the Contract may be awarded at the election of the Governing Board to the lowest responsible and responsive bidder using the method and procedures outlined in the Notice Inviting Bids and as specified in the section entitled Alternate/Deductive Bid Alternates.

a. Subcontractor Listing for Alternates. If alternate bids are called for and the bidder intends to use different or additional subcontractors, a separate list of subcontractors must be submitted for each such alternate.

14. Evidence of Responsibility. Upon the request of the District, a bidder whose bid is under consideration for the award of the Contract shall submit promptly to the District satisfactory evidence showing the bidder's financial resources, surety and insurance claims experience, construction experience, completion ability, workload, organization available for the performance of the Contract, and other factors pertinent to a Project of the scope and complexity involved.

15. Listing Subcontractors. Each bidder shall submit with his bid, on the form furnished with the Contract Documents, a list of the names, license numbers, scopes of work, locations of the places of business, contact information, and Department of Industrial Relations ("DIR") registration numbers of each subcontractor who will perform work or labor or render service to the bidder in or about the project, or a subcontractor who under subcontract to the bidder, specially fabricates and installs a portion of the work, in an amount in excess of one-half of 1 percent of the bidder's total bid as required by the Subletting and Subcontracting Fair Practices Act (Public Contract Code section 4100, et seq.) Pursuant to Labor Code section 1725.5, all subcontractors (of any tier) performing work on this Project must be properly registered with DIR.

16. Workers' Compensation. In accordance with the provisions of Labor Code section 3700, the successful bidder as the Contractor shall secure payment of compensation to all employees. The Contractor shall sign and file with the District the following certificate prior to performing the work under this contract: "I am aware of the provisions of Section 3700 of the Labor Code, which requires every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract." The form of such certificate is included as a part of the Bid Documents.

17. Contractor's License. To perform the work required by this notice, the Contractor must possess the Contractor's License as specified in the Notice Inviting Bids, and the Contractor must maintain the license throughout the duration of the contract. If, at the time of bid, bidder is not licensed to perform the Project in accordance with Division 3, Chapter 9, of the Business and Professions Code for the State of California and the Notice to Contractors calling for bids, such bid will not be considered and the Contractor will forfeit its bid security to the District.

18. Anti-Discrimination. It is the policy of the District that in connection with all work performed under contracts, there be no discrimination against any prospective or active employee engaged in the work because of race, color, ancestry, national origin, religious creed, sex, age, or marital status. The Contractor agrees to comply with applicable federal and California laws, including, but not limited to, the California Fair Employment and Housing Act, beginning with Government Code section 12900 and Labor Code section 1735. In addition, the Contractor agrees to require like compliance by any subcontractors employed on the work by such Contractor.

19. Preference for Materials and Substitutions.

a. One Product Specified. Unless the Plans and Specifications state that no Substitution is permitted, whenever the Contract Documents indicate any specific article, device, equipment, product, material, fixture, patented process, form, method, construction, or any specific name, make, trade name, or catalog number, with or without the words, “or equal,” such specification shall be read as if the language “or equal” is incorporated.

b. Request for Substitution. Bidder may, unless otherwise stated, offer any material, process, article, etc., which is materially equal or better in every respect to that so indicated or specified (“Specified Item”) and will completely accomplish the purpose of the Contract Document. If bidder desires to offer a Substitution for a Specified Item, such bidder must make a request in writing on the District’s Substitution Request Form (“Request Form”) and submit the completed Request Form with the bidder’s bid. The Request Form must be accompanied by evidence as to whether the proposed substitution:

- 1) Is equal in quality, service, and ability to the Specified Item as demonstrated by a side by side comparison of key characteristics and performance criteria (CSI comparison chart);
- 2) Will entail no changes in detail, construction and scheduling of related work;
- 3) Will be acceptable in consideration of the required design and artistic effect;
- 4) Will provide no cost disadvantage to the District;
- 5) Will require no excessive or more expensive maintenance, including adequacy and availability of replacement parts; and
- 6) Will require no change in the Contract Time.

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

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

After the District’s receipt of such evidence by bidder, the District will make its final decision as to whether the bidder’s request for Substitution for any Specified Items will be granted. The District shall have sole discretion in deciding as to whether a proposed request for Substitution is equal to or better than a Specified Item. Any request for Substitution which is granted by the District shall be documented and processed through a Change Order. The District

may condition its approval of any Substitution upon delivery to the District of an extended warranty or other assurances of adequate performance of the Substitution. Any and all risks of delay due to DSA, or any other governmental agency having jurisdiction shall be on the bidder.

20. Disqualification of Bidders and Proposals. More than one proposal for the same work from any individual, firm, partnership, corporation, or association under the same or different names will not be accepted; and reasonable grounds for believing that any bidder is interested in more than one proposal for the work will be cause for rejecting all proposals in which such bidder is interested and the bidder will forfeit their bid security to the District.

21. Unbalanced or Altered Bids. Proposals in which the prices are obviously unbalanced, and those which are incomplete or show any alteration of form, or contain any additions or conditional or alternate bids that are not called for or otherwise permitted, may be rejected. A proposal on which the signature of the bidder has been omitted may be rejected. If, in the District's sole discretion, it determines any pricing, costs or other information submitted by a bidder may result in an unbalanced bid, the District may deem such bid non-responsive. A bid may be determined by the District to be unbalanced if the bid is based on prices significantly less than cost for some work and prices which are significantly overstated in relation to cost for other work, and if there is a reasonable doubt that the bid will result in the lowest overall cost to the District even though it may be the low evaluated bid, or if it is so unbalanced as to be tantamount to allowing an advanced payment.

22. Employment of Apprentices. The Contractor and all Subcontractors shall comply with the provisions of California Labor Code including, but not limited to sections 1777.5, 1777.6, and 1777.7 concerning the employment of apprentices. The Contractor and any Subcontractor under him shall comply with the requirements of said sections, including applicable portions of all subsequent amendments in the employment of apprentices; however, the Contractor shall have full responsibility for compliance with said Labor Code sections, for all apprenticeable occupations, regardless of any other contractual or employment relationships alleged to exist.

23. Non-Collusion Declaration. Public Contract Code section 7106 requires bidders to submit declaration of non-collusion with their bids. This form is included with the bid documents and must be signed and dated by the bidder under penalty of perjury.

24. Wage Rates, Travel and Subsistence.

a. The Contractor and all subcontractors shall comply with the requirements set forth in Division 2, Part 7, Chapter 1, of the Labor Code. Pursuant to Labor Code section 1770 et seq., the District has obtained from the Director of the Department of Industrial Relations the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this work is to be performed for each craft, classification or type of worker needed to execute the contract. Copies are available from the District to any interested party on request and are also available from the Director of the Department of Industrial Relations. The Contractor shall obtain copies of the above-referenced prevailing wage sheets and post a copy of such wage rates at appropriate, conspicuous, weatherproof points at the Site.

b. Any worker employed to perform work on the Project and such work is not covered by any classification listed in the published general prevailing wage rate determinations or per diem wages determined by the Director of the Department of Industrial Relations, shall be paid not less than the minimum rate of wages specified therein for the classification which most nearly corresponds to the employment of such person in such classification.

c. Holiday and overtime work, when permitted by law, shall be paid for at the rate set forth in the prevailing wage rate determinations issued by the Director of the Department of Industrial Relations or at least one and one-half (1½) times the specified basic rate of per diem wages, plus employer payments, unless otherwise specified in the Contract Documents or authorized by law.

d. These per diem rates, including holiday and overtime work, and employer payments for health and welfare, pension, vacation, and similar purposes, are on file at the administrative office of the District, located as noted above and are also available from the Director of the Department of Industrial Relations. It is the Contractor's responsibility to ensure the appropriate prevailing rates of per diem wages are paid for each classification. It shall be mandatory upon the Contractor to whom the Contract is awarded, and upon any subcontractor under such Contractor, to pay not less than the said specified rates to all workers employed by them in the execution of the Contract.

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

This Project is a public works project as defined in Labor Code section 1720. Each contractor bidding on this Project and all subcontractors (of any tier) performing any portion of the Work must comply with the Labor Code sections 1725.5 and 1771.1 and must be properly and currently registered with DIR and qualified to perform public works pursuant to Labor Code section 1725.5 throughout the duration of the Project. For more information and up to date requirements, contractors are recommended to periodically review the DIR's website at www.dir.ca.gov. Contractor shall be solely responsible for ensuring compliance with Labor Code section 1725.5 as well as any requirements implemented by DIR applicable to its services or its subcontractors throughout the term of the Agreement and in no event shall contractor be granted increased payment from the District or any time extensions to complete the Project as a result of contractor's efforts to maintain compliance with the Labor Code or any requirements implemented by the DIR. Failure to comply with these requirements shall be deemed a material breach of this Agreement and grounds for termination for cause. The contractor and all subcontractors shall furnish certified payroll records as required pursuant Labor Code section 1776 directly to the Labor Commissioner in accordance with Labor Code section 1771.4 on at least on a monthly basis (or more frequently if required by the District or the Labor Commissioner) and in a format prescribed

by the Labor Commissioner. The District reserves the right to withhold contract payments if the District is notified, or determines as the result of its own investigation, that contractor is in violation of any of the requirements set forth in Labor Code section 1720 et seq. at no penalty or cost to the District. Monitoring and enforcement of the prevailing wage laws and related requirements will be performed by the Labor Commissioner/ Department of Labor Standards Enforcement (DLSE).

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

27. Obtaining Bidding Documents. Bidding Documents, may be obtained from: **Nevada County Contractors' Association** (www.nccabuildingpros.com), 149 Crown Point Circle #A, Grass Valley, CA 95945; the **Placer County Contractors Association** (www.placerbx.com), 10656 Industrial Ave #160, Roseville, CA 95678; and affiliates of the **Federation of California Builders Exchanges** (www.calbx.com); **Dodge Data & Analytics**, 300 American Metro Blvd. Suite 185, Hamilton, NJ 08619 (www.construction.com); **Construction BidBoard**, 11622 El Camino Real, Suite 100, San Diego, CA 92130 (www.ebidboard.com); or ordered from **The Real Graphic Source** (at contractor's expense) by calling 530-273-8835. Additionally, bidding documents may be downloaded from the District's website (www.njuhsd.com) under top tab Measure B.

Bidder shall utilize a complete set of Bidding Documents in preparing a bid. The failure or omission of bidder to receive any Bidding Document, form, instrument, Addendum, or other document shall not relieve bidder from any obligations with respect to the bid and/or Contract.

28. Addenda. Clarification or any other notice of a change in the Bidding Documents will be issued only by the District and only in the form of a written Addendum, transmitted by fax, e-mail, or available for pick up to all who are known by the issuing office to have received a complete set of Bidding Documents. Any other purported Addenda are void and unenforceable.

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

29. Debarment. Bidder may also be subject to debarment, in addition to seeking remedies for False Claims under Government Code section 12650 et seq. and Penal Code section 72, the District may debar a Contractor pursuant to Article 15 of the General Conditions if the Board, or the Board may designate a hearing officer who, in his or her discretion, finds the Contractor has done any of the following:

a. Intentionally or with reckless disregard, violated any term of a contract with the District

b. Committed an act or omission which reflects on the Contractor's quality, fitness or capacity to perform work for the District;

c. Committed an act or offense which indicates a lack of business integrity or business honesty; or,

d. Made or submitted a false claim against the District or any other public entity (See Government Code section 12650, et seq., and Penal Code section 72)

CHECKLIST OF MANDATORY BID FORMS

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

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

PRE-BID CLARIFICATION FORM (For Contractor's Use)

PROJECT NAME:	POOL BUILDING MODERNIZATION / RENOVATION INCLUDING ADA ENHANCEMENTS THROUGHOUT, BOILER/PIPING REPLACEMENT AND NEW ADA RAMP		
DSA APPLICATION NUMBER:	02-116957		
TO:	Andrew Pawlowski & Paul Palmer	EMAIL:	ajp@sitelinearch.com & ppalmer@njuhsd.com

DATE:			
FROM:		EMAIL:	
DOCUMENT / DIVISION NUMBER:		DRAWING NUMBER:	

REQUESTED CLARIFICATION:

RESPONSE TO CLARIFICATION:

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

DESIGNATION OF SUBCONTRACTORS

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

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

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

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

All subcontractors (of any tier) performing any portion of the Work must comply with the Labor Code sections 1725.5 and 1771.1 and must be properly and currently registered with the California Department of Industrial Relations and qualified to perform public works pursuant to Labor Code section 1725.5 throughout the duration of the Project.

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

DESIGNATION OF SUBCONTRACTORS FORM

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

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

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

Proper Name of Bidder: _____

Date: _____

Name: _____

Signature of Bidder
Representative: _____

Address: _____

Phone: _____

Nevada Union HS Pool Building Modernization
Nevada Joint Union High School District

Designation of Subcontractors
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BID FORM

FOR

**POOL BUILDING MODERNIZATION / RENOVATION INCLUDING
ADA ENHANCEMENTS THROUGHOUT, BOILER/PIPING
REPLACEMENT, AND NEW ADA RAMP**

NEVADA UNION HIGH SCHOOL

11761 Ridge Road

Grass Valley, CA 95945

DSA Application No. 02-116957

FOR

NEVADA JOINT UNION HIGH SCHOOL DISTRICT

CONTRACTOR
NAME:

ADDRESS:

TELEPHONE: ()

FAX: ()

EMAIL

TO: Nevada Joint Union High School District, acting by and through its Governing Board, herein called "District".

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

DSA APPLICATION NO. 02-116957

Nevada Union HS Pool Building Modernization

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

2. BIDDER ACKNOWLEDGES THE FOLLOWING ADDENDUM:

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

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

3. TOTAL CASH PURCHASE PRICE IN WORDS & NUMBERS:

_____ DOLLARS

(\$ _____)

4. ALTERNATE BIDS: **NOT APPLICABLE**

5. UNIT PRICING

Contractor to provide unit pricing for the following items:

A. Price per square foot of (1,500) square feet of asphaltic concrete paving per sheet C4.6, detail 6 and the specifications: \$ _____

- B. Price per square foot of (100) square feet of concrete paving per sheet C4.6, detail 7 and the specifications:** \$ _____
- C. Price per square foot of (100) square feet of concrete sidewalk per sheet C4.6, detail 5 and the specifications:** \$ _____
- D. Price per cubic yard for removal of (6) cubic yards subsurface rock:** \$ _____
- E. Price per cubic yard for removal of (15) cubic yards of unsuitable subgrade soils:** \$ _____
- F. Price per cubic yard for removal of (25) cubic yards of unsuitable subgrade soils:** \$ _____
- G. Price per cubic yard for import, placement, and compaction of (15) cubic yards of suitable subgrade per details and specifications:** \$ _____
- H. Price per cubic yard for import, placement, and compaction of (25) cubic yards of suitable subgrade per details and specifications:** \$ _____
- I. Price per linear foot for fabrication and installation of (15) linear feet of guardrail per sheet A7.3 detail D12 and specifications:** \$ _____
- J. Price per square foot of (100) square feet of exterior wood siding including installation labor, sealing, painting, etc per sheet A 5.2 and the specifications:** \$ _____
- K. Price per square foot of (100) square feet of 3/4" thick tongue and groove exterior grade roof sheathing including installation labor, etc., per the specifications:** \$ _____

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

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

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

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

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

Bid bond (10% of the Bid), certified check, or cashier's check (circle one)

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

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

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

11. It is understood and agreed that if written notice of the acceptance of this bid is mailed, telegraphed, or delivered to the undersigned after the opening of the bid, and within the time this bid is required to remain open, or at any time thereafter before this bid is withdrawn, the undersigned will execute and deliver to the District a Contract in the form attached hereto in accordance with the bid as accepted, and that he or she will also furnish and deliver to the District the Performance Bond and Payment Bond, all within five (5) calendar days after award of Contract, and that the work under the Contract shall be commenced by the undersigned bidder, if awarded the Contract, by the start date provided in the District's Notice to Proceed, and shall be completed by the Contractor in the time specified in the Contract Documents.

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

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

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

14. The undersigned bidder shall be licensed and shall provide the following California Contractor's license information:

License Number: _____

License Expiration Date: _____

Name on License: _____

Class of License: _____

DIR Registration Number: _____

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

15. Time is of the essence regarding this Contract, therefore, in the event the bidder to whom the Contract is awarded fails or refuses to post the required bonds and return executed copies of the Agreement form within five (5) calendar days from the date of receiving the Notice of Award, the District may declare the bidder's bid deposit or bond forfeited as damages.

16. The bidder declares that he/she has carefully examined the location of the proposed Project, that he/she has examined the Contract Documents, including the Plans, General Conditions, Supplemental Conditions, Addenda, and Specifications, all others documents and requirements that are attached to and/or contained in the Project Manual, all other documents issued to bidders and read the accompanying instructions to bidders, and hereby proposes and agrees, if this proposal is accepted, to furnish all materials and do all work required to complete the said work in accordance with the Contract Documents, in the time and manner therein prescribed for the unit cost and lump sum amounts set forth in this Bid Form.

17. DEBARMENT. In addition to seeking remedies for False Claims under Government Code section 12650 et seq. and Penal Code section 72, the District may debar a Contractor pursuant to Article 15 of the General Conditions if the Board, or the Board may designate a hearing officer who, in his or her discretion, finds the Contractor has done any of the following:

a. Intentionally or with reckless disregard, violated any term of a contract with the District;

b. Committed an act or omission which reflects on the Contractor's quality, fitness or capacity to perform work for the District;

c. Committed an act or offense which indicates a lack of business integrity or business honesty; or

d. Made or submitted a false claim against the District or any other public entity. (See Government Code section 12650, et seq., and Penal Code section 72)

18. DESIGNATION OF SUBCONTRACTORS. In compliance with the Subletting and Subcontracting Fair Practices Act (California Public Contract Code section 4100 et seq.) and any amendments thereof, each bidder shall list subcontractors on the District's form Subcontractor list. This subcontractor list shall be submitted with the bid and is a required form

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

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

Proper Name of Company

Name of Bidder Representative

Street Address

City, State, and Zip

()
Phone Number

()
Fax Number

E-Mail

By: _____ Date: _____
Signature of Bidder Representative

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

All signatures must be made in permanent blue ink.

CONTRACTOR'S CERTIFICATE REGARDING WORKERS' COMPENSATION
FORM

Labor Code section 3700 in relevant part provides:

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

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

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

(Signature)

(Print)

(Date)

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

NON-COLLUSION DECLARATION

The undersigned declares:

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

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

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

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

Signed: _____

Typed Name: _____

BID GUARANTEE FORM

(Use only when not using a Bid Bond)

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

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

Bidder

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

BID BOND FORM

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

SIGNED this _____ day of _____, 20__.

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

NOW, THEREFORE,

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

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

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

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

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

(Corporate Seal)

By _____

Principal's Signature

Typed or Printed Name

Principal's Title

(Corporate Seal)

By _____

Surety's Signature

Typed or Printed Name

Title

(Attached Attorney in Fact Certificate)

Surety's Name

Surety's Address

Surety's Phone Number

IMPORTANT:

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

THIS IS A REQUIRED FORM.

Any claims under this bond may be addressed to:

(Name and Address of Surety)

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

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

REQUEST FOR SUBSTITUTION AT TIME OF BID

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

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

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

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

District; (5) will require no excessive or more expensive maintenance, including adequacy and availability of replacement parts; (6) will require no change of the construction schedule or milestones for the Project; and, (7) Contractor agrees to pay for any DSA Fees or other Governmental Plan check costs associated with this Substitution Request. (See General Conditions Section 3.6)

The undersigned states that the following paragraphs are correct:

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

Name of Bidder: _____

By: _____

District: _____

By: _____

ACKNOWLEDGMENT OF BIDDING PRACTICES REGARDING INDEMNITY FORM

TO: Nevada Joint Union High School District

RE: DSA Application Number: 02-116957

Construction Contract for _____

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

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

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

Contracting Party

Name of Agent/Title

DISABLED VETERAN BUSINESS ENTERPRISE (DVBE) PARTICIPATION
STATEMENT

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

Project Name: _____

DSA Application No.: _____

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

- The Contractor was unable after reasonable efforts to secure DVBE participation in the Contract for the above-referenced Project/Bid No. However, the Contractor will use DVBE services if the opportunity arises at any time during construction of the Project. Upon completion of the Project, the Contractor will report to the District the total dollar amount of DVBE participation in any Contract awarded to Contractor, and in any change orders, for the above-referenced Project.

- The Contractor has secured DVBE participation in the Contract for the above referenced Project/Bid No., and anticipates that such DVBE participation will equal approximately _____ dollars (\$ _____), which represents approximately _____ percent (___%) of the total Contract for such Project. Upon completion of the Project, Contractor will report to the District the actual total dollar amount of DVBE participation in the Contract awarded to Contractor, and in any change orders, for such Project

Company: _____

Name: _____

Title: _____

Signature: _____

Date: _____

CONTRACTOR’S CERTIFICATE REGARDING DRUG-FREE WORKPLACE

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

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

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

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

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

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

DATE: _____

_____ CONTRACTOR

By: _____
Signature

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

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

DATE: _____

CONTRACTOR

By: _____
Signature

[End of Bid Documents to be Submitted with Bid]

AGREEMENT FORM

THIS AGREEMENT, entered into this _____ day of _____, 20____ in the County of Nevada of the State of California, by and between the Nevada Joint Union High School District, hereinafter called the “District”, and _____, hereinafter called the “Contractor”.

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

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

ARTICLE 2 - TIME OF COMPLETION: The District may give notice to proceed within ninety (90) days of the award of the bid by the District. Once the Contractor has received a notice to proceed, the Contractor shall reach Substantial Completion (See Article 1.1.46) of the Work within **One Hundred Twenty-Four (124)** calendar days from receipt of the Notice to Proceed. This shall be called Contract Time. (See Article 8.1.1). Additionally, the new boiler, filtration, chlorination and mechanical piping for pool heating and chemistry balance shall be fully operational on or before **January 18, 2018**. It is expressly understood that time is of the essence.

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

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

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

ARTICLE 3 - LIQUIDATED DAMAGES: It being impracticable and infeasible to determine the amount of actual damage, it is agreed that the Contractor will pay the District the sum of **Two Thousand Dollars (\$2,000)** per calendar day for each and every day of delay beyond the Contract Time set forth in Article 2 of this Agreement (inclusive of Milestones that are critical on the critical path or noted as critical to the District in the Supplementary Conditions) as liquidated damages and not as a penalty or forfeiture. In the event Liquidated Damages are not paid, the Contractor further agrees that the District may deduct such amount thereof from any money due or that may become due the Contractor under the Contract (See Article 9.6 and 2.2 of the General Conditions).

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

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

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

Furthermore, Contractor agrees to and does hereby defend, indemnify and hold harmless District, Architect, Construction Manager, Inspector, the State of California and their officers,

employees, agents and independent contractors from every claim or demand made, and every liability, loss, damage, expense or attorney's fees of any nature whatsoever, which may be incurred by reason of:

(a) Liability for (1) death or bodily injury to persons; (2) damage or injury to, loss (including theft), or loss of use of, any property; (3) any failure or alleged failure to comply with any provision of law or the Contract Documents; or (4) any other loss, damage or expense, sustained by any person, firm or corporation or in connection with the Work called for in this Agreement or the Contract Documents, except for liability resulting from the sole or active negligence, or the willful misconduct of the District.

(b) Any bodily injury to or death of persons or damage to property caused by any act, omission or breach of Contractor or any person, firm or corporation employed by Contractor, either directly or by independent contract, including all damages or injury to or death of persons, loss (including theft) or loss of use of any property, sustained by any person, firm or corporation, including the District, arising out of or in any way connected with Work covered by this Agreement or the Contract Documents, whether said injury or damage occurs either on or off District property, but not for any loss, injury, death or damages caused by the sole or active negligence or willful misconduct of the District.

(c) Any dispute between Contractor and Contractor's subcontractors/suppliers/Sureties, including, but not limited to, any failure or alleged failure of the Contractor (or any person hired or employed directly or indirectly by the Contractor) to pay any Subcontractor or Materialman of any tier or any other person employed in connection with the Work and/or filing of any stop notice or mechanic's lien claims.

(d) Any claims, allegations, penalties, assessments, or liabilities to the extent caused by the Contractor's failure or the failure of any Subcontractor of any tier, to fully comply with the DIR registration requirements under Labor Code section 1725.5 at all times during the performance of any Work on the Project and shall reimburse the District for any penalties assessed against the District arising from any failure by the Contractor or any Subcontractor of any tier from complying with Labor Code sections 1725.5 and 1771.1. Nothing in this paragraph, however, shall require the Contractor or any Subcontractor to be liable to the District or indemnify the District for any penalties caused by the District in accordance with Labor Code section 1773.3 (g).

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

The Contractor's and Subcontractors' obligation to defend, indemnify and hold harmless the Owner, Architect, Inspector, the State of California and their officers, employees, agents and independent contractors hereunder shall include, without limitation, any and all claims, damages, and costs for the following: (1) any damages or injury to or death of any person, and damage or injury to, loss (including theft), or loss of use of, any property; (2) breach of any warranty, express

or implied; (3) failure of the Contractor or Subcontractors to comply with any applicable governmental law, rule, regulation, or other requirement; (4) products installed in or used in connection with the Work; and (5) any claims of violation of the Americans with Disabilities Act (“ADA”).

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

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

Notice Inviting Bids
Instructions to Bidders
Designation of Subcontractors
Non-Collusion Declaration
Bid Guarantee Form
Bid Bond
Bid Form
Contractor’s Certificate Regarding Worker’s Compensation
Acknowledgment of Bidding Practices Regarding Indemnity
DVBE Participation Statement and Close-Out Forms
Agreement Form
Payment Bond
Performance Bond
Guarantee
Escrow Agreement for Security Deposit In Lieu of Retention
Workers’ Compensation/Employers Liability Endorsement
General Liability Endorsement
Automobile Liability Endorsement
Contractor’s Certificate Regarding Drug-Free Workplace
Contractor’s Certificate Regarding Alcohol and Tobacco
Contractor’s Certificate Regarding Background Checks
General Conditions
Supplementary and Special Conditions
Specifications
All Addenda as Issued
Drawings/Plans
Substitution Request Form
Requirements, Reports and/or Documents in the Project Manual or Other Documents Issued to Bidders

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

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

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

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

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

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

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

Nevada Joint Union High School District

CONTRACTOR:

By: _____

Typed or Printed Name

By:

Title

Superintendent

Signature

Dated: _____

Type or Printed Name

Title (Authorized Officers or Agents)

Signature

(CORPORATE SEAL)

PAYMENT BOND

(CALIFORNIA PUBLIC WORK)

KNOW ALL MEN BY THESE PRESENTS:

THAT WHEREAS, the NEVADA JOINT UNION HIGH SCHOOL DISTRICT (sometimes referred to hereinafter as "Obligee") has awarded to _____ (hereinafter designated as the "Principal" or "Contractor"), an agreement for the work described as follows: **Pool building Modernization / Renovation Including ADA Enhancements Throughout, Boiler / Piping Replacement, and New ADA Ramp** (hereinafter referred to as the "Public Work"); and

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

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

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

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

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

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

PRINCIPAL/CONTRACTOR:

By: _____

SURETY:

By: _____

Attorney-in-Fact

IMPORTANT: THIS IS A REQUIRED FORM.

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

Any claims under this bond may be addressed to:

(Name and Address of Surety)

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

Telephone: _____

Telephone: _____

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

STATE OF CALIFORNIA)
) ss.
COUNTY OF)

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

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

WITNESS my hand and official seal.

Notary Public in and for said State

(SEAL)

Commission expires: _____

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

PERFORMANCE BOND
(CALIFORNIA PUBLIC WORK)

KNOW ALL MEN BY THESE PRESENTS:

THAT WHEREAS, the NEVADA JOINT UNION HIGH SCHOOL DISTRICT (sometimes referred to hereinafter as "Obligee") has awarded to _____ (hereinafter designated as the "Principal" or "Contractor"), an agreement for the work described as follows: **Pool Building Modernization / Renovation Including ADA Enhancements Throughout, Boiler / Piping Replacement, and New ADA Ramp** (hereinafter referred to as the "Public Work"); and

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

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

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

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

The Surety, for value received, hereby stipulates and agrees that it shall not be exonerated or released from the obligation of this bond (either by total exoneration or pro tanto) by any change,

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

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

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

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

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

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

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

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

PRINCIPAL/CONTRACTOR:

By: _____

SURETY:

By: _____

Attorney-in-Fact

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

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

IMPORTANT: THIS IS A REQUIRED FORM.

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

Any claims under this bond may be addressed to:

(Name and Address of Surety)

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

Telephone: _____

Telephone: _____

GUARANTEE

Guarantee for _____ . We hereby guarantee that the _____, which we have installed in _____ has been done in accordance with the Contract Documents, including without limitation, the drawings and specifications, and that the work as installed will fulfill the requirements included in the bid documents. The undersigned and its surety agrees to repair or replace any or all such work, together with any other adjacent work, which may be displaced in connection with such replacement, that may prove to be defective in workmanship or material within a period of Two (2) years from the date of the Notice of Completion of the above-mentioned structure by the Nevada Joint Union High School District, ordinary wear and tear and unusual abuse or neglect excepted.

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

Countersigned

(Proper Name)

(Proper Name)

By: _____

By: _____

(Signature of Subcontractor or Contractor)

(Signature of General Contractor if for Subcontractor)

Representatives to be contacted for service:

Name: _____

Address: _____

Phone Number: _____

ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION

This Escrow Agreement is made and entered into by and between the Nevada Joint Union High School District, 11645 Ridge Road, Grass Valley, California 95945, hereinafter called "Owner", and _____ whose address is _____, hereinafter called "Contractor", and _____ whose address is _____, hereinafter called "Escrow Agent".

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

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

Owner to the Escrow Agent that Owner consents to the withdrawal of the amount sought to be withdrawn by Contractor.

7. The Owner shall have a right to draw upon the securities in the event of default by the Contractor. Upon seven (7) days' written notice to the Escrow Agent from the Owner of the notice of default under Article 2.2, Article 9.6 or Article 14, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by the Owner.

8. Upon receipt of written notification from the Owner certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payment of fees and charges.

9. Escrow Agent shall rely on the written notifications from the Owner and the Contractor pursuant to Sections (5) to (8), inclusive, of this Agreement and the Owner and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.

10. The names of the persons who are authorized to give written notice or to receive written notice on behalf of the Owner and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of Owner:

Title

Name

Signature

Address

On behalf of Contractor:

Title

Name

Signature

Address

On behalf of Agent:

Title

Name

Signature

Address

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

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

OWNER

CONTRACTOR

Title

Title

Name

Name

Signature

Signature

INSURANCE DOCUMENTS & ENDORSEMENTS

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

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

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

Attn: _____
(Title) (Department)

(Company)

(Street Address)

(City) (State) (Zip Code)

(_____) _____
(Telephone Number)

2. Workers’ Compensation/ Employer’s Liability Insurance: Certificate of Workers’ Compensation Insurance meeting the coverages and requirements set forth in Article 11 of the General Conditions, minimum of 30 days’ cancellation notice, proper Project description, waiver of subrogation and any applicable endorsements.

3. Automobile Liability Insurance: Certificate of Automobile Insurance meeting the coverages and requirements set forth in Article 11 of the General Conditions, minimum 30 days' cancellation notice, any applicable endorsements and a statement that the insurance provided is primary to any insurance obtained by the District.

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

Attn: _____
(Title) (Department)

(Company)

(Street Address)

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

DATE: _____

CONTRACTOR

By: _____

Signature

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

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

Project Name: Pool Building Modernization / Renovation Including ADA Enhancements Throughout, Boiler / Piping Replacement, and New ADA Ramp

DSA Application No.: 02-116957

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

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

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

Company: _____

Name: _____

Title: _____

Signature: _____

Date: _____

CONTRACTOR CERTIFICATION REGARDING BACKGROUND CHECKS

(Modernization Projects)

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

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

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

OR

- Pursuant to Education Code section 45125.2, Contractor will ensure the safety of pupils by one or more of the following methods:
 - 1. The installation of a physical barrier at the worksite to limit contact with pupils.
 - 2. Continual supervision and monitoring of all employees of the entity by an employee of the entity whom the Department of Justice has ascertained has not been convicted of a violent or serious felony.

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

Date _____, 20_____
[Name of Contractor/Consultant]

By its: _____

ATTACHMENT A:

CONTRACTOR CERTIFICATION REGARDING BACKGROUND CHECKS

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

GENERAL CONDITIONS

ARTICLE 1 DEFINITIONS

1.1 BASIC DEFINITIONS

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

1.1.1 Action of the Governing Board is a vote of a majority of the District's Governing Board.

1.1.2 Approval means written authorization through action of the Governing Board. The Governing board has delegated to the Superintendent the authority to approve certain modifications, Change Orders or Immediate Change Directives (Subject to the limits of the Delegation of Authority provided by the Board). In no case shall the Superintendent have authority to approve total Change Orders or Modifications to the Project exceeding 10% of the Contract Sum.

1.1.3 Architect means the architect, engineer, or other design professional engaged by the District to design and perform general observation of the work of construction and interpret the Drawings and Specifications for the Project. (See ARTICLE 4)

1.1.4 As-Builts are a set of Plans and Specifications maintained by the Contractor clearly showing all changes, revisions, substitutions, field changes, final locations, and other significant features of the Project. The As-Builts shall be maintained continuously throughout the Work for the Project and is both a prerequisite to the issuance of Payment Application and a requirement for Contract Close-Out. (See Article 3.17)

1.1.5 Beneficial Occupancy is the point in time when a building or buildings are fit for occupancy is fit for occupancy and its intended use. Basic requirements are the building is safe, at or near Substantial Completion, and all fire/ life safety items are approved and operational. The fact that a building is occupied does not mean that the building is ready for Beneficial Occupancy if there are elements that are unsafe or if fire/ life safety items are not approved and operational. Taking occupancy on a structure that is under a fire watch is not considered beneficial occupancy. Further, taking of Beneficial Occupancy is not a point in time when retention is due unless the entire school has obtained a Certificate of Substantial Completion that meets the definition of 1.1.46.

1.1.6 Claims. A Claim is a request for payment, supported by back-up documentation which includes, invoices time sheets, or other documents substantiating legitimacy or entitlement that is submitted during the Project or immediately following the Project made prior to the Final Retention Payment Application and prior to Final Completion of the Project. A "Claim" means a

GENERAL CONDITIONS

separate demand by the Contractor for (1) time extension, (2) payment of money or damages arising from Work done by or on behalf of the Contractor pursuant to the CONTRACT and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (3) and amount the payment of which is disputed by the District. (See Article 4.6)

1.1.7 Change Order (CO). A CO is a written instrument prepared by the Architect and signed by the District (as authorized by the District's Governing Board), the Contractor, and the Architect, stating their agreement upon (1) A description of a change in the Work, (2) The amount of the adjustment in the Contract Sum, if any; and (3) The extent of the adjustment in the Contract Time, if any. (See Article 7.2)

1.1.8 Change Order Request (COR). A COR is a written request supported by backup documentation prepared by the Contractor requesting that the District and the Architect issue a CO based upon a proposed change, or a change that results in an adjustment in cost, time or both, or arising from an RFP, CCD or ICD. (See Article 7.6)

1.1.9 Close-Out means the process for Final Completion of the Project, but also includes the requirements for the DSA Certification that the Project is Complete (See DSA Certification Guide). (See Article 9.9)

1.1.10 Construction Change Document (CCD). A Construction Change Document is a DSA term that is utilized to address changes to the DSA approved Plans and Specifications. There are two types of Construction Change Documents. (1) DSA approved CCD Category A for work affecting structural, access or fire/ life safety of the Project which will require a DSA approval; and, (2) CCD Category B for work NOT affecting structural safety, access compliance or fire/ life safety that will not require a DSA approval (except to confirm that no approval is required). Both CCD Category A and Category B shall be set forth in DSA Form 140 and submitted to DSA as required. (See Article 7.3)

1.1.11 Complete/ Completion/ Final Completion means that all Work in the Contract Documents is finished, the requirements of the Contract Documents have been met, the Project has been Closed Out, and all Work has ceased on the Project. This may also be referred to as Final Completion. In most cases, the recording of a Notice of Completion shall represent Completion of the Project. Beneficial Occupancy does not mean the Work is Complete.

1.1.12 Completion Date is the date when all Work for the Project shall be Substantially Complete and is the date assigned at the end of the Contract Time for the Project. (See Article 1.1.46)

1.1.13 Construction Manager. The Construction Manager is a consultant to the District contracted to assist in Project planning, management and construction of the Project. If there is a Construction Manager, they may assist in various aspects of the Project including, but not limited to Monitoring the progress of the construction, reviewing and monitoring the schedule, progress of work, monitoring pay requests, facilitating communications, advising the District and its Board of Education on various aspects of the construction process, monitoring the RFI, COR, CCD, ICD, RFP, Claims, Disputes and other Project related processes.

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1.1.14 Contract or Agreement when the terms are used in these General Conditions shall be references to the Contract Documents as defined herein.

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

1.1.16 Contract Time is the time period specified in the Contract Documents in which the Project shall be completed. This is sometimes referred to a Contract Duration, or "time in which the Contractor has to complete the Project". (See Article 8.1.1)

1.1.17 Contractor, District, and Architect are those mentioned as such in the Agreement. They are treated throughout the Contract Documents as if they are of singular number and neuter gender. Any reference to "Owner" shall mean "District" or Nevada Joint Union High School District.

1.1.18 Cure is the act of remedying a material failure to perform under the terms of the Contract Documents during the time provided to correct Contractor's Default. Specific time periods are provided to Cure and Correct a Contractor Default under Article 14 and for a Partial Default under Article 2.2 as well as elsewhere in the Contract Documents.

1.1.19 Days mean calendar days unless otherwise specifically stated.

1.1.20 Default is a material breach of Contract. A Termination for Cause under Article 14 is a declaration of Default of the Contract and shall act as a demand upon the Surety to perform under the terms of the Performance Bond. Partial Defaults may also be tendered to the Surety at District's discretion. (See Article 2.2)

1.1.21 Dispute. A dispute is a disagreement on terms or conditions of the Project where the Contractor's opinion of the Project, Payment, Change Order or Request for Proposal differs from that of the District or Architect. A dispute only rises to the level of a claim once the dispute is assembled with back-up documentation and presented for evaluation. (See Article 4.6)

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1.1.22 District Representative is the person designated by the District to represent the District during the Construction for the Project. This District Representative shall have the delegated authority as further defined in Article 1.1.2. This District Representative may be an employee of the District who may have the delegated authority as set forth in Article 1.1.3, and may also include Construction Managers. In some cases, the District and its Board may be assisted by a Construction Manager. When a Construction Manager is assisting the District, the Contractor, Architect, and Inspector shall have a primary contact with the District's Construction Manager who will advise the District.

1.1.23 Drawings/Plans are graphic and pictorial portions of the Contract Documents prepared for the Project and approved changes thereto, wherever located and whenever issued, showing the design, location, and scope of the Work, generally including Plans, elevations, sections, details, schedules, and diagrams as drawn or approved by the Architect. Sometimes Drawings will also be included in Addenda, Change Orders, and Specifications.

1.1.24 DSA is the Division of State Architect. DSA is the agency that provides design and construction oversight for K-12 Schools, Community Colleges, and State Funded Charter School Projects. DSA is the responsible agency for this Project and Contractor has submitted a bid for the Project since Contractor is familiar with Contractor's responsibilities under the DSA requirements more thoroughly set forth at Title 24 of the California Code of Regulations. Contractor agrees to abide by the jurisdiction of DSA and shall construct the Project to conform with the approved Plans, Specifications, Addenda, and Change Orders (inclusive of approved CCD's and ICD's issued by the District pending CCD approval). See DSA website.

1.1.25 Emergency shall be defined as a sudden, unexpected occurrence, involving a clear and imminent threat to the continuation of school classes, a critical path delay that will result in not being able to occupy the school when students arrive to use the facility, danger from the facility or from outside the facility, Act of God, or other action which requires immediate action to prevent or mitigate loss of, or damage to, life, health, property, or essential public services.

1.1.26 Float the total number of days an activity may be extended or delayed without delaying the Completion Date shown in the schedule. Float will fall into three categories: (1) Rain Days; (2) Governmental Delays; and, (3) Project Float. (See Article 8.1.4)

1.1.27 Immediate Change Directive. (ICD) A written order prepared by the Architect and signed by the District and the Architect, directing a change in the Work where the Work must proceed immediately and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. (See Article 7.3)

1.1.28 Inspector of Record (IOR)/ Project Inspector (PI) is the individual retained by the District in accordance with Title 24 of the California Code of Regulations and who will be assigned to the Project

1.1.29 Notice of Non-Compliance (DSA Form 154) is a document issued by the Inspector if there is a deviation from the DSA approved Plans, Specifications, and Change Orders. (See Article 7.1.2)

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1.1.30 Payment Application or Certificate of Payment is the Contractor's certified representation of the actual level of Work performed on the Project. Payment Applications are sometimes also called "Certificate of Payment", "Request for Payment", "Payment Application", or similar terms, and shall follow the Schedule of Values that are approved by the Architect, Inspector and District. (See Article 9.3)

1.1.31 Project is the complete construction of the Work performed in accordance with the Contract Documents.

1.1.32 Project Manual is the volume assembled for the Work which may include, without limitation, the bidding requirements, sample forms, Conditions of the Contract, and Specifications.

1.1.33 Provide shall include "provide complete in place," that is "furnish and install complete."

1.1.34 Punch List/ Punch Item/ Incomplete Punch Item is a list of minor repair items, prepared after the issuance of a Certificate of Substantial Completion, by the Inspector and Architect of Work required in order to complete the Contract Documents and ensure compliance with the DSA Approved Plans so the Project may be Closed Out. Issuance of the Retention Payment is dependent of the proper completion of the Punch List. (See Article 9.9)

1.1.34.1 *Contractor's List of Punch Items* is a list of minor repair items the Contractor submits when the Contractor considers the Work Substantially Complete. Submission of this List of Incomplete Punch Items is the Contractor's representation that the Project is Substantially Complete. (See Article 9.9.1.1)

1.1.35 Request for Information (RFI) is a written request prepared by the Contractor requesting the Architect to provide additional information necessary to clarify or amplify an item which the Contractor believes is not clearly shown or called for in the Drawings or Specifications, or to address problems which have arisen under field conditions. (See Article 7.4)

1.1.36 Request for Proposal (RFP) is a written request prepared by the Architect (and/or CM) requesting the Contractor to submit to an estimate of the effect of a proposed change on the Contract Price and (if applicable) the Contract Time. (See Article 7.5)

1.1.37 Safety Orders are those issued by any city, county, state or federal agency having jurisdiction over the Project.

1.1.38 Schedule is the Contractor's view of the practical way in which the Work will be accomplished. In this Agreement there is a requirement for a Baseline Schedule and regular Schedule Updates that show all Work to be completed during the Contract Time and shall include all items listed under Article 8.3.2.9. See Article 8 of the General Conditions.

1.1.39 Schedule of Values is a detailed breakdown of the Contract Price for each Project, building, Phase of Work or Site as determined by the District. This Schedule of Values

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shall adequately detail the price for the Work so Progress Payments Applications can be meaningfully reviewed by the Inspector, Architect of Record, Engineer of Record, and District. (See Article 9.2)

1.1.40 Separate Contracts are Contracts that the District may have with other Contractors, vendors, suppliers, or entities to perform Work on the Project. This may include, but is not limited to Multi-Prime Trade Contractors, furniture installers, testing agencies, clean-up contractors, or network or low voltage contractors. Contractor shall plan for certain other contractors that may also be working on the Project site and address these other contractors in Contractor's Schedule. (See Article 6)

1.1.41 Site refers to the grounds of the Project as defined in the Contract Documents and such adjacent lands as may be directly affected by the performance of the Work.

1.1.42 Specifications are that portion of the Contract Documents consisting of the written requirements for material, equipment, construction systems, instructions, quality assurance standards, workmanship, and performance of related services.

1.1.43 Standards, Rules, and Regulations referred to are recognized printed standards and shall be considered as one and a part of these Specifications within limits specified. Federal, state and local regulations are incorporated into the Contract Documents by reference.

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

1.1.45 Subcontractor, as used herein, includes those having direct or indirect contracts with Contractor and ones who furnished labor, material or services for a special design according to Plans, Drawings, and Specifications of this Work.

1.1.46 Substantial Completion/ Substantially Complete(d) is not reached unless and until each of the following four (4) conditions have been met: (1) all contractually required items have been installed with the exception of only minor and Incomplete Punch List Items (See Article 9.9.1.2); (2) All Fire/Life Safety Systems have been installed, and are working and signed off on the DSA Form 152 Inspection Card, and all building systems including mechanical, electrical and plumbing are all functioning; (3) all other items DSA Form 152 Inspection Card for the Project have been approved and signed off; and (4) the Project is fit for occupancy and its intended use. For the purposes of this Contract, any references to Completion Date means Substantial Completion Date.

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1.1.47 Substitution is a change in product, material, equipment, or method of construction from those required by the Construction Documents proposed by the Contractor. For this Project, a Substitution is subject to the filing of a Construction Substitution Request Form at the time of bid and meeting the requirements of Article 3.10.

1.1.48 Supplementary Conditions/ Supplementary General Conditions/ Special Conditions are terms that are sometimes used interchangeably and refer to any additional requirements or changes to the General Conditions as noted.

1.1.49 Surety is the person, firm, or corporation that executes as a bid bond, Payment Bond or Performance Bond guarantor on the Contractor's Bid, Contractor's Performance on the Contract and Payment of the Contractor's Subcontractors, material suppliers, vendors and labor on the Project. The Surety is bound to the same extent as the Contractor is bound once a Default occurs. A default includes a Termination for Substantial Failure to Perform under Article 14, but also includes any breach of Contract and is subject to the requirements and responsibilities as set forth in the Performance Bond.

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

1.1.51 Workers include laborers, workers, and mechanics.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 Correlation and Intent

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

1.2.1.2 *Work to be Complete.* Contractor has thoroughly studied the Contract Documents and understands that the District contracted with Contractor to provide a complete

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

1.2.1.3 *Coverage of the Drawings and Specifications.* The Drawings and Specifications generally describe the Work to be performed by Contractor. Generally, the Specifications describe Work which cannot be readily indicated on the Drawings and indicate types, qualities, and methods of installation of the various materials and equipment required for the Work. It is not intended to mention every item of Work in the Specifications, which can be adequately shown on the Drawings, or to show on the Drawings all items of Work described or required by the Specifications even if they are of such nature that they could have been shown. All materials or labor for Work, which is shown on either the Drawings or the Specifications (or is reasonably inferable therefrom as being necessary to complete the Work), shall be provided by the Contractor. The Contractor is responsible for the whole Project as contractually set forth as the Contract Documents. It is intended that the Work be of sound, quality construction, and the Contractor shall be responsible for the inclusion of adequate amounts to cover installation of all items indicated, described, or implied in the portion of the Work to be performed by them.

1.2.1.4 *Conflicts.* In the event there is a discrepancy between the various Contract Documents, it is intended that the more stringent, higher quality, and greater quantity of Work shall apply.

1.2.1.5 *Conformance with Laws.* Each and every provision of law required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein, even if through mistake or otherwise any such provision is not inserted, or is not correctly inserted.

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

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inconsistency shall be corrected in the manner provided hereunder prior to the construction of that portion of the Project. (See Title 24 Section 4-343)

The Contractor shall bear all expenses of correcting Work done contrary to said laws, ordinances, rules, and regulations if the Contractor performed same (1) without first consulting the Architect for further instructions regarding said Work or (2) disregarded the Architect's instructions regarding said Work.

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

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

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

1.2.2 Addenda and Deferred Approvals

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

1.2.2.2 *Deferred Approvals.* Deferred Approvals are Submittals that are reviewed by the Architect (or Engineer of Record) and submitted to DSA for approval based on thorough detailing of manufacturer and Project specific design. See Article 3.9.1 and 3.9.3. The Deferred Approval item cannot be fully detailed on the originally approved Drawings or

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

1.2.3 Specification Interpretation

1.2.3.1 *Titles.* The Specifications are separated into titled sections for convenience only and not to dictate or determine the trade or craft involved.

1.2.3.2 *As Shown, Etc.* Where “as shown,” “as indicated,” “as detailed,” or words of similar import are used, reference is made to the Drawings accompanying the Specifications unless otherwise stated. Where “as directed,” “as required,” “as permitted,” “as authorized,” “as accepted,” “as selected,” or words of similar import are used, the direction, requirement, permission, authorization, approval, acceptance, or selection by Architect is intended unless otherwise stated.

1.2.3.3 *General Conditions.* The General Conditions and Supplementary General Conditions are a part of the Contract Documents which further defines and refines the Contract entered between the Contractor and District.

1.2.3.4 *Abbreviations.* In the interest of brevity, the Specifications are written in an abbreviated form and may not include complete sentences. Omission of words or phrases such as “Contractor shall,” “shall be,” etc., are intentional. Nevertheless, the requirements of the Specifications are mandatory. Omitted words or phrases shall be supplied by inference in the same manner as they are when a “note” occurs on the Drawings. In the interest of brevity, the Contract Documents frequently omit modifying words such as “all” and “any” and articles such as “the” and “an,” but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

1.2.3.5 *Plural.* Words in the singular shall include the plural whenever applicable or the context so indicates.

1.2.3.6 *Metric.* The Specifications may indicate metric units of measurement as a supplement to U.S. customary units. When indicated thus: 1” (25 mm), the U. S. customary unit is specific, and the metric unit is nonspecific. When not shown with parentheses, the unit is specific. The metric units correspond to the “International System of Units” (SI) and generally follow ASTM E 380, “Standard for Metric Practice.”

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

1.2.4 Rules of Document Interpretation

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

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

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

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

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

- a. General Conditions take precedence over Drawings and Specifications.
- b. Supplemental Conditions take precedence over General Conditions.
- c. The Agreement Form shall take precedence over the Supplemental Conditions.

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- d. In the case of disagreement or conflict between or within Specifications, and Drawings, the more stringent, higher quality, and greater quantity of Work shall apply.
- e. Addenda shall take precedence over Drawings and Specifications.
- f. General Conditions shall take precedence over Addenda.
- g. Drawings and Specifications take precedence over the Soils Report.

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

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

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ARTICLE 2 DISTRICT

2.1 INFORMATION AND SERVICES REQUIRED OF THE DISTRICT

2.1.1 Site Survey

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

2.1.2 Soils

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

2.1.3 Soils Report Part of the Contract Documents: Contractor Reliance

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

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

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INDEPENDENT INVESTIGATION OF THE PROJECT SITE AND THE SOILS CONDITIONS OF THE SITE. DISTRICT DOES NOT WARRANT THE SOILS CONDITIONS OF THE SITE AND CONTRACTOR IS FULLY RESPONSIBLE TO ASCERTAIN SITE CONDITIONS FOR THE PURPOSES OF DETERMINING CONSTRUCTION MEANS AND METHODS PRIOR TO COMMENCING CONSTRUCTION.

2.1.4 Utilities

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

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

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

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

GENERAL CONDITIONS

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

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

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

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

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

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

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

2.1.5 Existing Utility Lines; Removal, Relocation

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

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

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

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

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

2.1.6 Easements

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

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

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

1. Failure to supply adequate workers on the entire Project or any part thereof;

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2. Failure to supply a sufficient quantity of materials;
3. Failure to perform any provision of this Contract;
4. Failure to comply with safety requirements, or due to Contractor is creation of an unsafe condition;
5. Cases of bona fide emergency;
6. Failure to order materials in a timely manner;
7. Failure to prepare Deferred Approval items or Shop Drawings in a timely manner;
8. Failure to comply with Contractor's Baseline or Update Schedule, meet critical Milestones which would result in a delay to the critical path, or delay the Contract Time;
9. Failure to comply with the Subletting and Subcontracting Fair Practices, Public Contract Code section 4100, et seq.
10. Failure to meet the requirements of the Americans with Disabilities Act;
11. Failure to complete Punch List work;
12. Failure to proceed on an Immediate Change Directive
13. Failure to correct a Notice of Deviation

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

2.2.1 Service of Notice of Partial Default with Right to Cure

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

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

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

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

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

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

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

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ARTICLE 3 THE CONTRACTOR

3.1 SUPERVISION AND CONSTRUCTION PROCEDURES

3.1.1 Contractor

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

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

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

3.1.2 Contractor Responsibility to Study the Plans and Specifications

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

3.1.3 All Work Under the Direction of Inspector

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

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3.1.4 Contractor to Establish Timing and Protocol with Inspector

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

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

3.1.5 Verified Reports

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

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

3.1.6 Contractor Responsibility

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

3.1.7 Obligations not Changed by Architect's Actions

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

3.1.8 Acceptance/Approval of Work

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

3.2 SUPERVISION

3.2.1 Full Time Supervision

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

3.2.2 Staff

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

3.2.3 Right to Remove

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

3.3 LABOR AND MATERIALS

3.3.1 Contractor to Provide

Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, material, equipment, tools, construction equipment and machinery, water, heat, air conditioning, utilities, transportation, and other facilities, services and permits necessary for

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proper execution and completion of the Work whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

3.3.2 Quality

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

3.3.3 Replacement

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

3.3.4 Discipline

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

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

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

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

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

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

3.3.6 Noise, Drugs, Tobacco, and Alcohol

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

3.3.7 Delivery of Material

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

3.3.8 Liens and Other Security Interests of Subcontractors and Material Suppliers

No material, supplies, or equipment for the Work shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in

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

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

3.3.9 Title to Materials

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

3.3.10 Assemblies

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

3.3.11 Noise Control

The Contractor shall be responsible for the installation of noise reducing devices on construction equipment. Contractor shall comply with the requirements of the city and county having jurisdiction with regard to noise ordinances governing construction sites and activities. Construction equipment noise is subject to the control of the Environmental Protection Agency's Noise Control Program (Part 204 of Title 40, Code of Federal Regulations). If school is in session

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

3.4 WARRANTY

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

3.4.1 In addition to any other warranties provided elsewhere, Contractor shall, and hereby does, warrant all Work after the date of Notice of Completion of Work by District and shall repair or replace any or all such Work, together with any other Work, which may be displaced in so doing that may prove defective in workmanship or materials within a one (1) year period from date of Final Completion which shall be no later than the final date of Punch List as noted at Article 9.11) without expense whatsoever to District, ordinary wear and tear, unusual abuse or neglect excepted. District will give notice of observed defects with reasonable promptness. Contractor shall notify District upon completion of repairs.

3.4.2 In the event of failure of Contractor to comply with above mentioned conditions within one week after being notified in writing, District is hereby authorized to proceed to have defects repaired and made good at expense of Contractor who hereby agrees to pay costs and charges therefore immediately on demand.

3.4.3 If, in the opinion of the District, defective Work creates a dangerous condition or requires immediate correction or attention to prevent further loss to the District, the District will attempt to give the notice required by this Article. If the Contractor cannot be contacted or does not comply with the District's requirements for correction within a reasonable time as determined by the District, the District may, notwithstanding the provisions of this article, proceed to make such correction or attention which shall be charged against Contractor. Such action by the District will not relieve the Contractor of the guarantee provided in this Article or elsewhere in this Contract.

3.4.4 This Article does not in any way limit the guarantee on any items for which a longer warranty is specified or on any items for which a manufacturer gives a guarantee for a

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longer period. Contractor shall furnish District all appropriate guarantee or warranty certificates upon completion of the project.

3.5 TAXES

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

3.6 PERMITS, FEES AND NOTICES

3.6.1 Payment

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

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

3.6.2 Compliance

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

3.6.3 Responsibility

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

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

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

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

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

3.7 SUBMITTALS REQUIRED AT THE COMMENCEMENT OF THE PROJECT

3.7.1 Requirements Within Ten (10) Calendar Days

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

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

3.7.2 Requirements Within Thirty-Five (35) Calendar Days

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

3.7.2.1 *All Submittals for the Project* except those specifically agreed upon by District and Architect, in writing, and shall be specifically incorporated into the Submittal section of the Schedule so as to not delay the Work. The agreement to allow a later Submittal does not mean that Article 3.3.7 is waived. Contractor shall order materials and ensure prices are honored and secured for the Project.

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- a. Structural Steel may be included as a later Submittal than 35 days if Structural Steel is a significant portion of the Work, at least one or some of the Project is a structural steel structural system, or as specifically agreed upon by the Architect or District.
- b. It is specifically agreed that submissions of structural steel Submittals shall not be piecemeal (unless some portion is requested separately by the District or Architect), shall provide complete designs, shall be stamped by the structural steel Subcontractor, Contractor, and structural steel Subcontractor's structural engineer at time of submission and as further addressed in Article 3.9.
- c. In no case shall the submission of structural steel Drawings delay the critical path for the schedule. If a Milestone is provided for submission of complete structural steel Shop Drawings then the date shall be no later than as set forth in the Milestone

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

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

3.8 DOCUMENTS, SAMPLES, AND COMPUTER AT THE SITE

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

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available to the Architect and shall be delivered to the Architect for delivery to the District upon completion of the Work.

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

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

3.9 SUBMITTALS INCLUDING SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

3.9.1 Definitions

3.9.1.1 *Deferred Approvals.* Approval of certain aspects of the construction may be deferred until the construction Contract has been awarded. To facilitate the design process, DSA grants Deferred Approval to the design and detailing of certain elements of the Project at the request of the Architect or Engineer of Record. Design elements that may be deferred may include, but are not limited to access floors, bleachers, elevator guide rails and related elevator systems, exterior wall systems - precast concrete, glass fiber reinforced concrete, etc., skylights, window wall systems, storefronts, stage rigging, and other systems as noted in the Contract Documents. (Also see Article 1.2.2.2 and 3.9.3)

3.9.1.2 *Shop Drawings.* The term “Shop Drawings” as used herein means Drawings, diagrams, equipment or product schedules, and other data, which are prepared by Contractor, Subcontractors, manufacturers, suppliers, or distributors illustrating some portion of the Work, and includes: illustrations; fabrication, erection, layout and setting Drawings; manufacturer’s standard Drawings; schedules; descriptive literature, instructions, catalogs, and brochures; performance and test data including charts; wiring and control diagrams; and all other Drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment, or systems and their position conform to the requirements of the Contract Documents.

3.9.1.3 *Manufactured* applies to standard units usually mass-produced, and “Fabricated” means items specifically assembled or made out of selected materials to meet individual design requirements. Shop Drawings shall: establish the actual detail of all manufactured or Fabricated items, indicate proper relation to adjoining work, amplify design details of mechanical and electrical systems and equipment in proper relation to physical spaces in the structure, and incorporate minor changes of design or construction to suit actual conditions.

3.9.1.4 *Submittals* is a term used interchangeably and sometimes refers to Shop Drawings, Product Data, and samples since all Subcontractor submissions are tracked in a Submittal Log and may include any of the noted items. However, generally, a Submittal is a manufacturer’s product information and Product Data including description, characteristics, size, physical characteristics, and requirements to prepare the jobsite for receiving of the particular manufactured item.

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3.9.1.5 *Samples.* The term “samples” as used herein are physical examples furnished by Contractor to illustrate materials, equipment, or quality and includes natural materials, Fabricated items, equipment, devices, appliances, or parts thereof as called for in the Specifications, and any other samples as may be required by the Architect to determine whether the kind, quality, construction, finish, color, and other characteristics of the materials, etc., proposed by the Contractor conform to the required characteristics of the various parts of the Work. All Work shall be in accordance with the approved samples.

3.9.2 Shop Drawings.

3.9.2.1 *When Shop Drawings Are Required.* Shop Drawings are required for prefabricated components and for installation and coordination of these prefabricated components into the Project. In addition, Shop Drawings, are prepared to address the actual size and installation of components from various Subcontractors and provides an opportunity for the Contractor to coordinate and address conflicts between the subcontracting trades. In some cases, each Subcontractor or trade will provide Shop Drawings in a BIM format or other format as agreed by District.

3.9.2.2 *Purpose for Shop Drawings.* Shop Drawings are the Contractor’s manufacturer, Subcontractor, supplier, vendor or the Contractor’s detailed drawings showing particularized method for assembly, specifics to a manufacturer, manufacturer component installation requirements, specifics as to a manufactured item, alterations to a manufactured, a custom created item, or drawn version of more detailed information expanding on the Architect’s design shown in the Contract Documents. The Shop Drawings address the appearance, performance, size, weight, characteristics and prescriptive descriptions associated with the Contractor or Contractor’s Subcontractor’s plan for installation or assembly based on the design in the Specifications and Contract Documents. The Shop Drawing often is more detailed than the information shown in the Contract Documents to give the Architect and Engineer the opportunity to review the fabricator’s version of the product (along with particulars specific to that particular product), prior to fabrication. References to the Contract Documents, Construction Documents, Drawings, Plans, and Specifications assist the Architect and Engineer in their review of the Shop Drawings. Attachment of manufacturer’s material Specifications, “catalog cut sheets,” and other manufacturer’s information may be provided to accompany Shop Drawings. Because Shop Drawings facilitate the Architect’s and Engineer’s approval of the system, they should be as clear and complete as possible so they may be reviewed by Architect or Engineer for the Project.

3.9.2.3 *Shop Drawing Requirements.* The Contractor shall obtain and submit with Shop Drawings all seismic and other calculations and all Product Data from equipment manufacturers. “Product Data” as used herein are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work.

3.9.2.4 *Not a Reproduction of Architectural or Engineering Drawings.* The Shop Drawings are not a reproduction of the architectural or engineering Drawings. Instead, they must show more detail than the Construction Documents and details the fabrication and/or installation of the items to the manufacturer’s production crew or Contractor’s installation crews.

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3.9.2.5 *Shop Drawings Engineering Requirements:* Some Shop Drawings require an engineer stamp to be affixed on the Drawings and calculations. In such cases, a current and valid engineering stamp shall be affixed by a California registered engineer. No out of State engineers shall stamp Shop Drawings. (See DSA IR A-18). In most cases, an engineer means California registered mechanical, structural, electrical or plumbing engineer. California Registered Civil Engineers will not be accepted for structural details unless specifically approved by DSA.

3.9.2.6 *DSA Approvals Required Prior to Work.* No work on a Shop Drawing that requires DSA approval may proceed until DSA approval is received. Contractor has provided DSA approval time and allowed adequate time for corrections in Contractor's Schedule as required pursuant to Article 8.

3.9.2.7 *Shop Drawing Identification.* All Shop Drawings must be properly identified with the name of the Project and dated, and accompanied by a letter of transmittal referring to the name of the Project and to the Specification section number for identification of each item clearly stating in narrative form, as well as "clouding" all qualifications, departures, or deviations from the Contract Documents. Shop Drawings, for each section of the Work shall be numbered consecutively and the numbering system shall be retained throughout all revisions. All Subcontractor submissions shall be made through the Contractor. Each drawing shall have a clear space for the stamps of Architect and Contractor.

3.9.3 Deferred Approvals

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

3.9.4 Submittals and Samples

3.9.4.1 *Information Required With Submittals:* Manufacturer, trade name, model or type number and quantities: Information provided must be of sufficient detail to allow Architect and Engineer to compare the submitted item with the specified products and acceptable products listed, in the Specifications and addenda.

3.9.4.2 *Description of Use and Performance Characteristics:* Information should be furnished describing the normal use and expected performance of the product. The

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Architect and Contractor review this information to confirm that the product is appropriate for the intended use.

3.9.4.3 *Size and Physical Characteristics:* The size and physical characteristics, such as adjustment capabilities, which is reviewed by both the Contractor and Architect. The Contractor has the most available information for comparing adjoining materials and equipment. The Contractor also needs to know the size and weight of the equipment for lifting and handling considerations.

3.9.4.4 *Finish Characteristics:* The Architect reviews the available finishes and selects the appropriate finish, if the finish was not previously specified in the documents. The Contractor should confirm that finish requirements in the Specifications are being met by the product.

3.9.4.5 *Contractor Responsible for Jobsite Dimensions:* Some material is custom-fabricated to job conditions, requiring dimensions from the jobsite. These jobsite dimensions are provided by the Contractor as part of the Contractor's responsibilities for the Project and shall be provided prior to release of the product for manufacture. Contractor shall not rely on Architect or Engineers to provide jobsite dimensions.

3.9.4.6 *Full Range of Samples Required (When Specific Items Not Specified).* Except in cases where the exact color and type of item is specified since the District is utilizing items Standardized or pre-selected by District, the full range of color, graining, texture, or other characteristics are anticipated for review in finished products, a sufficient number of samples of the specified materials shall be furnished by the Contractor to indicate the full range of characteristics which will be present in the finished products. Products delivered or erected without Submittal and approval without providing a full range of samples shall be subject to rejection. Except for range samples, and unless otherwise called for in the various sections of the Specifications or Specification Section 1, samples shall be submitted in duplicate.

3.9.4.7 *Labeling of Samples.* All samples shall be marked, tagged, or otherwise properly identified with the name of the submitting party, the name of the Project, the purpose for which the samples are submitted and the date.

3.9.4.8 *Transmittal letter.* All samples shall be accompanied by a letter of transmittal containing similar information, together with the Specification section number.

3.9.4.9 *Labels and Instructions.* All samples of materials shall be supplied with the manufacturer's descriptive labels and application instructions. Each tag or sticker shall have clear space for the review stamps of Contractor and Architect.

3.9.4.10 *Architect's Review.* The Architect will review and, if appropriate, approve submissions and will return them to the Contractor with the Architect's stamp and signature applied thereto, indicating the timing for review and appropriate action in compliance with the Architect's (or District's) standard procedures. In the cases where a CM is hired by the District, CM may be the party that receives and performance logging and initial processing of the

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Samples. CM may, in some cases, reject samples that are not in conformance with Contract requirements.

3.9.5 Submittal Submission Procedure

3.9.5.1 *Transmittal Letter and Other Requirements.* All Submittals must be properly identified with the name of the Project and dated, and each lot submitted must be accompanied by a letter of transmittal referring to the name of the Project and to the Specification section number for identification of each item clearly stating in narrative form, as well as “clouding” on the submissions, all qualifications, departures, or deviations from the Contract Documents. Shop Drawings, for each section of the Work shall be numbered consecutively and the numbering system shall be retained throughout all revisions. All Subcontractor submissions shall be made through the Contractor. Each drawing shall have a clear space for the stamps of Architect and Contractor. Refer to Division 1. In the case where a CM is hired on the Project, the CM may be designated to receive the Submittals for the Project, log the Submittals, and in some cases reject Submittals that do not conform to Contract requirements. Submittal Procedures for further information.

3.9.5.2 *Copies Required.* Each Submittal shall include one (1) legible, reproducible (if electronic is available, electronic copies shall also be provided) and five (5) legible prints of each drawing or schedule, table, cut sheet, etc., including fabrication, erection, layout and setting drawings, and such other drawings as required under the various sections of the Specifications, until final acceptance thereof is obtained. Subcontractor shall submit copies, in an amount as requested by the Contractor, of: (1) manufacturers’ descriptive data for materials, equipment, and fixtures, including catalog sheets showing dimensions, performance, characteristics, and capacities; (2) wiring diagrams and controls; (3) schedules; (4) all seismic calculations and other calculations; and (5) other pertinent information as required by the District or Architect. (See also Division 1)

3.9.5.3 *Corrections.* The Contractor shall make all corrections required by Architect, District or CM and shall resubmit, as required by Architect or CM, corrected copies of Shop Drawings or new samples until approved. Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections required by the Architect on previous submissions. Professional services required for more than one (1) re-review of required Submittals of Shop Drawings, Product Data, or samples are subject to charge to the Contractor pursuant to Article 4.5.

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

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

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3.9.6 Schedule Requirements for Submittals

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

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

3.9.7 General Submittal Requirements

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

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

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

Signature of Contractor and date

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3.9.7.3 *No Deviation from Contract Documents.* The submission of the Shop Drawings, Product Data, samples, etc., shall not deviate from the *requirements* of the Contract Documents including detailing and design intent which is specifically outlined in Contract Documents except as specifically authorized by the Architect or through an accepted substitution pursuant to Article 3.10.4. All deviations from the Contract Documents shall be narratively described in a transmittal accompanying the Shop Drawings. However, Shop Drawings shall not be used as a means of requesting a substitution, the procedure for which is defined in Article 3.10.4, “Substitutions.”

3.9.7.4 *Contractor Responsibility for Shop Drawings Conformance to Contract Documents.* Review by District and Architect shall not relieve the Contractor or any Subcontractor from its responsibility in preparing and submitting proper Shop Drawings in accordance with the Contract Documents.

3.9.7.5 *Incomplete Submittals.* Any submission, which in Architect’s opinion is incomplete, contains errors, or has been checked superficially, will be returned not reviewed by the Architect for resubmission by the Contractor. Refer to Submittal Procedures of the Specifications for additional information. The Contractor shall be responsible for any related delays and shall not be the basis for any Claim.

3.9.7.6 *Shop Drawings and Submittals Shall Not Be Used as a Method to Make a Substitution.* Shop Drawings and Submittals shall not be used as a means of requesting a substitution or to make changes in the Contract Documents. If changes are made to the Contract Documents through the Shop Drawings, the Architect shall have the right to reject the Submittal. If the Architect does not note the deviation from the approved Plans and Specifications, the Contractor is still responsible for the change and the Architect or the District may require the Shop Drawings be revised to properly reflect the approved Contract Documents. The Architect or District may also require that the Contractor bear all costs under Article 4.5 and consequential damages associated with a CCD to revise Plans and Specifications to accommodate the deviation from approved Plans and Specifications.

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

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3.10 SUBSTITUTIONS

3.10.1 Definition

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

3.10.2 One Product Specified

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

3.10.3 Products Specified Which Are Commercially Unavailable

If the Contractor fails to make a request for substitutions for products, prior to the submission of its bid, and such products subsequently become commercially unavailable, the Contractor may request a substitution for such commercially unavailable item. The decision to grant this request is solely at the District’s discretion. The written approval of the District, consistent with the procedure for Change Orders, shall be required for the use of a proposed substitute material. The District may condition its approval of the substitution upon the delivery to District of an extended warranty or other assurances of adequate performance of the substitution as well as an equitable deduction in the Contract Price should the substituted item cost less than the Specified Item. All risks of delay due the approval of a requested substitution by the DSA, or any other governmental agency having jurisdiction, shall be on the requesting party. All additional costs, DSA review costs, all procurement and construction delays, and all costs for review by the Architect or its consultants shall be the responsibility of the Contractor and will be deducted from Contractor’s pay request.

3.10.4 Substitution Request Form

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

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

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

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

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

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

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

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3.10.5 Substitution Requests After Bid

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

3.11 INTEGRATION OF WORK

3.11.1 Scope

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

3.11.2 Structural Members

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

3.11.3 Subsequent Removal

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

3.12 CLEANING UP

3.12.1 Contractor's Responsibility to Clean Up

Contractor at all times shall keep premises free from debris such as waste, dust, excess water, storm water runoffs, rubbish, and excess materials and equipment. Contractor shall not leave debris under, in, or about the premises, but shall promptly remove same from the

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premises and dispose of it in a lawful manner. Disposal receipts or dump tickets shall be furnished to the Architect within five (5) days of request.

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

3.12.2 General Final Clean-Up

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

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

3.12.3 Special Clean-Up.

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

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

3.12.4 Failure to Cleanup

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

3.13 ACCESS TO WORK

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

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

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

If Contractor has a Subcontractor or supplier that requires in plant or special inspections or inspections or tests that are out of the country, out of the state, or a distance of more than 200 miles from the Project site, the Special Inspector or Inspector shall be provided access so the special inspection or inspection may occur in the remote location. In some cases, the DSA Inspector may also require access in addition to Special Inspectors and individuals performing tests. Inspections/tests shall occur during normal work hours. (See also Article 4.3.6)

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3.14 ROYALTIES AND PATENTS

3.14.1 Payment and Indemnity for Infringement

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

3.14.2 Review

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

3.15 INDEMNIFICATION

3.15.1 Contractor

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

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

3.16 SUBMISSION OF DAILY REPORTS

3.16.1 General

By 10:00 a.m. on the following business day, the Contractor shall submit a Daily Report to the Inspector and copy the Architect for the previous day's Work. If there is a Construction Manager, the original Daily Report is to be provided to the District's Director of

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Planning & Construction, and copies sent to the Architect and the Inspector. Daily Reports shall be prepared on forms approved by the District, together with applicable delivery tickets, listing all labor, materials, and equipment involved for that day. The District reserves the right to note inconsistencies or inaccuracies in the Daily Reports. In such cases, pertinent notes shall be entered by each party to explain points which cannot be resolved that day. Each party shall retain a signed copy of the report. Daily Reports by Subcontractors or others shall be submitted through the Contractor.

3.16.2 Labor

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

3.16.3 Materials

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

3.16.4 Equipment

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

3.16.5 Other Services and Expenditures

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

3.16.6 Failure to Submit Daily Report

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

3.17 AS-BUILT DRAWINGS AND ANNOTATED SPECIFICATIONS

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

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The Contractor will update the As-Built Drawings and Annotated Specifications as often as necessary to keep them current, but no less often than weekly.

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

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

3.17.1 Upon Beneficial Occupancy

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

3.17.2 As-Builts at Completion of Work

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

3.17.3 Log of Control and Survey Documentation

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

3.17.4 Record Coordinates for Key Items

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

3.17.5 BIM As-Built Drawings

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

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3.18 EQUIPMENT MANUALS

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

3.19 DIR REGISTRATION

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

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

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ARTICLE 4 ADMINISTRATION OF THE CONTRACT AND CLAIMS

4.1 ARCHITECT

4.1.1 Replacement of Architect

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

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

4.2.1 Status

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

4.2.2 Site Visits

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

4.2.3 Limitations of Construction Responsibility

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

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CM in the Architect, District or CM's administration of the Contract Documents, or by tests, inspections, or approvals required or performed by persons other than the Contractor.

4.2.4 Communications Facilitating Contract Administration

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

4.2.5 Payment Applications

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

4.2.6 Rejection of Work

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

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

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

4.2.7 Warranties upon Completion

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

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

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

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

4.2.8 Interpretation

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

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4.3 PROJECT INSPECTOR

4.3.1 General

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

4.3.2 Inspector's Duties and DSA Noted Timelines for Inspection

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

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

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

4.3.3 Inspector's Authority to Reject or Stop Work

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

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rejection of any portion of the Work shall not relieve the Contractor from any of its obligations pursuant to the Contract Documents.

4.3.4 Inspector's Facilities

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

4.3.5 Testing Times

The District will provide inspection and testing at its cost during the normal eight (8) hour day Monday through Friday (except holidays). Work by the Contractor outside of the normal eight (8) hour day shall constitute an authorization from the Contractor to the District to provide inspection and testing as required outside of the normal eight (8) hour day. Contractor shall provide adequate time for inspections so as to not delay the Work. An advanced timing protocol may be established pursuant to Article 4.3.2. If the Contractor is behind Schedule then it is incumbent on the Contractor to provide advance forecast through look ahead of the anticipated date for inspection so the Inspector may plan their activities so as to not delay the Project. Contractor shall reimburse District for any additional costs associated with inspection and testing (including re-inspection and re-testing) outside the normal eight-hour day and for any retests caused by the Contractor.

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

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

If Contractor has a Subcontractor or supplier that requires in plant or special inspections, inspections or tests that are out of the country, out of the state or a distance of more than 200 miles from the Project Site, the District shall provide the Special Inspector or individual performing tests time for inspection and testing during normal work hours. Contractor, however, is responsible for the cost of travel, housing, food, out of area premiums that may be in the Inspector/Testing Agreement with District, or other expenses necessary to ensure proper inspection, special inspection or testing is provided by a DSA Certified Inspector, Special Inspector, or individual performing tests. In some cases all three (DSA Inspector, Special Inspector, and Tester) may be required. In addition, if the DSA Certified Inspector, Special Inspector, or individual performing test has contractual travel clauses or special rates for out of

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town inspection, Contractor is responsible for all costs associated with the contractual travel costs in addition to all other costs. Arrangements for inspection and/or testing shall be made far enough in advance so as to not delay the Work.

4.4 STOP WORK ORDER

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

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

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

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

- a. Services made necessary by the default of the Contractor (Article 14 or Article 2.2).
- b. Services made necessary due to the defects or deficiencies in the Work of the Contractor (Article 2.2 and Article 9.6).
- c. Spurious or frivolous RFI's issued that do not conform to the requirements of Article 7.4. Issuance of the same RFI after receiving an answer from the Architect or Engineer
- d. Review of Schedules that are provided by Contractor that do not Conform with the Requirements of Article 8.

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- e. Preparation of a CCD or ICD to correct a Contractor Deficiency, or Contractor Caused Notice of Non-Compliance (See Article 7.3).
- f. Review of Incomplete Shop Drawings or Submittals, including the submission of Piecemeal Shop Drawings or Submittals unless piecemeal Submittals are specifically agreed upon by District (See Article 3.9)
- g. Services required by failure of the Contractor to perform according to any provision of the Contract Documents.
- h. Services in connection with evaluating substitutions of products, materials, equipment, Subcontractors' proposed by the Contractor, and making subsequent revisions to Drawings, Specifications, obtaining DSA approvals, DSA costs for review of CCD's, other governmental agency review costs, and providing other documentation required (except for the situation where the specified item is no longer manufactured or available). (See Article 3.10)
- i. Services for evaluating and processing Claims or Disputes submitted by the Contractor in connection with the Work outside the established Change Order process.
- j. Services required by the failure of the Contractor to prosecute the Work in a timely manner in compliance within the specified time of completion.
- k. Services in conjunction with the testing, adjusting, balancing and start-up of equipment other than the normal amount customarily associated for the type of Work involved.
- l. Services in conjunction with more than one (1) re-review of Submittals of Shop Drawings, Product Data, samples, RFI's etc.

4.6 DISPUTES AND CLAIMS

4.6.1 Decision of Architect

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

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

4.6.2 Architect's Review

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

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

4.6.3 Documentation if Resolved

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

4.6.4 Actions if Not Resolved

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

4.6.5 Architect's Written Decision

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

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

4.6.6 Continuing Contract Performance

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

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

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

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

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

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

4.6.8 Dispute Concerning Extension of Time.

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

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4.6.9 Claims Procedures

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

4.6.9.1 *Procedure Applicable to All Claims*

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

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also be considered null and void by the District. All Claims shall be reviewed pursuant to Articles 4.6.1 through 4.6.5.

The Formal Notification of Claim must be presented as follows:

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

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- (b) Any analysis performed by outside consultants
 - (c) Any legal analysis that Contractor deems relevant
 - f. Break down of all costs associated with the Claim.
 - g. For Claims relating to time extensions, an analysis and supporting documentation evidencing any effect upon the critical path in conformance with the requirements of Article 8.4 chronology of events and related correspondence.
 - h. Applicable Daily Reports and logs.
 - (a) If the Daily Reports or Logs are not available, lost or destroyed, there shall be a presumption that the lost documentation was unfavorable to the Contractor. See California Civil Jury Instruction 204.
 - i. For Claims involving overhead, cost escalation, acceleration, disruption or increased costs, a full version of job costs reports organized by category of work or Schedule of Values with budget information tracked against actual costs. Any and all supporting back-up data, including the original bid (and associated original unaltered metadata).
 - (a) The metadata and bid information shall be provided confidentially and subject to a protective order to prevent dissemination to other contractors or to the public. However, the bid documentation should remain intact and available for review and inspection in case of this type of increased cost Claim.
 - (b) This data on the bid shall be made available to any District attorneys or experts and shall also be utilized as evidence for any legal proceedings.
 - (c) If the bid documentation is not available, lost or destroyed, there shall be a presumption that the lost bid documentation was unfavorable to the Contractor. See California Civil Jury Instruction 204.
- e. Certification: The Contractor (and Subcontractors, if applicable) shall submit with the Claim a certification under penalty of perjury:

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1. That the Contractor has reviewed the Claim and that such Claim is made in good faith;
 2. Supporting data are accurate and complete to the best of the Contractor's knowledge and belief;
 3. The amount requested accurately reflects the amount of compensation for which the Contractor believes the District is liable.
 4. That the Contractor is familiar with Government Code sections 12650 et seq. and Penal Code section 72 and that false claims can lead to substantial fines and/or imprisonment.
- f. Signature of Certification: If the Contractor is not an individual, the certification shall be executed by an officer or general partner of the Contractor having overall responsibility for the conduct of the Contractor's affairs.
- g. Upon receipt of a Claim and all supporting documents as required above, the District shall conduct a reasonable review of the Claim and, within a period not to exceed 45 days, shall provide the Contractor a written statement identifying what portion of the Claim is disputed and what portion is undisputed. Upon receipt of a Claim, the District and Contractor may, by mutual agreement, extend the time period provided in this paragraph.
- h. If the District needs approval from its governing Board to provide the Contractor a written statement identifying the disputed portion and the undisputed portion of the Claim, and the governing Board does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a Claim sent by registered mail or certified mail, return receipt requested, the District shall have up to three days following the next duly publicly noticed meeting of the governing Board after the 45-day period, or extension, expires to provide the Contractor a written statement identifying the disputed portion and the undisputed portion.
- i. Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the District issues its written statement. If the District fails to issue a written statement, paragraph o below shall apply.

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- j. If the Contractor disputes the District's written response, or if the District fails to respond to a Claim issued pursuant to this Article 4.6.9 within the time prescribed, the Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the District shall schedule a meet and confer conference within 30 days for settlement of the Claim.
- k. Within 10 business days following the conclusion of the meet and confer conference, if the Claim or any portion of the Claim remains in dispute, the District shall provide the Contractor a written statement identifying the portion of the Claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the District issues its written statement. Any disputed portion of the Claim, as identified by the Contractor in writing, shall be submitted to nonbinding mediation, with the District and the Contractor sharing the associated costs equally. The District and Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the Claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the Claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the Claim remaining in dispute shall be subject to applicable procedures in Article 4.6.9.5.
- l. For purposes of this Article 4.6.9, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.
- m. Unless otherwise agreed to by the District and the Contractor in writing, the mediation conducted pursuant to this Article 4.6.9 shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.
- n. This Claims process does not preclude the District from requiring arbitration of disputes under private arbitration or the Public Works

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Contract Arbitration Program, if mediation under this Article 4.6.9 does not resolve the parties' Claim. This Claims process does not preclude the District from submitting individual Disputes or Claims to binding arbitration pursuant to Article 4.6.9.4 below.

- o. Failure by the District to respond to a Claim from the Contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this Article 4.6.9 shall result in the Claim being deemed rejected in its entirety. A Claim that is denied by reason of the District's failure to have responded to a Claim, or its failure to otherwise meet the time requirements of this Article 4.6.9, shall not constitute an adverse finding with regard to the merits of the Claim or the responsibility or qualifications of the Contractor.
- p. If a subcontractor or a lower tier subcontractor lacks legal standing to assert a Claim against a District because privity of contract does not exist, the Contractor may present to the District a Claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the Contractor present a Claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the Claim be presented to the District shall furnish reasonable documentation to support the Claim. Within 45 days of receipt of this written request, the Contractor shall notify the subcontractor in writing as to whether the Contractor presented the Claim to the District and, if the Contractor did not present the Claim, provide the subcontractor with a statement of the reasons for not having done so.
- q. Upon receipt of a Claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable.
- r. The Contractor's Claim shall be denied if it fails to follow the requirements of this Article.

4.6.9.2 *District (through CM or District's Agent or Attorney) May Request Additional Information.* Within thirty (30) days of receipt of the Claim and the information under this Article, the District may request in writing any additional documentation supporting the Claim or documentation relating to defenses to the Claim which the District may assert. If additional documents are required, the time in which the Claim is evaluated may be extended by a reasonable time so the Claim and additional documents may be reviewed.

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4.6.9.3 *Claims Procedures in Addition to Government Code Claim.* Nothing in the Claims procedures set forth in this Article 4 of the General Conditions shall act to waive or relieve the Contractor from meeting the requirements set forth in Government Code section 900 et seq.

4.6.9.4 *Binding Arbitration of Individual Claim Issues.* To expedite resolution of Claims pursuant to Public Contract Code section 9201, at the District's sole option, the District may submit individual Claims to Arbitration prior to Retention Payment consistent with the requirements of Article 4.6.6.1.

4.6.9.5 *Resolution of Claims in Court of Competent Jurisdiction.* If Claims are not resolved under the procedure set forth and pursuant to Article 4.6.9, such Claim or controversy shall be submitted to a court in the County of the location of the Project after the Project has been completed, and not before.

4.6.9.6 *Warranties, Guarantees and Obligations.* The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon Contractor by the General Conditions and amendments thereto; and all of the rights and remedies available to District and Architect thereunder, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by laws or regulations by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this Article will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

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ARTICLE 5 SUBCONTRACTORS

5.1 DEFINITIONS

5.1.1 Subcontractual Relations Bound to Same Contract Terms at General Contractor

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

5.1.2 Subcontractor Licenses and DIR Registration

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

5.1.3 Substitution of Subcontractor

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

5.1.4 Contingent Assignment of Subcontracts and Other Contracts

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

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- a. Such assignment is effective only after Termination of this Contract with the Contractor by the District as provided under Article 14 and only for those subcontracts and other contracts and agreements that the District accepts by notifying the Subcontractor or Materialman (as may be applicable) in writing; and
- b. Such assignment is subject to the prior rights of the Surety(ies) obligated under the Payment Bond and Performance Bond.
- c. The Contractor shall include adequate provisions for this contingent assignment of subcontracts and other contracts and agreements in each such document.

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ARTICLE 6 CONSTRUCTION BY DISTRICT OR BY SEPARATE CONTRACTORS

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

6.1.1 Separate Contracts.

6.1.1.1 District reserves the right to let other contracts in connection with this Work. Contractor shall afford other contractors reasonable opportunity for (1) introduction and storage of their materials; (2) access to the Work; and (3) execution of their work. Contractor shall properly connect and coordinate its work with that of other Contractors.

6.1.1.2 If any part of Contractor's Work depends on proper execution or results of any other contractor, the Contractor shall inspect and within seven (7) days or less, report to Architect, in writing, any defects in such work that render it unsuitable for proper execution of Contractor's Work. Contractor will be held accountable for damages to District for that Work which it failed to inspect or should have inspected. Contractor's failure to inspect and report shall constitute its acceptance of other contractors' Work as fit and proper for reception of its Work, except as to defects which may develop in other contractors' work after execution of Contractor's work.

6.1.1.3 To ensure proper execution of its subsequent Work, Contractor shall measure and inspect Work already in place and shall at once report to the Architect in writing any discrepancy between executed Work as built and the Contract Documents.

6.1.1.4 Contractor shall ascertain to its own satisfaction the scope of the Project and nature of any other contracts that have been or may be awarded by District in prosecution of the Project and the potential impact of such Work on the Baseline Schedule or Schedule updates.

6.1.1.5 Nothing herein contained shall be interpreted as granting to Contractor the exclusive occupancy at the site of Project. Contractor shall not cause any unnecessary hindrance or delay to any other contractor working on the Project Site. If execution of any contract by the District is likely to cause interference with Contractor's performance of this Contract, once Contractor provides District timely written notice and identifies the Schedule Conflict, District shall decide which contractor shall cease work temporarily and which contractor shall continue, or whether Work can be coordinated so that contractors may proceed simultaneously.

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

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

6.1.2 District's Right to Carry Out the Work

(See Article 2.2)

6.1.3 Designation as Contractor

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

6.1.4 District Notice to the Contractor of Other Contractors

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

- a. Notice is provided in the Contract Documents of other scope of Work,
- b. In the case where there is known Work to be performed by other Contractors
- c. For outside contractors hired by utilities
- d. Where the Contract Document provides "Work by Others" or "By Others"
- e. Where specifically noted during the Pre-Bid Conference
- f. Where specifically noted in the Mandatory Job Walk

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- g. By CO or ICD,
- h. With respect to the installation of:
 - 1. Furniture,
 - 2. Electronics and networking equipment,
 - 3. Cabling,
 - 4. Low voltage,
 - 5. Off-site work,
 - 6. Grading (when by a separate contractor),
 - 7. Environmental remediation when excluded by the Contract Documents (i.e. asbestos, lead or other hazardous waste removal)
 - 8. Deep cleaning crews,
 - 9. Commissioning and testing,
 - 10. Keying and re-keying,
 - 11. Programming

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

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

6.2 CONSTRUCTIVE OWNERSHIP OF PROJECT SITE AND MATERIAL

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

6.3 DISTRICT’S RIGHT TO CLEAN UP

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

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ARTICLE 7 CHANGES IN THE WORK

7.1 CHANGES

7.1.1 No Changes Without Authorization

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

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

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

7.1.2 Notices of Non-Compliance

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Contractor deviation or changes from approved Plans and Specifications may result in the issuance of a Notice of Non-Compliance (See DSA Form 154). Contractor is specifically notified that deviations from the Plans and Specifications, whether major or minor, may result in the requirement to obtain a DSA Construction Change Document to correct the Notice of Non-Compliance. (See Article 7.3.1 for Definition of CCD). In some cases, the lack of a DSA approved CCD AND verification from the Inspector that a Notice of Non-Compliance has been corrected may result in a critical path delay to the next stage of Work on the Project. Specifically, a deviation from approved Plans and Specifications may prevent approval of the category of Work listed in the DSA 152 Project Inspection Card. Any delays that are caused by the Contractor's deviation from approved Plans and Specifications shall be the Contractor's responsibility.

7.1.3 Architect Authority

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

7.2 CHANGE ORDERS ("CO")

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

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

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

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

7.3.1 Definitions

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

7.3.1.2 *Immediate Change Directive (ICD)*. An Immediate Change Directive is a written order to the Contractor prepared by the Architect and signed by the District (and CM if

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there is a CM on the Project) and the Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. The District may by ICD, without invalidating the Contract, direct immediate changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions within. If applicable, the Contract Sum and Contract Time will be adjusted accordingly.

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

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

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

7.3.2 Use to Direct Change

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

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

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

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

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

7.3.3.2 *Exception in the Case of DSA Issued Stop Work Order.* Contractor must proceed with an ICD even if a CCD has not been approved by DSA except in the case of a DSA issued Stop Work Order. If a DSA Stop Work Order is issued, Contractor must stop work and wait further direction from the District.

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

7.4 REQUEST FOR INFORMATION (“RFI”)

7.4.1 Definition

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

7.4.1.1 A RFI shall not be used as a vehicle to generate time extensions.

7.4.1.2 Resubmission of the same or similar RFI is not acceptable. RFI’s that are similar should be addressed in Project meetings where the requestor (Contractor, Subcontractor or vendor) is able to address the particular issue with the Architect or Engineer and a resolution addressed in the minutes.

7.4.1.3 A RFI response applicable to a specific area cannot be extended to other situations unless specifically addressed in writing within the RFI or in a separate RFI.

7.4.1.4 RFI’s should provide a proposed solution and should adequately describe the problem that has arisen.

7.4.2 Scope

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

7.4.3 Response Time

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

7.4.4 Costs Incurred

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

7.5 REQUEST FOR PROPOSAL ("RFP")

7.5.1 Definition

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

7.5.2 Scope

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

7.5.3 Response Time

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

7.6 CHANGE ORDER REQUEST ("COR")

7.6.1 Definition

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

7.6.2 Changes in Price

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

7.6.3 Changes in Time

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

7.7 COST OF CHANGE ORDERS

7.7.1 Scope

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

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

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

7.7.2 Determination of Cost

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

- a. Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation. If an agreement cannot be reached within fifteen (15) days after submission and negotiation of Contractor's proposal, Contractor may submit pursuant to Article 7.7.3. Submission of sums which have no basis in fact are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650 et seq.);
 1. If the District objects to 7.7.2(a) as a method for submission due to inaccuracies in the submitted amount, overstatement of manpower or time required to perform the CO, or unreliability of the data provided, the District may either have the Architect or a professional estimator determine the cost for the CO, and the applicable time extension, or the Contractor shall utilize Article 7.7.2(d) or 7.7.3.
 2. Once the District provides a written objection to use of Article 7.7.2(a) due to unreliability of the estimated price, the Contractor shall no longer utilize mutual acceptance of a lump sum as a method for submission of CO's and shall provide a breakdown of estimated or actual costs pursuant to Article 7.7.2(d) or 7.7.3
- b. By unit prices contained in Contractor's original bid and incorporated in the Project documents or fixed by subsequent agreement between District and Contractor;
- c. Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee. However, in the case of disagreement, Contractor must utilize the procedure under Article 7.7.3; or
- d. By cost of material and labor and percentage of overhead and profit. If the value is determined by this method the following requirements shall apply:
 1. *Basis for Establishing Costs*
 - (1) Labor will be the cost for wages prevailing locally for each craft or type of workers at the time the extra Work is done, plus employer payments of payroll taxes and workers compensation insurance (exclude insurance costs as part of the overhead and profit mark-up), health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State, or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. In no case shall the total labor costs

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exceed the applicable prevailing wage rate for that particular classification. The use of a labor classification which would increase the extra Work cost will not be permitted unless the Contractor establishes the necessity for such additional costs. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.

- (2) Materials shall be at invoice or lowest current price at which such materials are locally available and delivered to the Site in the quantities involved, plus sales tax, freight, and delivery. The District reserves the right to approve materials and sources of supply or to supply materials to the Contractor if necessary for the progress of the Work. No markup shall be applied to any material provided by the District.
- (3) Tool and Equipment Rental. No payment will be made for the use of tools which have a replacement value of \$250 or less.

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

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

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

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

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

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

7.7.3 Format for COR or CO’s

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

	<u>EXTRA</u>	<u>CREDIT</u>
(a) Material (attach itemized quantity and unit cost plus sales tax)	_____	_____
(b) Labor Not to Exceed Applicable Prevailing Wage Rates (attach itemized hours and rates)	_____	_____
(c) Equipment (attach invoices)	_____	_____
(d) Subtotal	_____	_____

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		<u>EXTRA</u>	<u>CREDIT</u>
(e)	If Subcontractor performed work, add Subcontractor's overhead and profit to portions performed by Subcontractor, not to exceed 10% of item (d).		
(f)	Subtotal		
(g)	Contractor's Overhead and Profit: Not to exceed 10% of Item (d) if Contractor performed the work. No more than 5% of Item (d) if Subcontractor performed the work. If work was performed by Contractor and Subcontractors, portions performed by Contractor shall not exceed 10% of Item (d), and portions performed by Subcontractor shall not exceed 10% of Item (d).		
(h)	Subtotal		
(i)	Bond not to exceed one percent (1%) of Item (h)		
(k)	TOTAL		
(l)	Time/ Days		

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

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

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

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

7.7.4 Deductive Change Orders

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

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

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

7.7.5 Discounts, Rebates, and Refunds

For purposes of determining the cost, if any, of any change, addition, or omission to the Work hereunder, all trade discounts, rebates, refunds, and all returns from the sale of surplus materials and equipment shall accrue and be credited to the Contractor, and the Contractor shall make provisions so that such discounts, rebates, refunds, and returns may be secured, and the amount thereof shall be allowed as a reduction of the Contractor's cost in determining the actual cost of construction for purposes of any change, addition, or omissions in the Work as provided herein. All CO's are subject to Audit under Article 13.11 for discounts, rebates and refunds.

7.7.6 Accounting Records

With respect to portions of the Work performed by CO's and CCD's on a time-and-materials, unit-cost, or similar basis, the Contractor shall keep and maintain cost-accounting records in a format consistent with accepted accounting standards and satisfactory to the District,

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which shall be available to the District on the same terms as any other books and records the Contractor is required to maintain under the Contract Documents.

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

7.7.7 Notice Required

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

7.7.8 Applicability to Subcontractors

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

7.7.9 Alteration to Change Order Language

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

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ARTICLE 8 TIME AND SCHEDULE

8.1 DEFINITIONS

8.1.1 Contract Time

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

8.1.2 Notice to Proceed

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

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

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

8.1.3 Computation of Time

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

8.1.4 Float

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

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

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

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

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

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

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

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

8.2 HOURS OF WORK

8.2.1 Sufficient Forces

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

8.2.2 Performance During Working Hours

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

8.2.3 Costs for After Hours Inspections

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

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

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

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8.3 PROGRESS AND COMPLETION

8.3.1 Time of the Essence

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

8.3.2 Baseline Schedule Requirements

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

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

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

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

8.3.2.5 *Float Must Be Incorporated.* The Baseline Schedule must indicate the beginning and completion of all phases of construction and shall use the "critical path method" (commonly called CPM) for the value reporting, planning and scheduling, of all Work required under the Contract Documents. The Baseline Schedule must incorporate all Milestones in the Project and apply Governmental Float at each Milestone in the Contractor's discretion. The Baseline Schedule shall incorporate any Schedule provided by the District as part of the bid and shall note durations that will not be adequate or should be shortened based on Contractor's review. These changes shall be identified and incorporated into Contractor's Baseline Schedule as long as requested changes are made within 10 days after the District chooses to move forward with the Project. Scheduling is necessary for the District's adequate monitoring of the progress of the Work and shall be prepared in accordance with the time frame described in this Article 8. The Architect may disapprove of any Schedule or require modification to it if, in the opinion of the Architect or

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District, adherence to the any Schedule prepared by the Contractor will not cause the Work to be completed in accordance with the Agreement.

8.3.2.6 *No Early Completion.* Contractor shall not submit any Schedule showing early completion without indicating float time through the date set for Project completion by District. Contractor's Baseline Schedule shall account for all days past early completion as float which belongs to the Project. Usage of float shall not entitle Contractor to any delay Claim or damages due to delay.

8.3.2.7 *Use of Schedule Provided in Bid Documents.* In some cases, the bid will include a preliminary schedule indicating Milestones and construction sequences for the Project along with general timing for the Project. The preliminary schedule is not intended to serve as the Baseline Schedule utilized for construction. It is up to the Contractor to study and develop a Baseline Schedule to address the actual durations and sequences of Work that is anticipated while maintaining the Milestones provided by the District. Contract shall obtain information from Contractor's Subcontractors and vendors on the planning, progress, delivery of equipment, coordination, and timing of availability of Subcontractors so a practical plan of Work is fully developed and represented in the Baseline Schedule.

8.3.2.8 *Incorrect Logic, Durations, Sequences, or Critical Path.* The District may reject or indicate durations, sequences, critical path or logic are not acceptable and request changes. The electronic copy of the Baseline Schedule shall have adequate information so logic ties, duration, sequences and critical path may be reviewed electronically. Contractor is to diligently rebuild and resubmit the Baseline Schedule to represent the Contractor's plan to complete the Work and maintain Milestones at the next progress meeting, or before the next progress meeting. If Contractor is not able to build a Baseline Schedule that is acceptable to the District or Architect, the District reserves the right to utilize the unapproved originally submitted Baseline Schedule (See Article 8.3.2.12) and the comments submitted to hold Contractor accountable for timely delivery of Work and maintenance of Milestones. Furthermore, Contractor's representations in the Baseline Schedule, if unacceptable, may also be used as a basis for termination of the Contract under Article 14 if Contractor fails to adequately maintain the Schedule and falls significantly behind without undertaking the efforts to either submit and follow a Recovery Schedule or fail to submit a Recovery Schedule and make no effort toward recovery on the Project.

8.3.2.9 *Contractor Responsibility Even if Schedule Issues Are Not Discovered.* Failure on the Part of the District to discover errors or omissions in any Schedules submitted shall not be construed to be an approval of the error or omission and any flawed Schedule is not grounds for a time extension.

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

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

8.3.2.10 *Failure to include Mandatory Schedule Items.* District may withhold payment pursuant to Articles 9.3, 9.4 and 9.6. In lieu of withholding payment for failure to include Mandatory Schedule Items, after the District or Architect has notified the Contractor of failure to meet the Baseline Schedule or Updated Schedule requirements and provided a written notification of this failure and provided a written notice of Schedule preparation errors, and the Contractor fails to correct the noted deficiencies or the Contractor does not provide an updated Baseline Schedule correcting the deficiencies, then Contractor shall not be granted an extension of time for failure to obtain necessary items and approvals under Article 8.3.2 and for the time required for failure to comply with laws, building codes, and other regulations (including Title 24 of the California Code of Regulations). Contractor shall maintain all required Article 8.3.2 Schedule items in the Baseline Schedule and indicate any days that have been used as allowed in Article 8. If Contractor fails to include all Article 8.3.2 items in its Baseline Schedule or Schedule Updates and the District either utilizes an Unapproved Schedule under Article 8.3.2.12 or does not object to the inclusion of required scheduling items, then all mandatory Schedule inclusions, including float, shall be utilized in the District's discretion. If the Contract Time is exceeded, then Contractor shall be subject to the assessment of Liquidated Damages pursuant to Article 8.4.

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8.3.2.11 *Failure to Meet Requirements.* Failure of the Contractor to provide proper Schedules as required by this Article and Article 9 is a material breach of the Contract and grounds for Termination pursuant to Article 14. The District, at its sole discretion, may choose, instead, to withhold, in whole or in part, any Progress Payments or Retention amounts otherwise payable to the Contractor.

8.3.2.12 *Use of an Unapproved Baseline Schedule.* If the Baseline Schedule submitted by the Contractor is unacceptable to the District (i.e. failing to meet the requirements of Article 8.3.2) and Contractor does not incorporate or address the written comments to the Baseline Schedule and a Baseline Schedule is not approved, but due to extreme necessity, the District moves forward without an approved Baseline Schedule, Contractor shall diligently revise and meet Schedule update requirements of Article 8 and incorporate all Article 8.3.2 comments in all updates). However, for purposes of Termination pursuant to Article 14, the unapproved Baseline Schedule initially submitted shall be treated as the Baseline Schedule with durations shortened or revised to accommodate all float, all mandatory Schedule requirements under Article 8.3.2, any requirements in the Contract Documents, and all revisions by the District or Architect.

8.3.3 Update Schedules

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

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

8.3.3.2 *Schedule Updates.* Contractor shall update the approved Schedule each month to address actual start dates and durations, the percent complete on activities, actual completion dates, estimated remaining duration for the Work in progress, estimated start dates for Work scheduled to start at future times and changes in duration of Work items

8.3.3.3 *Listing of Items Causing Delays.* Schedule updates shall provide a listing of activities which are causing delay in the progress of Work and a narrative shall be provided showing a description of problem areas, anticipated delays, and impacts on the Construction Schedule. Simply stating "District Delay" or "Architect Delay" shall be an inadequate listing. Delays shall only be listed if they meet the requirements of Article 8.4.

8.3.3.4 *Recovery Schedule.* In addition to providing a schedule update every thirty (30) days, the Contractor, if requested by the Architect or District, shall take the steps necessary to improve Contractor's progress and demonstrate to the District and Architect that the Contractor has seriously considered how the lost time, the Completion Date, or the Milestones that

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are required to be met within the terms of the Contract. Contractor shall immediately provide a Recovery Schedule showing how Milestones and the Completion Date will be met. In no case, shall a Recovery Schedule be provided later than ten (10) days following the request for a Recovery Schedule from the Architect or District.

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

8.4 EXTENSIONS OF TIME - LIQUIDATED DAMAGES

8.4.1 Liquidated Damages

CONTRACTOR AND DISTRICT HEREBY AGREE THAT THE EXACT AMOUNT OF DAMAGES FOR FAILURE TO COMPLETE THE WORK WITHIN THE TIME SPECIFIED IS EXTREMELY DIFFICULT OR IMPOSSIBLE TO DETERMINE. IF THE WORK IS NOT SUBSTANTIALLY COMPLETED IN THE TIME SET FORTH IN THE AGREEMENT, IT IS UNDERSTOOD THAT THE DISTRICT WILL SUFFER DAMAGES. IT BEING IMPRACTICAL AND UNFEASIBLE TO DETERMINE THE AMOUNT OF ACTUAL DAMAGE, IT IS AGREED THE CONTRACTOR SHALL PAY TO THE DISTRICT THE AMOUNT LIQUIDATED DAMAGES SET FORTH IN THE AGREEMENT, FOR EACH CALENDAR DAY OF DELAY IN REACHING SUBSTANTIAL COMPLETION (SEE ARTICLE 1.1.46). CONTRACTOR AND ITS SURETY SHALL BE LIABLE FOR THE AMOUNT THEREOF PURSUANT TO GOVERNMENT CODE SECTION 53069.85.

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8.4.2 Delay

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

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

8.4.3 Excusable Delay

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

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

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

8.4.3.3 *Extension Request.* In the event the Contractor requests an extension of Contract time for unavoidable delay, such request shall be submitted in accordance with the provisions in the Contract Documents governing changes in Work (See Article 7). When requesting time, i.e., extensions, for proposed Change Orders, they must be submitted with the proposed Change Order with full justification and documentation. If the Contractor fails to submit justification with the proposed Change Order it waives its right to a time extension at a later date. Such justification must be based on the official Contract schedule as updated at the time of occurrence of the delay or execution of Work related to any changes to the scope of Work. Blanket or general claims for extra days without specific detailed information as required herein or a

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blanket or general reservation of rights do not fulfill the requirements of this Article and shall be denied. The justification must include, but is not limited to, the following information:

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

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

8.4.4 Notice by Contractor Required

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

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

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

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

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

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

8.4.6 District Right to Accelerate the Work

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

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

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

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ARTICLE 9 PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

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

9.2 COST BREAKDOWN

9.2.1 Required Information

Contractor shall furnish the following:

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

9.2.2 Information and Preparation of Schedule of Values

9.2.2.1 *Break Down of Schedule of Values.* Schedule of Values shall be broken down by Project, site, building, Milestone, or other meaningful method to measure the level of Project Completion as determined by the District.

9.2.2.2 *Based on Contractor Bid Costs.* The Schedule of Values shall be based on the costs from Contractor's bid to the District. However, the submission of the Schedule of Values shall not be front loaded so the Contractor is paid a greater value than the value of the Work actually performed and shall not shift funds from parts of the Project that are later to Work that is performed earlier.

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9.2.2.3 Largest Dollar Value for Each Line Item. Identify Subcontractors and materials suppliers proposed to provide portions of Work equal to or greater than ten thousand dollars (\$10,000) or one-half of one percent (0.5%) of their Contract Price, whichever is less.

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

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

9.2.3 District Approval Required

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

9.3 PROGRESS PAYMENTS

9.3.1 Payments to Contractor

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

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

Notwithstanding anything to the contrary stated above, the Contractor may include in its Request for Payment the value of any structural steel, glue laminated beams, trusses,

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bleachers and other such custom-made materials prepared specifically for the Project and unique to the Project so long as all of the following requirements are satisfied:

- a. The aggregate cost of materials stored off-site shall not exceed Twenty Five Thousand Dollars (\$25,000) at any time or as otherwise agreed to be District in writing;
- b. Title to such materials shall be vested in the District as evidenced by documentation satisfactory in form and substance to the District, including, without limitation, recorded financing statements, UCC filings and UCC searches;
- c. With each Contractor Request for Payment, the Contractor shall submit to the District a written list identifying each location where materials are stored off-site (which must be a bonded warehouse) and the value of the materials at each location. The Contractor shall procure insurance satisfactory to the District (in its reasonable discretion) for materials stored off-site in an amount not less than the total value thereof;
- d. The consent of any Surety shall be obtained to the extent required prior to payment for any materials stored off-site;
- e. Representatives of the District shall have the right to make inspections of the storage areas at any time; and
- f. Such materials shall be: (1) protected from diversion, destruction, theft and damage to the reasonable satisfaction of the District; (2) specifically marked for use on the Project; and (3) segregated from other materials at the storage facility.

9.3.2 Purchase of Materials and Equipment and Cost Fluctuations

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

9.3.3 No Waiver

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

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

Notwithstanding any payment, the District may enforce each and every provision of this Contract which includes, but is not limited to, the Performance Bond and Payment Bond. The District may correct any error subsequent to any payment. In no event shall the Contractor or the Surety be released or exonerated from performance under this Contract when the District overpays the Contractor based upon any mistake, inaccuracy, error or falsification in any estimate that is included in any Request for Payment.

9.3.4 Issuance of Certificate of Payment

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

9.3.5 Payment of Undisputed Contract Payments

In accordance with Public Contract Code section 7100, payments by the District to the Contractor for any and all undisputed amounts (including all Progress Payments, Final Payments or Retention Payment) is contingent upon submission of a proper and accurate Payment Application and the Contractor furnishing the District with a release of all Claims against the

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District related to such undisputed amounts. Disputed Contract Claims in stated amounts may be specifically excluded by the Contractor from the operation of the release. If, however, the Contractor specifically excludes any Claims, the Contractor shall provide details such as a specific number of disputed days or costs of any such exclusion in accordance with Articles 4.6 and 7.7.

9.4 APPLICATIONS FOR PROGRESS PAYMENTS

9.4.1 Procedure

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

1. The amount paid to the date of the Payment Application to the Contractor, to all its Subcontractors, and all others furnishing labor, material, or equipment for its Contract;
2. The amount being requested under the Payment Application by the Contractor on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract;
3. The balance that will be due to each of such entities after said payment is made;
4. A certification that the As-Built Drawings and Annotated Specifications are current;
5. Itemized breakdown of Work done for the purpose of requesting partial payment;
6. An updated or approved Baseline Schedule or other Schedule updates in conformance with Article 8;
7. Failure to submit an updated Schedule for the month or any previous month;
8. The additions to and subtractions from the Contract Price and Contract Time;
9. A summary of the Retention held;
10. Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the District may require from time to time;

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11. The percentage of completion of the Contractor's Work by line item;
12. An updated Schedule of Values from the preceding Application for Payment;
13. Prerequisites for Progress Payments; and
14. Any other information or documents reasonably requested by the District, Architect, Inspector or CM (if applicable).

9.4.1.2 *First Payment Request.* The following items, if applicable, must be completed before the first payment request will be accepted for processing:

1. Installation of the Project sign;
2. Receipt by Architect of Submittals;
3. Installation of field office;
4. Installation of temporary facilities and fencing;
5. Submission of documents listed in the Article 9.2 relating to Contract Price breakdown;
6. Preliminary schedule analysis, due within 10 days after Notice to Proceed;
7. Contractor's Baseline Schedule (to be CPM based in conformance with Article 8);
8. Schedule of unit prices, if applicable;
9. Submittal Schedule;
10. Copies of necessary permits;
11. Copies of authorizations and licenses from governing authorities;
12. Initial progress report;
13. Surveyor qualifications;
14. Written acceptance of District's survey of rough grading, if applicable;
15. List of all Subcontractors, with names, license numbers, telephone numbers, and scope of work;

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16. All bonds and insurance endorsements; and
17. Resumes of General Contractor's Project Manager, and if applicable, job site secretary, record documents recorder, and job site Superintendent.

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

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

9.4.1.5 *Final Payment Application (90% or 95%).* See Article 9.11.1

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

9.5 STOP NOTICE CLAIMS AND WARRANTY OF TITLE

The Contractor warrants title to all Work. The Contractor further warrants that all Work is free and clear of liens, claims, security interests, stop notices, or encumbrances in favor of the Contractor, Subcontractors, material and equipment suppliers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work. Failure to keep work free of liens, stop notices, claims, security interests or encumbrances is grounds to make a claim against Contractor's Payment and Performance Bond to immediately remedy and defend.

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

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

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9.6 DECISIONS TO WITHHOLD PAYMENT

9.6.1 Reasons to Withhold Payment

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

- a. Defective Work not remedied;
- b. Stop notices served upon the District;
- c. Liquidated Damages assessed against the Contractor;
- d. The cost of Completion of the Contract if there exists reasonable doubt that the Work can be Completed for the unpaid balance of any Contract Price or by the completion date;
- e. Damage to the District or other contractor;
- f. Unsatisfactory prosecution of the Work by the Contractor;
- g. Failure to store and properly secure materials;
- h. Failure of the Contractor to submit on a timely basis, proper and sufficient documentation required by the Contract Documents, including, without limitation, acceptable monthly progress schedules, Shop Drawings, Submittal schedules, Schedule of Values, Product Data and samples, proposed product lists, executed Change Order, Construction Change Documents, and verified reports;
- i. Failure of the Contractor to maintain As-Built Drawings;
- j. Erroneous estimates by the Contractor of the value of the Work performed, or other false statements in an Payment Application;
- k. Unauthorized deviations from the Contract Documents (including but not limited to Unresolved Notices of Deviations (DSA Form 154));
- l. Failure of the Contractor to prosecute the Work in a timely manner in compliance with established progress schedules and completion dates.
- m. Failure to properly pay prevailing wages as defined in Labor Code section 1720, et seq.;
- n. Failure to properly maintain or clean up the Site;

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- o. Payments to indemnify, defend, or hold harmless the District;
- p. Any payments due to the District including but not limited to payments for failed tests, or utilities changes or permits;
- q. Failure to submit an acceptable Baseline Schedule or any Schedule or Schedule update in accordance with Article 8;
- r. Failure to pay Subcontractor or suppliers as required by Article 9.8.1
- s. Failure to secure warranties, including the cost to pay for warranties;
- t. Failure to provide releases from material suppliers or Subcontractors when requested to do so;
- u. Items deducted pursuant to Article 2.2;
- v. Incomplete Punch List items under Article 9.9.1.1 which have gone through the Article 2.2 process; or
- w. Allowances that have not been used.

9.6.2 Reallocation of Withheld Amounts

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

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

9.6.3 Payment After Cure

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

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9.7 NONCONFORMING WORK

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

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

9.8 SUBCONTRACTOR PAYMENTS

9.8.1 Payments to Subcontractors

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

9.8.2 No Obligation of District for Subcontractor Payment

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

9.8.3 Payment Not Constituting Approval or Acceptance

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

9.8.4 Joint Checks

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

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joint checks, so the ability to issue joint checks depends on the school district and the specific circumstances.

9.9 COMPLETION OF THE WORK

9.9.1 Close-Out Procedures

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

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

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

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

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

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a valued Punch List to the Contractor and withhold up to 150% of the value of the Punch List Work pursuant to Article 2.2 of this Agreement.

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

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

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

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

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

9.9.2 Close-Out Requirements for Final Completion of the Project

- a. Utility Connections. Buildings shall be connected to water, gas, sewer, and electric services, complete and ready for use. Service connections shall be made and existing services reconnected
- b. As-Builts Up to Date and Complete. The intent of this procedure is to obtain an exact "As-Built" record of the Work upon completion of the project. The following information shall be carefully and correctly drawn on the prints and all items shall be accurately located and dimensioned from finished surfaces of building walls on all As-Built Drawings
 1. The exact location and elevations of all covered utilities, including valves, cleanouts, etc. must be shown on As-Built Drawings
 2. Contractor is liable and responsible for inaccuracies in As-Built Drawings, even though they become evident at some future date.
 3. Upon completion of the Work and as a condition precedent to approval of Retention Payment, Contractor shall obtain the Inspector's approval of the "As-Built" information. When completed, Contractor shall deliver corrected sepias and/or a Diskette with an electronic file in a format acceptable to the District.
 4. District may withhold the cost to hire a draftsman and potholing and testing service to complete Record As-Built Drawings at substantial cost if the Contractor does not deliver a complete set of Record As-Built Drawings. This shall result in withholding of between \$10,000

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to \$20,000 per building that does not have a corresponding Record As Built Drawing.

- c. Any Work not installed as originally indicated on Drawings
- d. All DSA Close-Out requirements (See DSA Certification Guide) Contractor is also specifically directed to Item 3.2 in the DSA Certification Guide and the applicable certificates for the DSA-311 form.
- e. Submission of Form 6-C. Contractor shall be required to execute a Form 6-C as required under Title 24 Sections 4-343. The Contractor understands that the filing with DSA of a Form 6-C is a requirement to obtain final DSA Approval of the construction by Contractor and utilized to verify under penalty of perjury that the Work performed by Contractor complies with the DSA approved Contract Documents. The failure to file a DSA Form 6C has two consequences. First, the Construction of the Project will not comply with the design immunity provisions of Government Code section 830.6 and exposes the District and the individual Board members to personal liability for injuries that occur on the Project.

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

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

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

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12. Finished and decorative work shall have marks, dirt and superfluous labels removed;
13. Final cleanup, as in Article 3.12;
14. All Work pursuant to Article 9.11.2; and
15. Furnish a letter to District stating that the District's Representative or other designated person or persons have been instructed in working characteristics of mechanical and electrical equipment.

9.9.3 Costs of Multiple Inspections

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

9.10 PARTIAL OCCUPANCY OR USE

9.10.1 District's Rights

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

9.10.2 Inspection Prior to Occupancy or Use

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

9.10.3 No Waiver

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

9.11 COMPLETION AND FINAL PAYMENT

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

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

- a. Inspector sign-off of each item in the DSA 152 Project Inspection Card;
- b. The Project has reached the Punch List items under Article 9.9.1.2 and the Project has been determined to be Substantially Complete under Article 1.1.46;
- c. Removal of temporary facilities and services;
- d. Testing, adjusting and balance records are complete;
- e. Removal of surplus materials, rubbish, and similar elements;
- f. Changeover of door locks;
- g. Deductive items pursuant to Article 9.6 and Article 2.2; and
- h. Completion and submission of all final Change Orders for the Project.

9.11.2 Final Inspection (Punch List Completion)

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

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

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

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

9.11.3 Retainage (100% Billing for the Entire Project)

The retainage, less any amounts disputed by the District or which the District has the right to withhold pursuant to the Contract Documents (including but not limited to incomplete Punch List items under Article 9.9.1), shall be paid after approval by the District of the Application for Retention Payment, after the satisfaction of the conditions set forth in Article 9, the Final Inspection under Article 9.11.2 is completed, and after thirty-five (35) days after the acceptance of the Work and recording of the Notice of Completion by District. No interest shall be paid on any retainage, or on any amounts withheld due to a failure of the Contractor to perform, in accordance with the terms and conditions of the Contract Documents, except as provided to the contrary in any escrow agreement between the District and the Contractor.

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

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7. The Contractor shall have completed final clean up as required by Article 3.12
8. Contractor shall have all deductive items under Article 9.6 and Article 2.2 submitted as part of the Retention Payment.

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

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

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

9.11.5 Warranties

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

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

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

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

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on the Final Payment Application to address the Article 9.6 deductive items or process a unilateral Final Payment Application.

9.11.7 Unilateral Release of Retention

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

9.12 SUBSTITUTION OF SECURITIES

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

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ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 Contractor Responsibility

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

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

10.1.2 Subcontractor Responsibility

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

10.1.3 Cooperation

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

10.1.4 Accident Reports

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

10.1.5 First-Aid Supplies at Site

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

10.1.6 Material Safety Data Sheets and Compliance with Proposition 65

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

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

10.1.7 Non-Utilization of Asbestos Material

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

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

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

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

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

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

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

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

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

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor

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

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

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

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10.2.2 Contractor Notices

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

10.2.3 Safety Barriers and Safeguards

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

10.2.4 Use or Storage of Hazardous Material

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

10.2.5 Protection of Work

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

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

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

10.2.6 Requirements for Existing Sites

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

- a. When performing construction on existing sites, become informed and take into specific account the maturity of the students on the Site; and perform Work which may interfere with school routine before or after school hours, enclose working area with a substantial barricade, and arrange Work to

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cause a minimum amount of inconvenience and danger to students and faculty in their regular school activities. The Contractor shall comply with Specifications and directives of the District regarding the timing of certain construction activities in order to avoid unnecessary interference with school functioning.

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

10.2.7 Shoring and Structural Loading

The Contractor shall not impose structural loading upon any part of the Work under construction or upon existing construction on or adjacent to the Site in excess of safe limits, or loading such as to result in damage to the structural, architectural, mechanical, electrical, or other components of the Work. The design of all temporary construction equipment and appliances used in construction of the Work and not a permanent part thereof, including, without limitation, hoisting equipment, cribbing, shoring, and temporary bracing of structural steel, is the sole responsibility of the Contractor. All such items shall conform with the requirements of governing codes and all laws, ordinances, rules, regulations, and orders of all authorities having jurisdiction. The Contractor shall take special precautions, such as shoring of masonry walls and temporary tie bracing of structural steel Work, to prevent possible wind damage during construction of the Work.

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The installation of such bracing or shoring shall not damage the Work in place or the Work installed by others. Any damage which does occur shall be promptly repaired by the Contractor at no cost to the District.

10.2.8 Conformance within Established Limits

The Contractor and Subcontractors shall confine their construction equipment, the storage of materials, and the operations of workers to the limits indicated by laws, ordinances, permits, and the limits established by the District or the Contractor, and shall not unreasonably encumber the premises with construction equipment or materials.

10.2.9 Subcontractor Enforcement of Rules

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

10.2.10 Site Access

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

10.2.11 Security Services.

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

10.3 EMERGENCIES

10.3.1 Emergency Action

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

10.3.2 Accident Reports

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

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10.4 HAZARDOUS MATERIALS

10.4.1 Discovery of Hazardous Materials

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

10.4.2 Hazardous Material Work Limitations

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

10.4.3 Indemnification by Contractor for Hazardous Material Caused by Contractor

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

10.4.4 Terms of Hazardous Material Provision

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

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ARTICLE 11 INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 Insurance Requirements

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

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

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collapse, explosion, demolition, underground coverage, and excavating.
(XCU)

- g. Claims involving sudden or accidental discharge of contaminants or pollutants.

11.1.2 Specific Insurance Requirements

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

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

- (a) Per occurrence (combined single limit) \$2,000,000.00
.....
- (b) Project Specific Aggregate (for this Project only) \$2,000,000.00
.....
- (c) Products and Completed Operations (aggregate) \$2,000,000.00
.....
- (d) Personal and Advertising Injury Limit \$1,000,000.00
.....

Insurance Covering Special Hazards

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

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

GENERAL CONDITIONS

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

11.1.3 Subcontractor Insurance Requirements

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

11.1.4 Additional Insured Endorsement Requirements

The Contractor shall name, on any policy of insurance required under Article 11.1, the District, CM, Architect, Inspector, the State of California, their officers, employees, agents, volunteers and independent contractors as additional insureds. Subcontractors shall name the Contractor, the District, Architect, Inspector, the State of California, their officers, employees, agents, volunteers and independent contractors as additional insureds. The Additional Insured Endorsement included on all such insurance policies shall be an ISO CG 20 10 (04/13), or an ISO CG 20 38 (04/13), or their equivalent as determined by the District in its sole discretion, and must state that coverage is afforded the additional insured with respect to claims arising out of operations performed by or on behalf of the insured. If the additional insureds have other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis. The insurance provided by the Contractor pursuant to 11.1 must be designated in the policy as primary to any insurance obtained by the District. The amount of the insurer’s liability shall not be reduced by the existence of such other insurance.

11.2 WORKERS’ COMPENSATION INSURANCE

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

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

11.3 BUILDER’S RISK/ “ALL RISK” INSURANCE

11.3.1 Course-of-Construction Insurance Requirements

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

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

11.4 FIRE INSURANCE

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

11.5 AUTOMOBILE LIABILITY

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

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Project Inspector, their directors, officers, employees, agents and volunteers for losses paid under the terms of the insurance policy that arise from Work performed by the Contractor.

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

11.6 OTHER INSURANCE

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

11.7 PROOF OF INSURANCE

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

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

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

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

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11.8 COMPLIANCE

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

11.9 WAIVER OF SUBROGATION

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

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

11.10 PERFORMANCE AND PAYMENT BONDS

11.10.1 Bond Requirements

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

To the extent, if any, that the Contract Price is increased in accordance with the Contract Documents, the Contractor shall, upon request of the District, cause the amount of the bonds to be increased accordingly and shall promptly deliver satisfactory evidence of such increase to the District. To the extent available, the bonds shall further provide that no change or alteration of the Contract Documents (including, without limitation, an increase in the Contract Price, as referred to above), extensions of time, or modifications of the time, terms, or conditions of payment to the Contractor will release the Surety. If the Contractor fails to furnish the required bonds, the District may terminate the Contract for cause.

11.10.2 Surety Qualification

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

11.10.3 Alternate Surety Qualifications

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

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ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

12.1 COMPLIANCE WITH TITLE 24 INSTALLATION REQUIREMENTS

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

4-343. Duties of the Contractor.

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

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

12.1.1 Issuance of Notices of Non-Compliance

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

12.2 SPECIAL NOTICE OF AMERICAN'S WITH DISABILITIES ACT

Some of the requirements in the Plans and Specifications are meant to comply with the Americans with Disabilities Act ("ADA"). The requirements of the ADA are technical in nature and may appear to be minor in nature (i.e. whether a walkway or ramp has a 2% cross-slope). Contractor is warned that even the slightest deviation from the specific requirements from the ADA is considered a Civil Rights violation and subjects the District to fines of three times actual damages sustained by a handicap individual or up to \$4,000 per violation and attorney's fees required to enforce the ADA violation. As a result of the significant liability and exposure

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associated with ADA aspects of the Contract, Contractor shall take special care to meet all ADA requirements detailed in the Plans and Specifications. Failure to comply with ADA rules that results in a Notice of Non-Compliance shall be repaired to meet ADA requirements promptly. In addition, any ADA violations that are not identified by Inspector or Architect that are later identified shall be repaired and charged back to the Contractor through a Deductive Change Order.

12.2.1 Indemnification of ADA Claims

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

12.3 UNCOVERING OF WORK

12.3.1 Uncovering Work for Required Inspections

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

12.3.2 Costs for Inspections Not Required

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

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caused by the District or a separate contractor, in which event the District shall be responsible for payment of such costs to the Contractor.

12.4 CORRECTION OF WORK

12.4.1 Correction of Rejected Work

The Contractor shall promptly correct the Work rejected by the Inspector or the District upon recommendation of the Architect as failing to conform to the requirements of the Contract Documents, whether observed before or after Completion and whether or not Fabricated, installed, or completed. The Contractor shall bear costs of correcting the rejected Work, including cost for delays that may be incurred by Contractor or Subcontractors, the cost for additional testing, inspections, and compensation for the Inspector's or the Architect's services and expenses made necessary thereby (including costs for preparing a CCD, DSA CCD review fees, and additional inspection and special inspection costs).

12.4.2 One-Year Warranty Corrections

If, within one (1) year after the date of Completion of the Work or a designated portion thereof, or after the date for commencement of warranties established under Article 9.9.1, or by the terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the District to do so unless the District has previously given the Contractor a written acceptance of such condition. This period of one (1) year shall be extended with respect to portions of the Work first performed after Completion by the period of time between Completion and the actual performance of the Work. This obligation under this Article 12.4.2 shall survive acceptance of the Work under the Contract and termination of the Contract. The District shall give such notice promptly after discovery of the condition.

12.4.3 District's Rights if Contractor Fails to Correct

If the Contractor fails to correct nonconforming Work within a reasonable time, the District may correct the Work and seek a Deductive Change Order, pursuant to Article 9.6 or Article 2.2.

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ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located.

13.2 SUCCESSORS AND ASSIGNS

The District and the Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.3 WRITTEN NOTICE

In the absence of specific notice requirements in the Contract Documents, written notice shall be deemed to have been duly served if delivered in person to the individual, member of the firm or entity, or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

13.4 RIGHTS AND REMEDIES

13.4.1 Duties and Obligations Cumulative

Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

13.4.2 No Waiver

No action or failure to act by the Inspector, the District, or the Architect shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5 TESTS AND INSPECTIONS

13.5.1 Compliance

Tests, inspections, and approvals of portions of the Work required by the Contract Documents will comply with Division 1, Title 24, and with all other laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction.

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13.5.2 Independent Testing Laboratory

The District will select and pay an independent testing laboratory to conduct all tests and inspections. Selection of the materials required to be tested shall be made by the laboratory or the District's representative and not by the Contractor. See Articles 3.13.1 and 4.3.6 regarding costs or expenses of inspection or testing outside of the Project Site.

13.5.3 Advance Notice to Inspector

The Contractor shall notify the Inspector a sufficient time in advance of its readiness for required observation or inspection so that the Inspector may arrange for same. The Contractor shall notify the Inspector a sufficient time in advance of the manufacture of material to be supplied under the Contract Documents which must, by terms of the Contract Documents, be tested in order that the Inspector may arrange for the testing of the material at the source of supply.

13.5.4 Testing Off-Site

Any material shipped by the Contractor from the source of supply, prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said Inspector that such testing and inspection will not be required, shall not be incorporated in the Work.

13.5.5 Additional Testing or Inspection

If the Inspector, the Architect, the District, or public authority having jurisdiction determines that portions of the Work require additional testing, inspection, or approval not included under Article 13.5.1, the Inspector will, upon written authorization from the District, make arrangements for such additional testing, inspection, or approval. The District shall bear such costs except as provided in Articles 13.5.6 and 13.5.7.

13.5.6 Costs for Retesting

If such procedures for testing, inspection, or approval under Articles 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor shall bear all costs arising from such failure, including those of re-testing, re-inspection, or re-approval, including, but not limited to, compensation for the Architect's services and expenses. Any such costs shall be paid by the District, invoiced to the Contractor, and deducted from the next Progress Payment.

13.5.7 Costs for Premature Test

In the event the Contractor requests any test or inspection for the Project and is not completely ready for the inspection, the Contractor shall be invoiced by the District for all costs and expenses resulting from that testing or inspection, including, but not limited to, the Inspector's and Architect's fees and expenses, and the amount of the invoice shall be deducted from the next Progress Payment.

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13.6 TRENCH EXCAVATION

13.6.1 Trenches Greater Than Five Feet

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

13.6.2 Excavation Safety

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

13.6.3 No Tort Liability of District

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

13.6.4 No Excavation without Permits

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

13.7 WAGE RATES, TRAVEL, AND SUBSISTENCE

13.7.1 Wage Rates

Pursuant to the provisions of Article 2 (commencing at § 1720), Chapter 1, Part 7, Division 2, of the Labor Code, the District has obtained the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this public works project is to be performed for each craft, classification, or type of worker needed for this Project from the Director of the Department of Industrial Relations (“Director”). These rates are on file at the administrative office of the District and are also available from the Director of the Department of Industrial Relations. Copies will be made available to any interested party on request. The Contractor shall post a copy of such wage rates at appropriate, conspicuous, weatherproof points at the Site.

Any worker employed to perform Work on the Project, but such Work is not covered by any classification listed in the published general prevailing wage rate determinations or per diem wages determined by the Director of the Department of Industrial Relations, shall be

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paid not less than the minimum rate of wages specified therein for the classification which most nearly corresponds to the employment of such person in such classification.

13.7.2 Holiday and Overtime Pay

Holiday and overtime work, when permitted by law, shall be paid for at the rate set forth in the prevailing wage rate determinations issued by the Director of the Department of Industrial Relations or at least one and one-half (1½) times the specified basic rate of per diem wages, plus employer payments, unless otherwise specified in the Contract Documents or authorized by law.

13.7.3 Wage Rates Not Affected by Subcontracts

The Contractor shall pay and shall cause to be paid each worker engaged in the execution of the Work on the Project not less than the general prevailing rate of per diem wages determined by the Director, regardless of any contractual relationship which may be alleged to exist between the Contractor or any Subcontractor and such workers.

13.7.4 Per Diem Wages

The Contractor shall pay and shall cause to be paid to each worker needed to execute the Work on the Project per diem wages including, but not limited to, employer payments for health and welfare, pensions, vacation, travel time and subsistence pay as provided for in Labor Code §1773.1.

13.7.5 Forfeiture and Payments

Pursuant to Labor Code §1775, the Contractor shall forfeit to the District, not more than Two Hundred Dollars (\$200.00) for each calendar day, or portion thereof, for each worker paid less than the prevailing wages rates as determined by the Director of the Department of Industrial Relations, for the work or craft in which the worker is employed for any Work done under the Agreement by the Contractor or by any Subcontractor under it. The amount of the penalty shall be determined by the Labor Commissioner and shall be based on consideration of: (1) whether the Contractor or Subcontractor's failure to pay the correct rate of per diem wages was a good faith mistake and, if so, the error was promptly and voluntarily correct upon being brought to the attention of the Contractor or Subcontractor; and (2) whether the Contractor or Subcontractor has a prior record of failing to meet its prevailing wage obligations.

13.7.6 Monitoring and Enforcement by Labor Commissioner

Monitoring and enforcement of the prevailing wage laws and related requirements will be performed by the Labor Commissioner/ Department of Labor Standards Enforcement (DLSE). The Contractor and all subcontractors shall be required to furnish, at least monthly, certified payroll records directly to the Labor Commissioner in accordance with Labor Code section 1771.4. All payroll records shall be furnished in a format required by the Labor Commissioner. The Contractor and all subcontractors must sign up for, and utilize, the Labor

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Commissioner's electronic certified payroll records submission system. The District will have direct and immediate access to all CPRs for the Project that are submitted through the Labor Commissioner's system. The District can use this information for any appropriate purpose, including monitoring compliance, identifying suspected violations, and responding to Public Records Act requests.

The Labor Commissioner/ DLSE may conduct various compliance monitoring and enforcement activities including, but not limited to, confirming the accuracy of payroll records, conducting worker interviews, conducting audits, requiring submission of itemized statements prepared in accordance with Labor Code section 226, and conducting random in-person inspections of the Project site ("On-Site Visits"). On-Site Visits may include inspections of records, inspections of the Work site and observation of work activities, interviews of workers and others involved with the Project, and any other activities deemed necessary by the Labor Commissioner/DLSE to ensure compliance with prevailing wage requirements. The Labor Commissioner/DLSE shall have free access to any construction site or other place of labor and may obtain any information or statistics pertaining to the lawful duties of the Labor Commissioner/DLSE.

Any lawful activities conducted or any requests made by the Labor Commissioner/DLSE shall not be the basis for any delays, claims, costs, damages or liability of any kind against the District by the Contractor. Contractor and all subcontractors shall cooperate and comply with any lawful requests by the Labor Commissioner/ DLSE. The failure of the Labor Commissioner, DLSE, or any other entity related to the Department of Industrial Relations to comply with any requirement imposed by the California Code of Regulations, Title 8, Chapter 8 shall not of itself constitute a defense to the failure to pay prevailing wages or to comply with any other obligation imposed by Division 2, Part 7, Chapter 1 of the Labor Code.

Prior to commencing any Work on the Project, the Contractor shall post the required notice/poster required under the California Code of Regulations and Labor Code section 1771.4 in both English and Spanish at a conspicuous, weatherproof area at the Project site. The required notice/poster is available on the Labor Commissioner's website.

13.8 RECORDS OF WAGES PAID

13.8.1 Payroll Records

- a. Pursuant to §1776 of the Labor Code, the Contractor and each Subcontractor shall keep an accurate payroll record showing the name, address, social security number, work classification and straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker or other employee employed by him or her in connection with the Project.

All payroll records as specified in Labor Code §1776 of the Contractor and all Subcontractors shall be certified and furnished directly to the Labor Commissioner in accordance with Labor Code §1771.4(a)(3) on a monthly

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basis (or more frequently if required by the District or the Labor Commissioner) and in a format prescribed by the Labor Commissioner. Payroll records as specified in Labor Code §1776 shall be certified and submitted to the District with each application for payment. All payroll records shall be available for inspection at all reasonable hours at the principal office of the Contractor on the following basis:

1. A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request.
 2. A certified copy of all payroll records shall be made available for inspection or furnished upon request to a representative of District, the Division of Labor Standards Enforcement or the Division of Apprenticeship Standards of the Department of Industrial Relations.
 3. A certified copy of all payroll records shall be made available upon request by the public for inspection or for copies thereof. However, a request by the public shall be made through the District, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement. If the requested payroll records have not been provided pursuant to Paragraph (2) above, the requesting party shall, prior to being provided the records, reimburse the costs, according to law for the preparation by the Contractor, Subcontractor(s), and the entity through which the request was made. The public shall not be given access to such records at the principal office of the Contractor.
- b. The certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement or shall contain the same information as the forms provided by the Division of Labor Standards Enforcement.
 - c. The Contractor or Subcontractor(s) shall file a certified copy of all payroll records with the entity that requested such records within 10 calendar days after receipt of a written request.
 - d. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the District, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement shall be marked or obliterated to prevent disclosure of an individual's name, address and social security number. The name and address of the Contractor awarded the Contract or the Subcontractor(s) performing the Contract shall not be marked or obliterated. Any copy of records made available for inspection by, or furnished to, a joint labor-management committee established pursuant to the federal Labor Management Cooperation Act of 1978 (Section 175a of Title 29 of the

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United States Code) shall be marked or obliterated only to prevent disclosure of an individual's name and social security number. Notwithstanding any other provision of law, agencies that are included in the Joint Enforcement Strike Force on the Underground Economy established pursuant to Section 329 of the Unemployment Insurance Code and other law enforcement agencies investigating violations of law shall, upon request, be provided non-redacted copies of certified payroll records.

- e. The Contractor shall inform the District of the location of all payroll records, including the street address, city and county, and shall, within five working days, provide a notice of a change of location and address.
- f. The Contractor or Subcontractor(s) shall have 10 calendar days in which to comply subsequent to receipt of a written notice requesting payroll records. In the event that the Contractor or Subcontractor(s) fails to comply within the 10-day period, the Contractor or Subcontractor(s) shall, as a penalty to the District, forfeit One Hundred Dollars (\$100.00) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

Responsibility for compliance with this Article shall rest upon the Contractor.

13.8.2 Withholding of Contract Payments & Penalties

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

- a. The required prevailing rate of per diem wages determined by the Director of the Department of Industrial Relations is not paid to all workers employed on the Project; or
- b. The Contractor or Subcontractor(s) fail to submit all required certified payroll records with each application for payment, but not less than once per month; or
- c. The Contractor or Subcontractor(s) submit incomplete or inadequate payroll records; or
- d. The Contractor or Subcontractor(s) fail to comply with the Labor Code requirements concerning apprentices; or
- e. The Contractor or Subcontractor(s) fail to comply with any applicable state laws governing workers on public works projects.

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13.9 APPRENTICES

13.9.1 Apprentice Wages and Definitions

All apprentices employed by the Contractor to perform services under the Contract shall be paid the standard wage paid to apprentices under the regulations of the craft or trade for which he or she is employed, and as determined by the Director of the Department of Industrial Relations, and shall be employed only at the craft or trade to which he or she is registered. Only apprentices, as defined in §3077 of the Labor Code, who are in training under apprenticeship standards that have been approved by the Chief of the Division of Apprenticeship Standards and who are parties to written apprenticeship agreements under Chapter 4 (commencing with §3070) of Division 3, are eligible to be employed under this Contract. The employment and training of each apprentice shall be in accordance with the apprenticeship standards and apprentice agreements under which he or she is training, or in accordance with the rules and regulations of the California Apprenticeship Council.

13.9.2 Employment of Apprentices

Contractor agrees to comply with the requirements of Labor Code §1777.5. The Contractor awarded the Project, or any Subcontractor under him or her, when performing any of the Work under the Contract or subcontract, employs workers in any apprenticeable craft or trade, the Contractor and Subcontractor shall employ apprentices in the ratio set forth in Labor Code §1777.5. The Contractor or any Subcontractor must apply to any apprenticeship program in the craft or trade that can provide apprentices to the Project site for a certificate approving the contractor or subcontractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected. However, the decision of the apprenticeship program to approve or deny a certificate shall be subject to review by the Administrator of Apprenticeship. The apprenticeship program or programs, upon approving the Contractor or Subcontractor, shall arrange for the dispatch of apprentices to the Contractor or Subcontractor upon the Contractor's or Subcontractor's request. "Apprenticeable craft or trade" as used in this Article means a craft or trade determined as an apprenticeable occupation in accordance with the rules and regulations prescribed by the California Apprenticeship Council. The ratio of work performed by apprentices to journeyman employed in a particular craft or trade on the Project shall be in accordance with Labor Code §1777.5.

13.9.3 Submission of Contract Information

Prior to commencing Work on the Project, the Contractor and Subcontractors shall submit contract award information to the applicable apprenticeship program(s) that can supply apprentices to the Project and make the request for the dispatch of apprentices in accordance with the Labor Code. The information submitted shall include an estimate of journeyman hours to be performed under the Contract, the number of apprentices proposed to be employed, and the approximate dates the apprentices would be employed. A copy of this information shall also be submitted to the District if requested. Within 60 days after concluding Work on the Project, the Contractor and Subcontractors shall submit to the District, if requested, and to the apprenticeship program a verified statement of the journeyman and apprentice hours performed on the Project.

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13.9.4 Apprentice Fund

The Contractor or any Subcontractor under him or her, who, in performing any of the Work under the Contract, employs journeymen or apprentices in any apprenticeable craft or trade shall contribute to the California Apprenticeship Council the same amount that the Director determines is the prevailing amount of apprenticeship training contributions in the area of the Project. The Contractor and Subcontractors may take as a credit for payments to the California Apprenticeship Council any amounts paid by the Contractor or Subcontractor to an approved apprenticeship program that can supply apprentices to the Project. The Contractor and Subcontractors may add the amount of the contributions in computing his or her bid for the Contract.

13.9.5 Prime Contractor Compliance

The responsibility of compliance with Article 13 and §1777.5 of the Labor Code for all apprenticeable occupations is with the Prime Contractor. Any Contractor or Subcontractor that knowingly violates the provisions of this Article or Labor Code §1777.5 shall be subject to the penalties set forth in Labor Code §1777.7.

13.10 ASSIGNMENT OF ANTITRUST CLAIMS

13.10.1 Application

Pursuant to Government Code § 4551, in entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or Subcontractor offers and agrees to assign to the District all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act, (15 U.S.C. § 15) or under the Cartwright Act (Chapter 2 [commencing with § 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from the purchase of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders Retention Payment to the Contractor, without further acknowledgment by the parties. If the District receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under Chapter 11 (commencing with § 4550) of Division 5 of Title 1 of the Government Code, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the District any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the District as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

13.10.2 Assignment of Claim

Upon demand in writing by the assignor, the District shall, within one (1) year from such demand, reassign the cause of action assigned pursuant to this Article if the assignor has been or may have been injured by the violation of law for which the cause of action arose and the District has not been injured thereby or the District declines to file a court action for the cause of action.

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13.11 STATE AND DISTRICT CONDUCTED AUDITS

Pursuant to and in accordance with the provisions of Government Code § 10532, or any amendments thereto, all books, records, and files of the District, the Contractor, or any Subcontractor connected with the performance of this Contract involving the expenditure of state funds in excess of Ten Thousand Dollars (\$10,000.00), including, but not limited to, the administration thereof, shall be subject to the examination and audit of the Office of the Auditor General of the State of California for a period of five (5) years after Retention Payment is made or a Notice of Completion is Recorded, whichever occurs first. Contractor shall preserve and cause to be preserved such books, records, hard drives, electronic media, and files for the audit period.

Pursuant to the remedies under Public Contract Code section 9201 and Government Code section 930.2, Contractor, through execution of this Agreement, also agrees the District shall have the right to review and audit, upon reasonable notice, the books and records of the Contractor concerning any monies associated with the Project. The purpose of this "Audit" is to quickly and efficiently resolve Disputes based on the actual costs incurred and to reduce the uncertainty in resolving Disputes with limited information. The District shall perform any audits at its own cost and any such audit shall be performed by an independent auditor, having no direct or indirect relationship with the functions or activities being audited or with the business conducted by the Contractor or District. In the event the independent auditor determines that Change Orders, response to Request for Proposals, Claims, Appeal of Claims, or other requests for payment are in error, or have has any other concerns or questions, the Auditor shall report the results of the Audit findings to the District and provide a copy to the Contractor after giving the District Board the opportunity for at least 10 days review. If the Contractor disputes the findings of the independent auditor, such dispute shall be handled in the manner set forth under Article 4.6.2 entitled Disputes.

If Contractor having agreed to the terms of this Contract fails to produce books or records requested by Auditor, such failure to produce books or records that were required to be preserved for audit, it shall be presumed that the information contained in the withheld books or records were unfavorable to the Contractor and the Auditor shall note this refusal in the results of the Audit findings for further evaluation by the District and the District's Board. The refusal to release records that are concerning monies associated with the Project may be used as a grounds to debar the Contractor under Article 15 for failure to preserve records under Article 13.11 and the failure to produce required audit records may also be used as a grounds for a negative finding against the Contractor depending on the significance of the records that are withheld by Contractor. Failure to produce job cost data tied to job cost categories and budgets shall be presumed an intentional failure to produce key audit records. Similarly, failure to produce Daily Reports (prepared at or near the time of the Work actually took place (See Article 3.16) shall be presumed an intentional failure to produce key audited records.

If Contractor is seeking costs for inefficiency, home office overhead, or unanticipated increased costs due to delays or acceleration, Contractor shall also produce copies of the original bid tabulation utilized in submitting Contractor's bid for the Project. This document shall be considered confidential and shall not be subject to disclosure through a Public Records Act and shall not be distributed to anyone other than the District and the District's counsel. This bid tabulation shall only be used in litigation, arbitration, evaluation of Claims or Disputes, Audit,

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and trial. If the records for the bid tabulation are kept on a computer, the Contractor shall also produce all metadata (in native format) that accompanies the bid tabulation for inspection to prove the authenticity of the underlying bid tabulation. Failure to produce the bid tabulation for review of inefficiency, home office overhead, or unanticipated increased costs due to delays or accelerations shall be considered material evidence that the bid tabulation was not favorable to the Contractor. This evidence shall be entered as a jury instruction for trial that the bid tabulation was not produced and the bid tabulation information was unfavorable to the Contractor. The evidence may also be used in debarment proceedings, and noted as an exception to an Audit findings.

Upon notification of Contractor concerning the results of the audit and a reasonable time has passed for Contractor to respond to the Audit findings and if either there is no Dispute of the Audit findings under Article 4.6 or if the result after utilizing the Disputes Clause confirms the Audit findings, the District may seek reimbursement for overstated Claims, Change Orders, or Appeal of Claims and may also undertake debarment proceedings under Article 15 of these General Conditions.

13.12 STORM WATER POLLUTION PREVENTION

13.12.1 Application

This Section addresses the preparation, implementation and monitoring of a Storm Water Pollution Prevention Plan (SWPPP) for the purpose of preventing the discharge of pollutants from the construction site. This includes the elimination of pollution discharges such as improper dumping, spills or leakage from storage tanks or transfer areas. The District will not issue a Notice to Proceed until Contractor has prepared by a qualified individual and obtained approval of the Permit Registration Documents (“PRDs”) that include a Notice of Intent, Construction Risk Calculation, Site Map, SWPPP, Annual Fee and any additional required documents from all applicable Local Governing Agencies including the Regional Water Quality Control Board. The Contractor shall also secure a certification that the Project has met all of the conditions of the General Construction Activity Storm Water Permit (GCASP) and comply with all applicable local, state and federal regulations governing storm water pollution prevention.

13.12.2 References and Materials

- California Stormwater Quality Association New Development and Redevelopment Best Management Practice Handbook.
- 2009 California Stormwater Quality Association Construction BMP Handbook.
- State Water Resources Control Board (2009). Order 2009-0009-DWQ, NPDES General Permit No. CAS000002: Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbing Activities. Available on-line at:

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- http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml. - Use materials of a class, grade and type needed to meet the performance described in the BMP Handbook.

13.12.3 Preparation and Approval

The Contractor shall prepare by a qualified individual the PRDs that include a Notice of Intent, Construction Risk Calculation, Site Map, SWPPP, Annual Fee and any additional required documents. The Contractor's Qualified SWPPP Developer ("QSD") shall prepare the Storm Water Pollution Prevention Plan (SWPPP) as required to comply with storm water pollution regulations for project sites with storm water discharges associated with construction activity such as clearing or demolition, grading, excavation and other land disturbances. The SWPPP shall apply to all areas that are directly related to construction activity, including but not limited to staging areas, storage yards, material borrow areas, and access roads.

13.12.3.1 The Contractor shall prepare and submit to the Local Governing Agencies and the District the SWPPP for review and approval if the project sites, new or existing, with land disturbance of 1 or more acres (or less than 1 acres if part of a common plan of development); the construction activity that results in land surface disturbances of less than one acre is part of a larger common plan of development or sale of one or more acres of disturbed land surface; or the construction activity associated with Linear Underground/Overhead Projects ("LUPs") including, but not limited to, those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities) and include, but are not limited to, underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

13.12.3.2 The Contractor shall also pay annual renewal fee(s) until the contract is completed and make all such checks payable to the State Water Resources Control Board. The Notice of Intent must be submitted at least two weeks prior to the commencement of construction activities.

13.12.3.3 The Contractor shall prepare the SWPPP by following the format in Sections 2, 3, 4 and Appendices A through F of the California Stormwater BMP Handbook - Construction, January 2009 edition, published by the California Stormwater Quality Association. The publication is available from:

California Stormwater
Quality Association
P.O. Box 2105
Menlo Park, CA 94026-2105
Phone: (650) 366-1042
E-mail: info@casqa.org

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or

<https://www.casqa.org/store/products/tabid/154/p-167-construction-handbookportal-initial-subscription.aspx>

13.12.3.4 Where land disturbance is less than 1 acre, any BMPs indicated in the BMP Handbook needed to prevent or minimize storm water pollution shall be implemented at no extra cost to the District.

13.12.3.5 Within two weeks after Award of Contract by the District, the Contractor shall submit to the District's Civil Engineer one copy of the PRDs including the SWPPP for review. After the District's approval, the Contractor shall provide approved copies of the SWPPP as follows: one copy each to the Project Inspector, Construction Manager, Architect, Commissioned Architect and District's Civil Engineer.

13.12.4 Implementation

The Contractor shall implement the Storm Water Pollution Prevention Plan by doing the following:

- a. Obtain a Waste Discharger Identification (WDID) number from the SWRCB before beginning construction. This number will be issued once your PRDs are administratively accepted and fee is received.
- b. Keep the SWPPP, REAPs, monitoring data on the construction site.
- c. Employ a Qualified SWPPP Practitioner (QSP) to implement the SWPPP during construction and develop Rain Event Action Plans ("REAPs").
- d. Install, inspect, maintain and monitor BMPs required by the General Permit.
- e. Install perimeter controls prior to starting other construction work at the site.
- f. Contain on-site storm water at the jobsite. Do not drain on-site water directly into the storm drain.
- g. Implement the SWPPP.
- h. Provide SWPPP and BMP implementation training for those responsible for implementing the SWPPP.
- i. Designate trained personnel for the proper implementation of the SWPPP.
- j. Conduct monitoring, as required, and assess compliance with the Numeric Action Levels (NALs) or Numeric Effluent Limitations (NELs) appropriate to your project.

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- k. Report monitoring data:
 1. Maintain a paper or electronic copy of all required records for three years from the date generated or date submitted, whichever is last. These records must be available at the construction site until construction is completed.
 2. Have a QSD revise the SWPPP as needed to reflect the phases of construction and to suit changing site conditions and instances when properly installed systems are ineffective.
 3. Assist the District with entering any necessary data or information into the Stormwater Multi-Application and Reporting System (“SMARTS”) system.
1. At the end of Construction Contract:
 1. Submit Notice of Termination (NOT) into the SMARTS when construction is complete and conditions of termination listed in the NOT have been satisfied. A copy of the NOT can be found at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.
 2. Leave in place storm water pollution prevention controls needed for post-construction storm water management and remove those that are not needed as determined by the District. Thereafter, left-in-place controls will be maintained by the District.
 3. Provide Site Monitoring Reports, SWPPP revisions, Compliance Certifications and related documents to the District. Post-construction storm water operation and management plan as mentioned in the compliance certifications are considered to be in place at the end of the Construction Contract.

13.12.5 Monitoring

The Contractor shall conduct examination of storm water pollution prevention controls as required by the State Water Resources Control Board (2009). Order 2009-0009-DWQ, NPDES General Permit No. CAS000002: Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbing Activities. This includes properly qualified personnel performing all required monitoring, testing, inspections and monitoring. The Contractor shall also conduct examination of storm water pollution prevention controls, as well as before and after each storm event in compliance with the State Water Resources Control Board Order No. 2009-0009-DWQ, National Pollutant Discharge Elimination System General Permit No. CAS000002, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities (General Permit) (SWRCB,

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2009).and at least once each 24-hour period during extended storm events to identify BMP effectiveness and implement repairs or BMP changes as soon as feasible. All maintenance related to a storm event should be completed within 48 hours of the storm event. The Contactor shall also prepare and maintain, at the jobsite, a log of each inspection using Site Monitoring Report forms.

13.12.6 Liabilities and Penalties

- a. Review of the SWPPP and inspection logs by the District shall not relieve the Contractor from liabilities arising from non-compliance with storm water pollution regulations.
- b. Payment of penalties for non-compliance by the Contractor shall be the sole responsibility of the Contractor and will not be reimbursed by the District.
- c. Compliance with the Clean Water Act pertaining to construction activity is the sole responsibility of the Contractor. For any fine(s) levied against the District due to non-compliance by the Contractor, the District will deduct from the final payment due the Contractor the total amount of the fine(s) levied on the District, plus legal and associated costs.
- d. The Contractor shall submit to the District a completed NOI for change of information (Construction Site Information and Material Handling/Management Practices).

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ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR FOR CAUSE

14.1.1 Grounds for Termination

The Contractor may terminate the Contract if the Work is stopped for a period of thirty (30) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons performing portions of the Work for whom the Contractor is contractually responsible, for only the following reasons:

- a. Issuance of an order of a court or other public authority having jurisdiction; or
- b. An act of the United State or California government, such as a declaration of national emergency.

14.1.2 Notice of Termination

If one of the above reasons exists, the Contractor may, upon written notice of seven (7) additional days to the District, terminate the Contract and recover from the District payment for Work executed and for reasonable costs verified by the Architect with respect to materials, equipment, tools, construction equipment, and machinery, including reasonable overhead, profit, and damages.

14.2 TERMINATION BY THE DISTRICT FOR CAUSE

14.2.1 Grounds for Termination

The District may terminate the Contractor and/or this Contract for the following reasons:

- a. Persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- b. Persistently or repeatedly is absent, without excuse, from the job site;
- c. Fails to make payment to Subcontractors, suppliers, materialmen, etc.;
- d. Persistently disregards laws, ordinances, rules, regulations, or orders of a public authority having jurisdiction;
- e. Fails to provide a schedule or fails or refuses to update schedules required under the Contract;

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- f. Falls behind on the Project and refuses or fails to undertake a Recovery Schedule;
- g. If the Contractor has been debarred from performing Work
- h. Becomes bankrupt or insolvent, including the filing of a general assignment for the benefit of creditors; or
- i. Otherwise is in substantial breach of a provision of the Contract Documents.

14.2.2 Notification of Termination

When any of the above reasons exist, the District may, without prejudice to any other rights or remedies of the District and after giving the Contractor and the Contractor's Surety written notice of seven (7) days, terminate the Contractor and/or this Contract and may, subject to any prior rights of the Surety:

- a. Take possession of the Project and of all material, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- b. Accept assignment of Subcontracts. Contractor acknowledges and agrees that if the District (in its sole and absolute discretion) decides to takeover completion of the Project, the Contractor agrees to immediately assign all subcontracts to the District which the District has chosen to accept;
- c. Complete the Work by any reasonable method the District may deem expedient, including contracting with a replacement contractor or contractors; and,
- d. Agree to accept a takeover and completion arrangement with Surety that is acceptable to the District Board.

14.2.3 Takeover and Completion of Work after Termination for Cause

A Termination for Cause is an urgent matter which requires immediate radiation since Project Work is open and incomplete, the site is subject to vandalism and theft, the Project site is considered a public nuisance, and there is a possibility of injury and deterioration of the Project Work and materials. Thus, the District shall be entitled to enter a takeover contract to either remediate the unfinished condition or complete the Work for this Project.

14.2.4 Payments Withheld

If the District terminates the Contract for one of the reasons stated in Article 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is complete. All costs associated with the termination and completion of the Project shall be the responsibility of the Contractor and/or its Surety.

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14.2.5 Payments upon Completion

If the unpaid balance of the Contract Sum exceeds costs of completing the Work, including compensation for professional services and expenses made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor and its Surety shall pay the difference to the District. The amount to be paid to the Contractor, or District, as the case may be, shall be certified by the Architect upon application. This payment obligation shall survive completion of the Contract.

14.3 TERMINATION OF CONTRACT BY DISTRICT (CONTRACTOR NOT AT FAULT)

14.3.1 Termination for Convenience

District may terminate the Contract upon fifteen (15) calendar days of written notice to the Contractor and use any reasonable method the District deems expedient to complete the Project, including contracting with replacement contractor or contractors, if it is found that reasons beyond the control of either the District or Contractor make it impossible or against the District's interest to complete the Project. In such a case, the Contractor shall have no Claims against the District except for: (1) the actual cost for approved labor, materials, and services performed in accordance with the Contract Documents which have not otherwise been previously paid for and which are supported and documented through timesheets, invoices, receipts, or otherwise; and (2) profit and overhead of ten percent (10%) of the approved costs in item (1); and (3) termination cost of five percent (5%) of the approved costs in item (1). Contractor acknowledges and agrees that if the District (in its sole and absolute discretion) decides to takeover completion of the Project, the Contractor agrees to immediately assign all subcontracts to the District which the District has chosen to accept.

14.3.2 Non-Appropriation of Funds/ Insufficient Funds

In the event that sufficient funds are not appropriated to complete the Project or the District determines that sufficient funds are not available to complete the Project, District may terminate or suspend the completion of the Project at any time by giving written notice to the Contractor. In the event that the District exercises this option, the District shall pay for any and all work and materials completed or delivered onto the site for which value is received, and the value of any and all work then in progress and orders actually placed which cannot be canceled up to the date of notice of termination. The value of work and materials not otherwise already paid for by the District up to the time of termination under this Paragraph shall include a factor of fifteen percent (15%) for the Contractor's overhead and profit and there shall be no other costs or expenses paid to Contractor. All work, materials and orders paid for pursuant to this provision shall become the property of the District. District may, without cause, order Contractor in writing to suspend, delay or interrupt the Project in whole or in part for such period of time as District may determine. Adjustment shall be made for increases in the cost of performance of the Agreement caused by suspense, delay or interruption.

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14.4 REMEDIES OTHER THAN TERMINATION

If a default occurs, the District may, without prejudice to any other right or remedy, including, without limitation, its right to terminate the Contract pursuant to Article 14.2, do any of the following:

- a. Permit the Contractor to continue under this Contract, but make good such deficiencies or complete the Contract by whatever method the District may deem expedient, and the cost and expense thereof shall be deducted from the Contract Price or paid by the Contractor to the District on demand;
- b. If the workmanship performed by the Contractor is faulty or defective materials are provided, erected or installed, then the District may order the Contractor to remove the faulty workmanship or defective materials and to replace the same with work or materials that conform to the Contract Documents, in which event the Contractor, at its sole costs and expense, shall proceed in accordance with the District's order and complete the same within the time period given by the District in its notice to the Contractor; or
- c. Initiate procedures to declare the Contractor a non-responsible bidder for a period of two (2) to five (5) years thereafter.

All amounts expended by the District in connection with the exercise of its rights hereunder shall accrue interest from the date expended until paid to the District at the maximum legal rate. The District may retain or withhold any such amounts from the Contract Price. If the Contractor is ordered to replace any faulty workmanship or defective materials pursuant to Paragraph (b) above, the Contractor shall replace the same with new work or materials approved by the Architect and the District, and, at its own cost, shall repair or replace, in a manner and to the extent the Architect and the District shall direct, all Work or material that is damaged, injured or destroyed by the removal of said faulty workmanship or defective material, or by the replacement of the same with acceptable work or materials. In no event shall anything in this Article be deemed to constitute a waiver by the District of any other rights or remedies that it may have at law or in equity, it being acknowledged and agreed by the Contractor that the remedies set forth in this Article are in addition to, and not in lieu of, any other rights or remedies that the District may have at law or in equity.

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ARTICLE 15 DEBARMENT

15.1 DEBARMENT MEANS THERE HAS BEEN A FINDING THAT THE CONTRACTOR IS NOT RESPONSIBLE.

During the course of the Project, or if it is determined through Change Orders, Claims, or Audit that a Contractor is not responsible, the District may, in addition to other remedies provided in the Contract, debar the Contractor from bidding or proposing on, or being awarded, and/or performing work on District contracts for a specified period of time, which generally will not exceed five (5) years, but may exceed five (5) years or be permanent if the circumstances warrant such debarment. In addition to the debarment proceeding, a finding that a Contractor is to be debarred shall result in the termination of any or all existing Contracts the Contractor may have with the District.

15.2 BOARD FINDING

The District may debar a Contractor if the Board, or the Board's delegatee, in its discretion, finds the Contractor has done any of the following:

15.2.1 Intentionally or with reckless disregard, violated any term of the Contract with the District

15.2.2 Committed an acts or omission which reflects on the Contractor's quality, fitness or capacity to perform Work for the District;

15.2.3 Committed an act or offense which indicates a lack of business integrity or business honesty; or,

15.2.4 Made or submitted a false claim against the District or any other public entity.

15.3 HEARING AND PRESENTATION OF EVIDENCE

If there is evidence that the Contractor may be subject to debarment, the District shall notify the Contractor in writing of the evidence which is the basis for the proposed debarment and shall advice the Contractor of the scheduled date for a debarment hearing before the District Board or its delegated designee.

The District Board, or designee, shall conduct a hearing where evidence on the proposed debarment is presented. The Contractor or the Contractor's representative shall be given an opportunity to submit evidence at the hearing. The Contractor shall be provided an adequate amount of time to prepare and object to evidence presented. A tentative proposed decision shall be issued as a tentative decision and the District shall be entitled to modify, deny or adopt the proposed decision. The proposed decision shall contain a recommendation regarding whether the Contractor should be debarred, and, if so, the appropriate length of time of the debarment. The Contractor and the District shall be provided an opportunity to object to the tentative proposed

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decision for a period of 15 days. If additional evidence is presented, the District shall evaluate this evidence and either issue an amended ruling, issue the same ruling, or call a further hearing.

If a Contractor has been debarred for a period of longer than five (5) years, that Contractor may after the debarment has been in effect for at least five (5) years, submit a written request for review of the debarment determination to reduce the period of debarment or terminate the debarment. The District may, in its discretion, reduce the period of debarment or terminate the debarment if it finds that the Contractor has adequately demonstrated one or more of the following: (1) elimination of the grounds for which the debarment was imposed; (2) a bona fide change in ownership or management; (3) material evidence discovered after debarment was imposed; or (4) any other reason that is in the best interests of the District.

The District will consider a request for review of a debarment determination only where: (1) the Contractor has been debarred for a period longer than five (5) years; (2) the debarment has been in effect for at least five (5) years; and (3) the request is in writing, states one or more of the grounds for reduction of the debarment period or termination of the debarment, and includes supporting documentation. Upon receiving an appropriate request, the District will provide notice of the hearing on the request. At the hearing, the District shall review evidence on the proposed reduction of debarment period. This hearing shall be conducted and the request for review decided by the District pursuant to the same procedures as for a debarment hearing.

The District's proposed decision shall contain a recommendation on the request to reduce the period of debarment or terminate the debarment.

The terms shall also apply to Subcontractors of Contractor.

SUPPLEMENTARY GENERAL CONDITIONS

The following supplements modify the General Conditions. Where a portion of the General Conditions is modified and or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

ARTICLE 3 – THE CONTRACTOR

Article 3.10.4 Add the following: The Contractor shall require all Subcontractors to prepare and submit to the Contractor, within fifteen (15) days of execution of the Subcontract, comprehensive lists, in quadruplicate, of the manufacturers and products proposed for the Project, including information on materials, equipment, and fixtures required by the Contract Documents, as may be required for the Contractor’s or Architect’s approval.

ARTICLE 8 – TIME

Article 8 Schedule Inclusion Requirements –The Baseline Schedule shall include the following Milestone Schedule:

Critical Milestone:

Boiler, Filtration, Chlorination and Mechanical Piping For Pool Heating January 18, 2019
and Chemistry Balance--Fully Operational

Article 8.2.2 Performance During Working Hours – delete this Article and replace with the following:

8.2.2 Forty (40) hours between 7:00 a.m. and 11:00 p.m. shall constitute a work week at the applicable prevailing wage rate(s) for the entire duration of the project.

During the following times and dates, no motorized, mechanized, or vehicular construction activity is allowed (paving, demolition, compaction, removal of materials, delivery of materials). During these periods, hand labor with limited noise-producing capabilities will be allowed:

December 1, 2018 (Saturday) from 8:00 a.m. until 5:00 p.m.

December 8, 2018 (Saturday) from 8:00 a.m. until 5:00 p.m.

December 19-21, 2018 from 8:30 a.m. until 1:00 p.m.

January 8, 2019 from 8:30 a.m. until 3:30 p.m.

February 4, 2019 from 8:30 a.m. until 3:30 p.m.

February 9, 2019 (Saturday) from 8:00 a.m. until 5:00 p.m.

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March 9, 2019 (Saturday) from 8:00 a.m. until 5:00 p.m.

March 16, 2019 (Saturday) from 8:00 a.m. until 5:00 p.m.

April 1, 2019 from 8:30 a.m. until 3:30 p.m.

The District anticipates the possibility of adding additional dates and times to this list in the near future.

Article 8.4.1 Liquidated Damages – Contractor will be liable to the District for Liquidated Damages pursuant to Article 8.4 for each calendar day of delay in the amount set forth in the Agreement Form.

ARTICLE 9.3 PROGRESS PAYMENTS

9.3.1 Payments to Contractor – This project is **not** designated as substantially complex.

ARTICLE 11 – INSURANCE AND BONDS

Article 11.10 Performance and Payment Bonds – The number of executed copies of the Performance Bond and the Payment Bond required is two (2).

SUPPLEMENTARY GENERAL CONDITIONS

Division 1 Forms

IMMEDIATE CONSTRUCTION CHANGE DIRECTIVE NO.

PROJECT: _____

TO: _____

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

DESCRIPTION OF CHANGE: _____

COST (This cost shall not be exceeded): _____

TIME FOR COMPLETION: _____

NOTE:

Pursuant to Article 7.3.1.2 An Immediate Change Directive is a written order to the Contractor prepared by the Architect and signed by the District (and CM if there is a CM on the Project) and the Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. The District may by ICD, without invalidating the Contract, direct immediate changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions within. If applicable, the Contract Sum and Contract Time will be adjusted accordingly. CONTRACTOR SHALL PROCEED WITH WORK SET FORTH IN THIS ICD IMMEDIATELY UPON RECEIPT OR THE DISTRICT MAY EITHER HOLD THE CONTRACTOR IN EITHER PARTIAL DEFAULT PURSUANT TO ARTICLE 2.2 OR TOTAL DEFAULT PURSUANT TO ARTICLE 14.

Architect

District

SUPPLEMENTARY GENERAL CONDITIONS

CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT: _____

TO: _____

As the Architect for the Project described above, the Project has reached Substantial Completion. Substantial Completion is not reached unless and until each of the following three (3) conditions have been met: (1) all contractually required items have been installed with the exception of only minor and Incomplete Punch Items (See Article 9.9 of the General Conditions); (2) All Fire/Life Safety Systems have been installed, and are working and signed off on the DSA Form 152 Inspection Card, all building systems including mechanical, electrical and plumbing are all functioning; and (3) the Project is fit for occupancy and its intended use

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

Architect

SECTION 012000
SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY OF THE WORK:

- A. The Work under this Contract necessary for and incidental to the execution and completion of all Work indicated in the Contract Documents for construction of:

Nevada Union High School Pool Building Modernization

- B. Owner:

Nevada Union High School District
11645 Ridge Rd.
Grass Valley, California 95945

- C. Architect:

Siteline Architecture
644 Zion Street
Nevada City, California 95959

1.2 GENERAL DESCRIPTION OF WORK:

- A. Removal and Replacement of existing finishes, plumbing, plumbing fixtures, HVAC, doors, fire alarm system, lockers, benches, pool boiler, pool chlorinator, pool filtration equipment, roofing, and lighting. Installation of accessories, concrete walks, parking stalls, and stairs.
- B. The Work under this Contract includes the furnishing of all labor, materials, services and transportation, except as specifically excluded, which is required for the completion of the Project in accordance with the requirements of the Contract Documents.

1.3 REQUIREMENTS OF REGULATORY AGENCIES:

- A. Construction shall be in conformance with the California Code of Regulations (CCR), as follows:
1. 2015 STATE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 2012 EDITION (THE GREENBOOK)
 2. 2016 CALIFORNIA MECHANICAL CODE (CMC)
 3. 2016 CALIFORNIA ELECTRICAL CODE (CEC)
 4. 2016 CALIFORNIA ENERGY CODE (CEC T-24)
 5. 2016 CALIFORNIA PLUMBING CODE (CPC)
 6. 2016 CALIFORNIA FIRE CODE (CFC)

7. 2016 CALIFORNIA GREEN BUILDING CODE
 8. 2010 ADA STANDARDS FOR ACCESSIBLE DESIGN
 9. 2016 NFPA 24
 10. ALL LOCAL CODES AND ORDINANCES
 11. NFPA - Installation of Sprinkler Systems, as Amended by California
 12. NFPA - Installation of Standpipe & Hose Systems
 13. NFPA - Dry Chemical Extinguishing Systems
 14. NFPA - Wet Chemical Extinguishing Systems
 15. NFPA - Installation of Stationary Pumps for Fire Protection
 16. NFPA - Water Tanks for Private Fire Protection
 17. NFPA - Installation of Private Fire Service Mains and Their Appurtenances
 18. NFPA - Inspection, Testing, Maintenance of Water-Based Fire Protection Systems, as Amended by California
 19. NFPA 72 - National Fire Alarm Code, as Amended by California
- B. A copy of CCR Title 24 Parts 1 and 2 shall be kept at the Project site during construction.
- C. Accessibility Requirements: Construction shall be in conformance with the ADA Accessibility Guidelines for Buildings and Facilities, dated June 26, 1991 as amended thru the date of the start of construction.
- 1.4 OCCUPATIONAL SAFETY AND HEALTH ACT REQUIREMENTS:
- A. During the entire construction period, it shall be the responsibility of the Contractor to maintain conditions at the Project site so as to meet in all respects the requirements of the California Code of Regulations, Title 8, Industrial Relations, Chapter 4, Div. of Industrial Safety.
 - B. Asbestos Free Materials: Materials containing asbestos shall not be used. Comply with requirements of the Environmental Protection Agency (EPA), 16 CFR 1305 dated 1978, and other governmental agencies having jurisdiction.
- 1.5 COORDINATION OF PHYSICAL SPACE:
- A. Coordinate use of physical space and sequence of installation of mechanical work, specifically ductwork, electrical work, and plumbing which is indicated diagrammatically on the Drawings. Follow routing indicated as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Coordinate work of the various trades to assure efficient and orderly utilization of space available.
 - B. The Contractor's attention is directed to the need of special coordination and efficient use of the available physical space to circulate pedestrian and vehicle traffic around work areas in a safe manner.

- C. In finished areas, except as indicated otherwise, conceal pipes, ducts, and conduits in the construction. Coordinate location of fixtures and outlets with finish elements.
- 1.6 COORDINATION OF SITE UTILITIES AND FACILITIES:
- A. Coordinate the work and sequence of installation of the various utilities and facilities. Coordinate connection of utility systems with public agencies and other trades. Comply with requirements of governing agencies and regulations. Notify Architect of any conflict and make modifications as directed by Architect.
- 1.7 WORK INDICATED AS NIC:
- A. The term "NIC" shall be construed to mean that construction work not to be furnished, installed or performed by the Contractor. The term shall mean "Not in this Contract" or "Not a Part of the Work to be performed by the Contractor" except that coordination and installation of certain NIC items specified shall be the Contractor's responsibility.
 - B. "NIC" work is indicated on the Drawings and specified herein as an aid to the Contractor in scheduling the amount of time and materials necessary for the completion of the Contract.
- 1.8 OWNER-FURNISHED CONTRACTOR-INSTALLED PRODUCTS (OFCI):
- A. Owner's Responsibilities: The Owner will arrange and pay for product delivery to the site in accordance with the construction schedule. The Owner and the Contractor shall jointly inspect the deliveries for shortages and damaged or defective items. The Owner will arrange for replacement of damaged, defective or missing items.
 - B. Contractor's Responsibilities: The Contractor shall unload, uncrate, and store the products at the site and shall protect them from exposure to the elements and other damage. Items damaged after acceptance by the Contractor shall be replaced at the Contractor's expense. The products shall be installed, connected, adjusted and finished in accordance with the applicable section of these Specifications.
- 1.9 WORK SEQUENCE:
- A. Construct the Work in stages as required to accommodate the Owner's use of the premises during the construction period. Coordinate the construction schedule and operations with the Owner.
 - B. Do not close off the Owner's use of facilities in subsequent stages until construction in the previous stage will provide alternative facilities for the Owner's use.
 - C. In preparing the construction schedule specified in General Conditions, the Contractor shall indicate phasing and other scheduling required to accommodate the Owner's operations. Upon completion of this schedule, the Contractor shall meet with the Owner and the Architect to discuss, and obtain approval of, such phasing.
- 1.10 CONTRACTOR'S USE OF THE PREMISES:
- A. The Contractor shall limit his use of the premises for construction activities and for storage, to allow for Owner occupancy or for construction activities by other contractors.

- B. The Contractor shall be responsible for the following:
1. Coordinate the use of the premises under the direction of the Owner.
 2. Assume full responsibility for the protection and safekeeping of products under this Contract that are stored at the site.
 3. Move stored products that are under the Contractor's control, which interfere with operations of the Owner or the other contractors.
 4. Obtain and pay for the use of additional storage or construction areas needed for operations.
 5. The Contractor shall make provisions to insure the security of the buildings. The Contractor shall coordinate its operations with the Owner to determine if any scheduled work could potentially compromise existing campus security.

1.11 OWNER OCCUPANCY:

- A. The Owner will occupy the premises during the entire period of construction for the conduct of his normal operations. Cooperate with the Owner in all construction operations including the following to minimize conflict and to facilitate Owner usage.
- B. If and when it should be necessary for the Contractor to impact the day-to-day operations of Owner's functions in order to pursue the Work, the Contractor shall furnish adequate notice to the Owner and coordinate the means and timing to avoid, minimize, or circumvent such impacts. The Owner reserves the right to assess and anticipate such impacts and the right to stop or postpone the Work until a mutually satisfactory time and means can be agreed upon. Costs incurred due to delays caused by such impacts on Owner's functions will be negotiated at the time of the occurrence of such delay. Typical impacts shall include, but not be limited to, the following:
1. Interruption of utility service serving the existing buildings, areas, or functions.
 2. Blockage of or inhibiting access to existing entries, exits, delivery or pickup points, driveways, fire hydrants. Particular care shall be taken to maintain access for delivery of supplies, entry and egress of students, visitors and employees.
 3. Noise, dust, dirt, water, fumes or other objectionable, hazardous, or disruptive conditions.
 4. Interruption of heating, air conditioning, and ventilating systems.
 5. Interruption of internal systems such as gas supplies, communications, fire sprinklers, fire alarms, internal deliveries, other systems.
- C. The Contractor shall strongly emphasize to all members of the construction team that the Owner expects a zero tolerance policy for contact with students.

1.12 DIVISION AND IDENTIFICATION OF DRAWINGS AND SPECIFICATIONS:

- A. The drawings and specifications are divided in sections and titled, as set forth in the drawing sheet index and the specification table of contents, for convenience of ready reference only, and the Contractor shall not construe such as establishing the scope of work of the various trades. The Contractor shall be responsible for dividing the work among

various subcontractors. The Architect assumes no responsibility to act as arbiter to establish subcontract limits of work. The Contractor shall be responsible for providing items, devices or parts of work regardless of where they are indicated in the drawings or specifications.

END OF SECTION

1/25/07

SECTION 01 31 13

ADDITIONAL REQUIREMENTS FOR DSA REVIEWED PROJECTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Additional requirements for projects reviewed by the Division of the State Architect (DSA).
- B. DSA Forms: See attached forms at the end of this Section.
 - 1. DSA-6 – Verified Report.
 - 2. DSA-103 – Statement of Structural Tests and Inspections.

1.2 RELATED SECTIONS

- A. Division 01 – Quality Requirements: Testing and Inspection.
- B. Division 01 – Execution and Closeout Requirements: Project closeout requirements.

1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of this Project Manual.
- C. California Code of Regulations (CCR).
 - 1. Title 8, Division 1, Chapter 3.2 – California Occupational Safety and Health Regulations (Cal/OSHA).
 - 2. Title 8, Division 1, Chapter 4, Sub-Chapter 4 – Construction Safety Orders.
 - 3. Title 8, Division 1, Chapter 4, Sub-Chapter 7 – General Industrial Safety Orders.
 - 4. Title 19, Division 1 –State Fire Marshal (SFM).
 - 5. California Administrative Code, California Code of Regulations, Title 24, Part 1: Refer to Chapter 4, Group 1, Safety of Construction of Public Schools.
- D. Division of the State Architect Interpretation of Regulations Manual (DSA IR)
 - 1. DSA IR A-6 – Change Order and Field Change Approval Processes.
 - 2. DSA IR A-7 – Project Inspector Certification and Approval.
 - 3. DSA IR A-8 – Project Inspector and Assistant Inspector Duties and Performance.
 - 4. DSA IR A-12 – Assistant Inspector Approval.
- E. Division of the State Architect Website: www.dsa.dgs.ca.gov

1.4 GENERAL REQUIREMENTS

A. Contractor's Duties:

1. Comply with California Administrative Code, Chapter 4, Article 6, Paragraph 4-343, "Duties of the Contractor" in addition to the duties described in the Contract Documents.
2. Comply with CCR Title 8, Division 1, Chapter 3.2, California Occupational Safety and Health Regulations (Cal/OSHA).
3. Comply with CCR Title 8, Division 1, Chapter 4, Sub-Chapter 4, Construction Safety Orders.
4. Comply with requirements of CCR Title 19, Division 1, State Fire Marshal (SFM).

B. Architect's and Architect's Consultants' Duties: Comply with requirements of California Administrative Code, Chapter 4, Article 6, Paragraph 4-341, "Duties of the Architect, Structural Engineer or Professional Engineer" and Paragraph 4-344, "Duties of Mechanical and Electrical Engineers," in addition to the duties described in the Contract Documents.

C. Arbitration: DSA is not subject to arbitration proceedings.

D. The intent of Drawings and Specifications is to comply with Title 24, CCR for alteration, rehabilitation, or reconstruction work. Should any deterioration or non-complying existing conditions, not part of the Work covered by the Contract Documents, be discovered and cause non-compliance with Title 24, CCR requirements, a Change Order (CO) shall be submitted to DSA for approval, prior to proceeding with remedial work.

1.5 REGULATORY REQUIREMENTS

A. Perform all work in accordance with applicable laws, codes, ordinances, rules, and regulations including, without limitation, Parts 1 through 5, Part 9, and Part 12, Title 24, CCR. Maintain a copy of these documents at the project site at all times.

B. Codes adopted by the City, County, State, and Federal agencies govern minimum project requirements. Comply with the latest edition of applicable regulatory requirements and standards unless otherwise indicated or specified.

C. Work as described in Drawings and Specifications shall not be construed as to permit work not in accordance with applicable laws, codes, ordinances, rules, and regulations.

1.6 INSPECTION AND SUPERVISION

A. Supervision by DSA shall be in accordance with California Administrative Code, Chapter 4, Article 5, Paragraph 4-334.

B. Owner will select and pay for the services of a Project Inspector, certified and approved by DSA in accordance with DSA IR A-7.

1. When required, Owner will select and pay for the services of additional full-time Assistant Project Inspector(s) certified and approved by DSA in accordance with DSA IR A-12

C. Project Inspector shall inspect construction in accordance with California Administrative Code, Chapter 4, Article 5, Paragraph 4-333(b), "Inspection by Project Inspector," and Article 6, Paragraph 4-342, "Duties of the Project Inspector" ; and DSA IR A-8.

1. Project Inspector performance rating by DSA shall be in accordance with DSA IR A-8, Section 2, "DSA's Rating of the Inspector's Performance."

D. Reports: Project Inspector shall submit the following in accordance with DSA IR A-7.

1. Notice of Start of Construction: Notify DSA of start of construction in accordance with California Administrative Code, Chapter 4, Article 5, Paragraph 4-331.
2. Semi-Monthly Reports: Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-337.
3. Verified Reports: Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-336.

E. Special Inspection Requirements:

1. Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-333(c), "Special Inspection."
2. Special inspection costs to be paid by Owner.
3. Conduct special inspection in accordance with DSA-103, Statement of Structural Tests and Inspections.

1.7 TESTING AGENCY REQUIREMENTS

- A. Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-335, "Tests."
- B. Owner will select the Testing Agency, acceptable to DSA, with the advice of Architect and Structural Engineer.
- C. Sampling and testing shall be performed by properly qualified persons in accordance with applicable American Society for Testing and Materials (ASTM) standards.
- D. Conduct tests in accordance with DSA-103, Statement of Structural Tests and Inspections.
- E. Submit one copy of test reports to DSA.

1.8 SUBSTITUTIONS AND REQUESTS FOR INFORMATION

- A. Substitutions and Requests for Information (RFIs) that affect structural safety, fire and life safety, access compliance or energy (as applicable) shall be submitted to DSA for review and approval prior to fabrication and installation on the project.

1.9 ADDENDA AND CHANGE ORDERS

- A. Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-338, "Addenda and Change Orders."
- B. Comply with DSA IR A-6.
- C. Obtain DSA approval for changes to Code-regulated construction and inspection/testing functions prior to start of that Work. Code-regulated construction refers to Work that is regulated by Code provisions applicable to public school construction, including those adopted by Division of the State Architect-Structural Safety Section (DSA/SS), Division of the State Architect-Access Compliance Section (DSA/AC), and Division of the State Architect-Fire and Life Safety Section (DSA/FLS).
- D. Changes can be approved by DSA through Field Change Document (FCD) Approval Process or Change Order (CO) Process, as applicable. Comply with DSA IR A-6, Article 3, Section 3.1, "Field Change Document (FCD) Approval Process," and DSA IR A-6, Article 3, Section 3.2, "Change Order (CO) Approval Process."
- E. Do not begin any work under addendum or change order until required DSA written approval is obtained.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

CONTRACTOR VERIFIED REPORT

This form shall be completed by each contractor having a contract with the owner, in accordance with California Code of Regulations, Title 24, Part 1, Sections 4-343 or 4-220. The completed form shall be submitted to the Design Professional in General Responsible Charge, DSA, the project inspector and the school board.

School District/Owner:		DSA File #:	-
Project Name/School:		DSA App. #:	-
Date of Report:	Number of Attached Pages: (If none, enter zero.)	DSA 152 Card #(s):	
Note that DSA-approved construction documents, referred to below, are those portions of the construction documents, duly approved by DSA, that contain information related to and affecting the Structural Safety, Fire/Life Safety, and Accessibility portions of the project.		List all inspection card numbers for which this verified report applies.	
COMPLETE SECTIONS 1, 2, 3 & 4 AND PROVIDE ALL REQUIRED DOCUMENTATION			
1. CONTRACTOR INFORMATION (Enter name and check applicable box.)			
Name of Contractor (Company/Firm) Submitting this Report:			
<input type="checkbox"/>	Operating as general contractor responsible for all work shown in the <i>DSA-approved</i> construction documents.		
<input type="checkbox"/>	Operating as contractor responsible for part of the work shown in the <i>DSA-approved</i> construction documents. (Describe scope of work in the contract. Attach additional pages, using form DSA 211, if necessary):		
2. REASON FOR FILING THIS VERIFIED REPORT (Check applicable box.)			
<input type="checkbox"/>	Final Verified Report: Construction of all work shown in the <i>DSA-approved</i> construction documents that is part of my contract is complete.		
<input type="checkbox"/>	Termination of contract prior to completion of all work in the contract (Provide last date of work):		
<input type="checkbox"/>	DSA Request dated:		
3. DEFERRED SUBMITTALS (Check applicable box.)			
<input type="checkbox"/>	This project does not require deferred submittals within the scope of my contract.		
<input type="checkbox"/>	All deferred submittals within the scope of my contract are approved by DSA.		
<input type="checkbox"/>	The following deferred submittals, within the scope of my contract, are not approved by DSA (Provide list. Attach additional pages, using form DSA 211, if necessary.):		
4. DEVIATIONS AS OF THE DATE OF THIS REPORT (Check applicable box.)			
<input type="checkbox"/>	There are no outstanding or unresolved deviation notices pertinent to my contract and related to work shown in the <i>DSA-approved</i> construction documents.		
<input type="checkbox"/>	There are unresolved deviation notices pertinent to my contract and related to work shown in the <i>DSA-approved</i> construction documents. They are documented by the following form DSA 154 Notice of Deviations (provide list of DSA 154 Notice numbers and attach copies).		
<input type="checkbox"/>	There is work pertinent to my contract that is not completed in compliance with the <i>DSA-approved</i> construction documents. (Briefly describe. Attach additional pages, using form DSA 211, if necessary.)		

I attest that based on my own personal knowledge (as defined in California Code of Regulations, Title 24, Part 1, Sections 4-336 and 4-214) that, except as marked in Sections 3 and 4, as of the date of this report, the work has been performed and materials have been used and installed, in every material respect, in compliance with the *DSA-approved* construction documents. I declare under penalty of perjury that I prepared this report and that all statements are true.

Contractor Signature: _____ Date: _____

Print Name: _____ Contractor's License No.: _____

Submit completed form to the DSA Regional Office with construction oversight authority for the project.



DSA-103 Issued 9/1/2017
List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT # DSA File No.:
 Application No.:
 Date Submitted: Revised:
 Revised:

School Name District

IMPORTANT: This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A.
NOTE: This form is also available for projects submitted for review under the 2007, 2010, and 2013 CBC.

INSTRUCTIONS: Click a plus sign (+) before any category or subcategory to reveal additional tests and special inspections. A shaded box indicates a test or special inspection that may be required, depending on the scope of the construction and other issues. A shaded box can be clicked indicating your selection of that test. **Note:** A minus (-) on a category or subcategory heading indicates that it can be collapsed. However, any selections you may have made will be cleared. Click on the "COMPILE" button to show only the tests and inspections finally selected. **For more information on use of this form, see DSA-103.INSTR.**

Note: References are to the 2016 edition of the California Building Code (CBC) unless otherwise noted.

REQUIRED	TEST OR SPECIAL INSPECTION	TYPE:	PERFORMED BY:	CODE REFERENCE AND NOTES
+	SOILS			
+	CONCRETE			Table 1705A.3, ACI 318-14 Sections 26.12 & 26.13
+	MASONRY			TMS 402-13/ACI 530-13/ASCE 5-13 Table 3.1.3 & TMS 602-13/ACI 530.1-13/ASCE 6-13 Table 5
+	STEEL, ALUMINUM			Table 1705A.2.1, AISC 303-10, AISC 360-10, AISC 341-10, AISC 358-10, AISI S100-07/S2-10
+	WOOD			
+	OTHER			

List of required verified report(s):

KEY to Columns	
1 Type -	2 Performed By -
Continuous – Indicates that a continuous special inspection is required	GE – Indicates that the special inspection is to be performed by a registered geotechnical engineer or his or her authorized representative
Periodic – Indicates that a periodic special inspection is required	LOR – Indicates that the test or inspection is to be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See section 4-335, 2013 CCR Title 24, Part 1.
Test – Indicates that a test is required	SI – Indicates that the special inspection is to be performed by a special inspector

Name of Architect or Engineer in general responsible charge

Name of Structural Engineer (When structural design has been delegated)

Signature of Architect or Structural Engineer date

IDENTIFICATION STAMP
 DIV OF THE STATE ARCHITECT
 APP. #
 AC N/A F/LS N/A SS _____
 DATE _____

Appendix: Work Exempt from DSA Requirements for Special Inspection or Structural Testing

Exempt items given in IR A-22 or the 2016 CBC (including DSA amendments) and those items identified below with an "X" by the design professional are NOT subject to DSA requirements for the structural tests or special inspections noted. Items marked as exempt shall be identified by either: 1) listing specific details/sheets noted in the spaces provided below OR 2) on the approved construction documents. The project inspector shall verify all construction complies with the approved construction documents.

Exempted by Design Prof.

Soils:

Exempted by Design Prof.

Welding:



DSA-103 Issued 9/1/2017
List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #	DSA File No.:	
	Application No.:	
Date Submitted:	Revised:	
	Revised:	

X	1. Deep foundations acting as a cantilever footing designed based on minimum allowable pressures per 2016 CBC Table 1806A.2 and having no geotechnical report for the following types of structures: free standing sign, scrolling message sign, scoreboard, covered walkway or shade structure with dead load less than 5 psf and other light-weight structures of which the apex is less than 8' above the highest adjacent grade.
X	2. Shallow foundations meeting the exception item #1 criteria specified in 2016 CBC Section 1803A.2.
(Optional) List details for applicable exempt items:	
Concrete/Masonry:	
X	1. Post-installed anchors for the following: 1) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see item 7 for "Welding") given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) or 2) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding."
X	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.3.2 subject to the requirements and limitations in that section.
X	3. Masonry retaining walls less than 4'-0" above the top of foundation not supporting a surcharge and free standing nonbearing non-shear masonry walls up to 6'-0" above adjacent grade do not require grout, mortar or masonry core testing or DSA special inspection.
X	4. Epoxy shear dowels in site flatwork.
(Optional) List details for applicable exempt items:	

X	1. Solid-clad and open-mesh gates with maximum leaf span or rolling section for rolling gates of 10' and apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
X	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds cannot be ground flush.
X	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
X	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	7. Any support for exempt non-structural components given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) meeting the following: 1) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) ≤ 4' above supporting floor/roof, 2) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.
(Optional) List details for applicable exempt items:	

SECTION 013516 - ALTERATION PROJECT PROCEDURES

PART 1 - EXECUTION

1.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work or spillage.
 - 1. Provide temporary barricades and/or barriers to protect and exclude the public from areas where alteration work is being performed.
 - 2. Provide directional signage to protect and exclude the public from areas where alteration work is being performed.
 - 3. Provide covers over walkways to protect and exclude the public from areas where alteration work is being performed.
 - 4. Erect temporary barriers to form and maintain fire-egress routes.
 - 5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
 - 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
 - 7. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
 - 8. Collect and dispose of runoff in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.
- B. Protect existing materials, including floors along hauling routes, with temporary protections and construction.
 - 1. Use covering materials and masking agents that will not stain or leave residue on surfaces. When no longer needed, promptly remove protective materials.
- C. Comply with each product manufacturer's written instructions for protections and precautions.
- D. Utility and Communications Services: Notify Owner; Architect; authorities having jurisdiction; and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations. Disconnect and cap pipes and services as required by authorities having jurisdiction, and provide temporary services during interruptions to existing utilities.
- E. Existing Drains: Prior to the start of work in an area, verify that drainage system is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work until the drainage system is functioning properly.
 - 1. Prevent solids or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked from alteration work.

1.2 PROTECTION FROM FIRE

- A. Comply with NFPA 241 requirements unless otherwise indicated.
- B. Fire-Control Devices: Maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids.
- C. Sprinklers: Maintain sprinkler protection without interruption. While operations are performed close to sprinklers, shield them temporarily with guards and remove guards when nearby work is paused or completed.

1.3 GENERAL ALTERATION WORK

- A. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.
- B. Notify Architect of visible changes in the integrity of material or components, including cracks, movement, or distortion.
 - 1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 013516

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
- B. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Architect for a decision.
- C. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum. The actual installation may exceed the minimum within reasonable limits. Indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision.
- D. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, notices, receipts for fee payments, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- F. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

- G. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated; and where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- I. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- J. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction.

PART 2 - EXECUTION

2.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
- B. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- B. Abbreviations and Acronyms: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
1. ALSC – American Lumber Standard Committee; www.alsc.org.
 2. ANSI - American National Standards Institute; www.ansi.org.
 3. APA - APA - The Engineered Wood Association; www.apawood.org.
 4. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
 5. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
 6. ASSE - American Society of Safety Engineers (The); www.asse.org.
 7. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
 8. AWWA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
 9. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
 10. CABO – Council Of American Building Officials
 11. CFR – Code of Federal Regulations; www.ecfr.gov.
 12. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
 13. DHI - Door and Hardware Institute; www.dhi.org.
 14. DOC – Department of Commerce; www.commerce.gov.
 15. EPA – The Environmental Protection Agency; www.epa.gov.
 16. FSC - Forest Stewardship Council U.S.; www.fscus.org.
 17. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
 18. MPI - Master Painters Institute; www.paintinfo.com.
 19. NECA - National Electrical Contractors Association; www.necanet.org.
 20. NEMA - National Electrical Manufacturers Association; www.nema.org.
 21. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
 22. NRCA - National Roofing Contractors Association; www.nrca.net.
 23. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
 24. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
 25. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
 26. UL - Underwriters Laboratories Inc.; www.ul.com.
 27. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
 28. WWPA - Western Wood Products Association; www.wwpa.org.

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Provide field offices, storage and fabrication sheds, and other support facilities as necessary for construction operations. Store combustible materials apart from building.

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

- C. Heating and Cooling: Provide temporary heating and cooling required for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- D. Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

3.2 SUPPORT FACILITIES INSTALLATION

- A. Install project identification and other signs in locations approved by Owner to inform the public and persons seeking entrance to Project.
- B. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways.
- C. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- D. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- E. Furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
- F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- G. Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
- H. Install and maintain temporary fire-protection facilities. Comply with NFPA 241.

3.4 MOISTURE AND MOLD CONTROL

- A. Before installation of weather barriers, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.
 - 1. Protect stored and installed material from flowing or standing water.
- B. After installation of weather barriers but before full enclosure and conditioning of building, protect as follows:
 - 1. Do not load or install drywall or porous materials into partially enclosed building.
 - 2. Discard water-damaged material.
 - 3. Do not install material that is wet.
 - 4. Discard, replace, or clean stored or installed material that begins to grow mold.
 - 5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion.
- C. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period.

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
- B. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced.
 - 1. Show compliance with requirements for comparable product requests.
 - 2. Architect will review the proposed product and notify Contractor of its acceptance or rejection.
- C. Basis-of-Design Product Specification Submittal: Show compliance with requirements.
- D. Compatibility of Options: If Contractor is given option of selecting between two or more products, select product compatible with products previously selected.
- E. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Deliver products to Project site in manufacturer's original sealed container or packaging, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 3. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 - 4. Store materials in a manner that will not endanger Project structure.
 - 5. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
- F. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. Provide products that comply with the Contract Documents, are undamaged, and, unless otherwise indicated, are new at the time of installation.

1. Provide products complete with accessories, trim, finish, and other devices and components needed for a complete installation and the intended use and effect.
 2. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Where the following headings are used to list products or manufacturers, the Contractor's options for product selection are as follows:
1. Products:
 - a. Where requirements include "one of the following," provide one of the products listed that complies with requirements.
 - b. Where requirements do not include "one of the following," provide one of the products listed that complies with requirements or a comparable product.
 2. Manufacturers:
 - a. Where requirements include "one of the following," provide a product that complies with requirements by one of the listed manufacturers.
 - b. Where requirements do not include "one of the following," provide a product that complies with requirements by one of the listed manufacturers or another manufacturer.
 3. Basis-of-Design Product: Provide the product named, or indicated on the Drawings, or a comparable product by one of the listed manufacturers.
- C. Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
- D. Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Architect will consider Contractor's request for comparable product when the following conditions are satisfied:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications.
 3. List of similar installations for completed projects, if requested.
 4. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 EXECUTION REQUIREMENTS

A. Cutting and Patching:

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.2 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit one copy.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

1. Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other sections, including project record documents, operation and maintenance manuals, warranties and similar documents.
3. Submit maintenance material submittals specified in other sections, including tools, spare parts, extra materials, and similar items.
4. Submit test/adjust/balance records.
5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

B. Procedures Prior to Substantial Completion: Before requesting Substantial Completion inspection, complete the following:

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner.
3. Complete startup and testing of systems and equipment.
4. Remove temporary facilities and controls.
5. Complete final cleaning requirements, including touchup painting.

6. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Existing Conditions: 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.
- B. Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance.
 1. Verify compatibility with and suitability of substrates.
 2. Examine roughing-in for mechanical and electrical systems.
 3. Examine walls, floors, and roofs for suitable conditions.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Take field measurements as required to fit the Work properly. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.
- E. Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- F. Surface and Substrate Preparation: Comply with manufacturer's written recommendations for preparation of substrates to receive subsequent work.

3.2 CONSTRUCTION LAYOUT AND FIELD ENGINEERING

- A. Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks.
- B. Engage a land surveyor to lay out the Work using accepted surveying practices.

3.3 INSTALLATION

- A. 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. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations.
- C. 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.
- D. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
- E. 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.
- F. Use products, cleaners, and installation materials that are not considered hazardous.

3.4 CUTTING AND PATCHING

- A. Provide temporary support of work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- D. Cutting: Cut in-place construction using methods least likely to damage elements retained or adjoining construction.
 - 1. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- E. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
 - 1. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - 2. Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance.

3. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

3.5 CLEANING

- A. Clean Project site and work areas daily, including common areas. Dispose of materials lawfully.
 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.
 3. Remove debris from concealed spaces before enclosing the space.
- B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion:
 1. Clean Project site, yard, and grounds, in areas disturbed by construction activities. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 2. Sweep paved areas broom clean. Remove spills, stains, and other foreign deposits.
 3. Remove labels that are not permanent.
 4. Clean transparent materials, including mirrors. Remove excess glazing compounds.
 5. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Sweep concrete floors broom clean.
 6. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and foreign substances. Clean plumbing fixtures. Clean light fixtures, lamps, globes, and reflectors.
 7. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

3.6 OPERATION AND MAINTENANCE MANUAL PREPARATION

- A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 1. Prepare supplementary text if manufacturers' standard printed data are unavailable and where the information is necessary for proper operation and maintenance of equipment or systems.

- C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams.

3.7 DEMONSTRATION AND TRAINING

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Include a detailed review of the following:
 - 1. Include instruction for basis of system design and operational requirements, review of documentation, emergency procedures, operations, adjustments, troubleshooting, maintenance, and repairs.

END OF SECTION 017000

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Items indicated to be removed and salvaged remain Owner's property. Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.
- B. Owner will occupy portions of the site immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- C. It is not expected that hazardous materials will be encountered in the Work. If hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with EPA regulations and with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 DEMOLITION

- A. Maintain services/systems indicated to remain and protect them against damage during selective demolition operations. Before proceeding with demolition, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of the building.
- B. Locate, identify, shut off, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
- C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.
- D. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

- E. Protect walls, ceilings, floors, and other existing finish work that are to remain. Erect and maintain dustproof partitions. Cover and protect furniture, furnishings, and equipment that have not been removed.
- F. Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
- G. Provide temporary weather protection to prevent water leakage and damage to structure and interior areas.
- H. Requirements for Building Reuse:
 - 1. Maintain existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
 - 2. Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
- I. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.
- J. Remove demolition waste materials from Project site. Do not burn demolished materials.
- K. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119



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**HAZARDOUS MATERIALS SURVEY
FINAL REPORT**

OWNER/CLIENT

**Nevada Joint Union High School District
11645 Ridge Road
Grass Valley, CA 95945**

CONTACT

**Paul Palmer
Director of Facilities & Construction**

SURVEY ADDRESS

**Nevada Union High School
11761 Ridge Road
Grass Valley, CA 95945**

BUILDING SURVEYED

**Nevada Union High School - Pool House
Pool House Renovation Project**

PREPARED BY

**Andy Roed
CAC #16-5695 & CDPH #I/A-29001
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Entek Project #18-4748

May 9, 2018



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Executive Summary

The United States Environmental Protection Agency, National Emission Standards for Hazardous Air Pollutants (US EPA NESHAP), 40 CFR Part 61 - Nov. 20, 1990, requires an owner or operator of a demolition or renovation project to thoroughly inspect the affected facility or part of the facility where the demolition or renovation operation will occur for the presence of asbestos-containing materials (ACM) prior to the commencement of that project.

This inspection report was requested by Mr. Paul Palmer, Director of Facilities & Construction with Nevada Joint Unified School District.

The purpose of the inspection was to comply with US EPA NESHAP requirements and the California Air Resource Board (CARB) which has jurisdiction for this project site to determine if asbestos containing materials are present which may be impacted during an upcoming renovation project, which includes renovation of the interior of the pool house building. In addition, roofing materials may be impacted as part of this project. However, the exterior walls are not anticipated to be impacted as part of this renovation.

The attached drawing shows approximate sample locations. Materials are classified in the tables of this report as regulated asbestos containing material (RACM), Category I (CAT-I) or Category II (CAT-II) ACM, or asbestos containing construction material (ACCM), which included collecting multiple samples of some materials.

This is a summary of the report. The report must be read in its entirety, and the reader must review all the detailed information provided in the body of the report prior to making any interpretations, or conclusions pertaining to the information. Any conclusions made by the reader about the information provided in the body of this report which are contradictory or not included in this report are the responsibility of the reader.

Asbestos

On April 20, 2018, Entek conducted a survey specific to areas designated by the Owner which included the interior and roof system of the Pool House Building (Building P) at Nevada Unified Highschool located at 11761 Ridge Road in Grass Valley, California.

The results of testing for asbestos during this survey indicate asbestos is present in multiple materials which included:

- Joint Compound Associated with Gypsum Wallboard
- Black/Gray Sealant at Roof Penetrations
- Boiler Tank Insulation (small green boiler)

Specifics pertaining to individual materials can be found in later sections of this report.

Lead

Entek investigated existing paints, applied coatings and glazed ceramic tiles in an effort to determine if lead was present in these materials. None of the paints or materials sampled were determined to contain more than 5,000 ppm or 1.0 mg/cm² lead which would classify them as lead-based paint (LBP).

Other paints or applied coatings to include; white paint on interior drywall walls, clear glaze on 4"x4" white with brown streaks ceramic wall tile, and the white with brown streaks 6"x6" ceramic cove base tile the were determined to contain lead in amounts less than 5,000 ppm and are classified as lead containing paint (LCP). Any work designated by California Occupational Safety Health Administration (Cal/OSHA) as a "trigger task" which will impact these paints, coatings, or materials must be done by properly trained personnel, in compliance with all lead related Cal/OSHA regulations and requirements.

Other Hazardous Materials

Entek did not specifically inspect for mercury containing fluorescent light tubes or light ballast which may contain polychlorinated biphenyls (PCBs), thermostats which may contain mercury switches, equipment or systems which may contain Freon or other fluorocarbons, or smoke detectors which may contain a radioactive element. However, information pertaining to these materials is included in this report for your use and reference, since these light systems are present on the project.

Introduction

This report presents results of an asbestos and lead survey performed by Entek which included the interior and the roofing system as designated by Mr. Paul Palmer to be included in an upcoming renovation project. This structure has been designated Building P, or the Pool House Building and is located at 11761 Ridge Road in Grass Valley, California. Fluorescent lights were observed at this project site; therefore, this report also includes references to regulations pertaining to handling practices and waste disposal of PCB light ballasts and mercury containing light tubes and thermostats which may be impacted during this project.

The inspection was conducted by Mr. Andy Roed on April 20, 2018. Mr. Roed is a Cal/OSHA Certified Asbestos Consultant (CAC) and a State of California Department of Public Health (CDPH) certified Lead Inspector/Assessor.

This report was prepared for Mr. Paul Palmer, Director of Facilities and Construction with Nevada Joint Unified School District. Mr. Palmer will be directly overseeing this project.

Building Description

Building P, or the Pool House Building is a single story slab on grade structure. The interior of the structure was divided into 4 distinct rooms. From north to south, the 4 rooms were the boys locker room, storage room, girls locker room, and pump room. Floor systems consists of bare concrete throughout with the exception of ceramic floor tile in the shower area of each locker room. Wall systems of the storage room and pump room consisted of drywall

and joint compound. Wall systems of the locker rooms consisted of plaster. The ceiling was an exposed wood deck.

Asbestos Inspection and Sample Collection Protocols

Entek included the interior and roofing system of the pool house building included in this report.

Entek did not use any demolition methods to look within enclosed wall or ceiling cavities during this investigation. Entek did not inspect inside any operating equipment or disconnect piping to inspect for potential gaskets. Entek did include all suspect materials observed in, on, or associated with the areas included in this report.

Entek reviewed existing records pertaining to previous bulk sampling reports to determine if adequate sampling of some or all existing suspect materials had already been performed.

Bulk samples were collected of various materials suspected to contain asbestos by utilizing a power drill and coring tube, cutting the materials with a razor knife, or use of other appropriate hand tools.

Surfacing materials were collected in a statistically random manner representative of the associated homogenous area as required in 40 CFR Part 763, Asbestos-Containing Materials in Schools; Final Rule and Notice, published October 30, 1987.

Thermal system insulation (TSI) materials were collected in a randomly distributed manner from each homogenous area that was not assumed to be ACM as required in 40 CFR Part 763, Asbestos-Containing Materials in Schools; Final Rule and Notice, published October 30, 1987.

Miscellaneous materials were collected from each homogenous area in a manner sufficient to determine whether the material is or is not ACM as required in 40 CFR Part 763, Asbestos-Containing Materials in Schools; Final Rule and Notice, published October 30, 1987.

Approximate locations of all samples collected during this inspection are indicated on the "Bulk Asbestos Material Analysis Request Form for Entek", which served as the chain of custody for the samples, and on the building diagram(s) attached to this report.

Asbestos Bulk Sample Results

There were several materials observed which are considered "suspect" under US EPA guidelines. Under current US EPA guidelines for conducting building inspections for ACM, all "suspect" materials must be assumed to contain asbestos until otherwise determined by laboratory testing.

The samples of materials suspected of containing asbestos were submitted to Asbestech, a laboratory located in Carmichael, California. These samples were subsequently analyzed by polarized light microscopy (PLM) with dispersion staining.

The US EPA NESHAP and CARB uses the terms Regulated Asbestos Containing Material (RACM), Category I, and Category II when identifying materials which contain asbestos in amounts greater than 1%. Cal/OSHA uses the term Asbestos Containing Material (ACM) for materials containing >1% asbestos and the term Asbestos Containing Construction Material (ACCM) which indicates a manufactured construction material contains greater than 0.1% asbestos by weight by the PLM method. This definition can be found in Title 8, 1529.

All samples found to contain <1% asbestos by PLM analysis which are not identified as containing >1% asbestos, classified as RACM, CAT-I, or CAT-II materials in the following results tables were additionally analyzed using the 400 point count (PC) method with analysis by PLM. This additional analysis is required by NESHAP and enforced by the CARB. The PC method analysis results were used only to verify a material did not contain >1% asbestos as a single layer material, or as a composite result which is provided for materials such as sheet rock/drywall and joint compound used for wall/ceiling systems. A result reported as none detected or “trace” by the PC method only verified the initial PLM result of <1% and shall not be used to determine the identified material does not contain asbestos. Copies of Asbestech’s laboratory reports and accreditations are attached.

Neither OSHA or Cal/OSHA allow for composite sampling of wall system materials, and neither address the use of the PC method to confirm a material identified as containing <1% asbestos by the PLM method either contains <1% asbestos or is non-detected for asbestos. As a result, reporting of the asbestos content related to a composited material such as sheet rock/drywall and joint compound does not apply to determining if a material is or is not an ACM by OSHA or an ACCM by Cal/OSHA.

A total of 25 bulk samples were collected of all the materials considered to be "suspect", which had not been previously sampled, and which were observed during this investigation. Some of those samples contained multiple layers which were individually analyzed to determine their asbestos content. Analysis of all samples collected was by PLM with dispersion staining. Results of the analysis are listed in the following tables:

Suspect Materials Found or Known TO Contain >1% Asbestos (RACM)				
Sample ID#’s	Suspect Material	Asbestos Content/Type (%) by PLM	Location	Total Estimated Quantity
Assumed	White Boiler Tank Insulation	Assumed From Previous Sampling	Pump Room, Green Boiler, Nearest East Wall	75 SF

Suspect Materials Found or Known TO Contain >1% Asbestos (Category II)				
Sample ID#’s	Suspect Material	Asbestos Content/Type (%) by PLM	Location	Total Estimated Quantity
12A-B	Black/Gray Penetration Sealant	1-5 % Chrysotile	Roof, Penetrations Throughout	8 SF

NOTE: Any Category I or Category II materials identified in the previous tables which will be subjected to mechanical removal, must be considered RACM for the purposes of notification to the CARB and classification of waste. Removal of any Category I or Category II materials prior to demolition of a building is dependent upon how the materials will be impacted and if the impact will cause the materials to become friable. If any remaining Category I or Category II materials will become friable they must be removed prior to the initiation of demolition.

Suspect Materials Found or Known TO Contain <1% Asbestos (ACCM)				
Sample ID#'s	Suspect Material	Asbestos Content/Type (%) by PLM/PC	Location	Total Estimated Quantity
01A-D	Drywall and Joint Compound	None Detected (Drywall) <1% Chrysotile (Joint Compound) <1% Chrysotile (Composiste) Confirmed by 400 Point Count	Storage Room and Pump Room Walls Throughout	2,000 SF

NOTE: Cal/OSHA regulates all materials containing greater than 0.1% asbestos. As a result, impact to materials identified as ACCM and ACM must be performed by properly asbestos trained personnel utilizing appropriate personal protection, work practices, as well as, properly constructed and demarcated work areas or containments, in accordance with Cal/OSHA asbestos regulations.

Suspect Materials Found NOT TO Contain Asbestos or Considered Non-Suspect				
Sample ID#'s	Suspect Material	EPA AHERA "Suspected" ACBM	Asbestos Content	Location
02A-C	Texture, Smooth	Surfacing	None Detected	Storage Room and Pump Room
03A-E	Plaster with Skim Coat	Surfacing	None Detected	Locker Room Walls Throughout
04A	4"x4" White with Brown Streaks Ceramic Wall Tile and White Grout	Miscellaneous	None Detected	Locker Rooms, Select walls
05A	1"x1" Brown and Tan Ceramic Floor Tile and Black Grout	Miscellaneous	None Detected	Locker Rooms, Floor in Select Areas

Suspect Materials Found NOT TO Contain Asbestos or Considered Non-Suspect				
Sample ID#'s	Suspect Material	EPA AHERA "Suspected" ACMF	Asbestos Content	Location
06A	6"x6" White with Brown Streaks Ceramic Cove Base Tile and White Grout	Miscellaneous	None Detected	Locker Rooms, Cove Base at Perimeters of Rooms
07A-B HMS-C546B-04A-B	White Boiler Tank Insulation	Thermal System Insulation	None Detected	Large Boiler, East Wall, South Corner
08A	Black Vibration Damper Cloth	Miscellaneous	None Detected	Boiler Room, HVAC Ducting
09A	Concrete	Miscellaneous	None Detected	Foundation Throughout
10A	Multi-Colored Mosaic Tile with White Grout	Miscellaneous	None Detected	Outdoors, Near Water Fountains
11A-B	Asphaltic Shingles over Rolled Roofing	Miscellaneous	None Detected	Roof Throughout

All sample number noted in the tables above start with EGG-18-4748-

The tables above provide an estimate of the amount of materials in square feet or linear feet. Contractors are responsible for quantifying the exact quantity of materials impacted by the renovation or demolition and shall not rely on the quantities in the above tables.

US EPA AHERA uses three terms when determining the classification of a material for the purpose of sampling. These terms include miscellaneous, surfacing, and thermal system insulation (TSI).

Miscellaneous materials are building materials on structural components, structural members or fixtures, such as floor and ceiling tiles, and does not include surfacing material or TSI.

Surfacing materials are materials that are sprayed-on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceiling and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes.

TSI is material applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain, water condensation, or for other purposes.

The information provided in the tables of this report are for use by the Owner in determining where asbestos containing materials are located, and whether or not any future work may impact those materials. The information is also provided for use by any contractor who may perform work in areas impacting the materials listed in this report, and for use as

appropriate by asbestos abatement contractors to provide costs related to work impacting ACM.

Any building materials which are considered “suspect” for containing asbestos which have not been identified in this report must be assumed to contain asbestos in amounts >1% until properly investigated and/or tested.

Materials commonly excluded from being suspected for containing asbestos include, but are not limited to: unwrapped pink and yellow fiberglass insulating materials or products, foam insulation, wood, metal, plastic, or glass. All other types of building materials or coatings on the materials listed above are commonly listed as “suspect” and must be tested prior to impact by a Contractor. Work impacting these untested or newly discovered materials must cease until an investigation can be completed.

Asbestos Regulatory Requirements

US EPA

The property included in this survey report is located in Nevada County. The California Air Resource Board (CARB) has been given authority for enforcement of the NESHAP regulations by means of their own rules.

A demolition is the wrecking, taking out, or burning of any load supporting structural member. A renovation is everything else. 10 day written notification to CARB is required prior to the performance of any demolition project regardless of asbestos being present or not. This notification would also apply to any renovation project which involves the wrecking, taking out, or burning of any load bearing structural member during a renovation as well.

There is not a sufficient amount of ACM present to require a 10 day notification to the CARB be submitted prior to starting work which will impact materials identified as RACM or Category I and Category II materials if they are made friable. If more than 160 square feet, 260 linear feet or 35 cubic feet of RACM is planned for removal on the project, formal written notification to the CARB is required.

Cal/OSHA

Disturbance of any ACM or ACCM could generate airborne asbestos fibers and would be regulated by Cal/OSHA. Cal/OSHA worker health and safety regulations apply during any disturbance of ACM or ACCM by a person while in the employ of another. This is true regardless of friability or quantity disturbed. Since it has been estimated more than 100 square feet of ACCM does exist and will be impacted during the upcoming project, a licensed asbestos contractor, certified by the State of California, and registered with Cal/OSHA is required to perform the asbestos related removal work. Entek recommends a licensed asbestos contractor be used to remove ACCM even if less than 100 square feet of ACCM is being disturbed.

For compliance with Title 8, Section 341.9, the asbestos contractor must send written notice at least one day (24 hours) prior to start of any work which will impact any amount of asbestos to the local office for the State of California, Department of Occupational Safety and Health, and perform all work in accordance with Cal/OSHA requirements.

Lead Inspection, Sampling and Results

Seven (7) bulk samples of the painted surfaces from the interior of the project structure were collected and submitted to Asbestech Laboratory. These samples were subsequently analyzed by atomic absorption spectrometry (AAS). Results of the analysis are listed in the following tables:

Paints/Coatings/ Materials Determined to be Lead Containing Paint (LCP)		
Paint/Coating Color or Material	Lead Content (ppm)	Component/Location
White Paint	66	Interior Walls Throughout
Clear Glaze	230	4"x4" White with Brown Streaks Ceramic Wall Tile
Clear Glaze	790	6"x6" White with Brown Streaks Ceramic Cove Base Tile

LCP - Materials/coatings/paints which contain measurable amounts of lead. The disturbance of these materials/coatings/paints is regulated by Cal/OSHA.

Paints/Coatings/Materials Determined NOT TO Contain Lead (<50ppm)	
Paint/Coating Color or Material	Building Component
White Paint	Wood Ceiling
Gray Paint	Concrete Floors
Blue Paint	Wood Doors and Door Frames
Multi Color Mosaic Tiles Glaze	Mosaic Tiles, Exterior, Near Water Fountains

Paints determined “NOT TO” contain lead for the purposes of this report are those samples which when analyzed did not indicate lead to be present at or above the limit of detection for the analysis method used. This limit of detection was 50 parts per million (ppm). As a result, any paints shown “NOT TO” contain lead will not require any special training or work practices related to lead when impacted.

Lead Regulatory Compliance

Any upcoming project which may result in the disturbance of lead containing products or surfaces, but is not intended to remediate a lead hazard or specifically designed to remove LBP to reduce or eliminate a known hazard, would be considered “lead related construction work”.

Lead related construction work does not fit the classification of a “lead abatement project” under CDPH Title 17 regulations. “*Abatement*” is defined in Title 17, Division 1, Chapter 8, Article 1 as “any set of measures designed to reduce or eliminate lead hazards or LBP for public and residential buildings, but does not include containment or cleaning.” A *lead hazard* is defined in Title 17, Division 1, Chapter 8, Article 1 as “deteriorated LBP, lead contaminated dust, lead contaminated soil, disturbing LBP or presumed LBP without containment, or any other nuisance which may result in persistent and quantifiable lead exposure.”

Lead related construction work means any “construction, alteration, painting, demolition, salvage, renovation, repair, or maintenance of any residential or public building, including preparation and cleanup, that, by using or disturbing lead-containing material or soil, may result in significant exposure of adults or children to lead”. (Title 17, California Code of Regulations, Division 1, Chapter 8, Article 1).

Currently, Cal/OSHA has not established a definition for LBP, nor have they established minimum concentrations where their regulations do not apply. Cal/OSHA regulates all construction activities involving materials containing lead, including LBP. These regulations are found in CCR, Title 8 Section 1532.1 (§1532.1) Lead in Construction.

Since Cal/OSHA has not established a concentration of lead in a product where their regulations do not apply, any disturbance to products containing lead come under the jurisdiction of Cal/OSHA and their regulations. Disturbance of paints/coatings or materials determined to be LBP may trigger a pre-work notification to Cal/OSHA if “trigger tasks” disturb 100 square feet or more of those paints/coatings or materials. Trigger tasks are described in Title 8 CCR 1532.1.

Fluorescent Light Tubes and Polychlorinated Biphenyls (PCBs)

Fluorescent light tubes which contain mercury are considered a universal waste and must be packaged and recycled appropriately if they are removed from a building and not used again. The regulation, called the Universal Waste Rule, are in the California Code of Regulations (CCR), Title 22, Division 4.5, Chapter 23.

Fluorescent light tubes are the bulb or tube portion of an electric lighting device and are commonly referred to as “lamps”. Examples of other common electric lamps considered to be universal wastes include, but are not limited to, high intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps. Any lamp which is not spent and has been designated to be reused is not classified as a waste and does not meet the requirements of a hazardous waste or a universal waste.

Spent lamps typically contain concentrations of mercury exceeding the established Total Threshold Limit Concentration (TTLC) and/or the Soluble Threshold Limit Concentration (STLC) values. Therefore, these lamps must be sent to an authorized recycle facility or to a universal waste consolidator for shipment to an authorized recycling facility.

At a minimum, if removed lamps will not be reused they must be packaged in boxes/packages/containers which are structurally sound, adequate to prevent breakage, and compatible with the content of the lamps. These packages must remain closed and be free of damage which could cause leakage under reasonably foreseeable conditions. Each

container must be labeled or marked clearly with one of the following phrases: “Universal Waste Lamp(s),” or “Waste Lamp(s),” or “Used Lamp(s).” Entek recommends shipping any lamp not designated for reuse to a universal waste recycling facility once they have been packaged.

PCB containing light ballasts are to be considered a hazardous waste, and must be properly manifested for transport to a hazardous waste facility. Any contractor who may perform PCB related work (inspection, removal, clean-up) must be trained and qualified to do so. All workers must also follow current OSHA regulations including 29 CFR 1910.120 and 8 CCR 5192, as well as, other applicable federal, state, and local laws, and regulations. While light ballasts marked “No PCB” are not considered a hazardous waste, they are considered a universal waste. As a result, removal, packaging, and disposal/recycling of these types of ballasts must be conducted in accordance with current regulations of Title 22.

Thermostats With Mercury Switches

It is possible existing thermostats may utilize switches containing mercury. The mercury in these switches would be considered a hazardous waste if removed and disposed. Any work requiring removal of thermostats containing mercury switches, must include having the switches inspected for the presence of mercury, and subsequently following all requirements for packaging and disposal of any switch found to contain mercury.

Freon and Fluorocarbons

Freon and other fluorocarbon products associated with HVAC systems, refrigerators, etc. may be present in or on the exterior of the buildings included in this investigation. Prior to demolition of a structure or removal of existing HVAC systems, refrigerators, or any other type of equipment which typically uses these types of coolant products shall have the coolant materials investigated prior to their demolition and removed from the mechanical systems and recycled in accordance with Cal/EPA requirements.

Smoke Detectors Which May Contain a Radioactive Element

It is possible existing smoke detectors may contain a radioactive element. These types of detectors are easily identified by reviewing the label which is usually found on the back of the detector. Older units may display the international radiation symbol (three bladed propeller) and the radioactive content. Newer units state the radioactive content and their Nuclear Regulatory Agency (NRC) license number.

Any work requiring the removal of smoke detectors with a radioactive element must include contacting the manufacturer of the smoke detector to determine their return policies. The California Department of Toxic Substance Control (DTSC) has stated that it is a condition of the manufacturers NRC license they must accept returned units for disposal.

Limitations

Entek inspected only the specific designated areas identified by Mr. Paul Palmer to be impacted in the upcoming renovation, which did not include all areas of the building's exterior components. As a result the information provided in this inspection report may not be used to extend the inspection results to areas not included in this report without additional review and sampling as necessary.

Entek did not perform any destructive sampling to look into ceiling and wall cavities. As a result, it may be possible for materials to be hidden in these areas which are not included in this report. Entek also did not employ any destructive measures on floors of interior spaces or exterior areas covered with asphalt, concrete, or dirt.

If any new materials not listed as having been sampled, or listed as assumed for containing asbestos in this report are discovered, the new material must be assumed to contain asbestos until properly inspected and tested for asbestos content.

Entek's policy is to retain a full copy of these written documents for three (3) years once the file is closed. At the end of the 3 year period the written files will be destroyed without further notice. It is suggested copies of the file(s) are maintained as per the District's policy.

Entek will be providing only this electronic copy of the report and its attachments for your use. However, if you would like a hard copy of this report please do not hesitate to ask. Entek will be happy to mail the report upon receipt of your request.

Thank you for choosing Entek for your environmental needs. Please call me at (916) 632-6800 if you have any questions regarding this report.



Prepared by:

Andy Roed
Project Manager
Cal/OSHA CAC #16-5695
CDPH I/A Certification #29001

Appendices

- A. Asbestos Related Documents
- B. Lead Related Documents
- C. Backup Documentation

APPENDIX A

ASBESTOS RELATED DOCUMENTS

- Bulk Asbestos Material Analysis Report Form for Entek
- Bulk Asbestos Analysis Report From Asbestech
- Bulk Asbestos Material Analysis Request Form for Entek
- Asbestos Bulk Sample Location Drawing



BULK ASBESTOS MATERIAL *Analysis Report*

ENTEK CONSULTING GROUP, INC.

4200 ROCKLIN ROAD, SUITE 7
ROCKLIN, CA 95677
(916) 632-6800 PHONE
(916) 632-6812 FAX
mainoffice@entekgroup.com

Date of Sampling: 4-20-18

Lab: Asbestech

Job Number: 18-4748

Collected by: Andy Roed

Client Name: Nevada UHS

Site Address: 11761 Ridge Road
Grass Valley, CA 95945

SAMPLE #	RESULTS	MATERIAL DESCRIPTION/LOCATION
ECG-18-4748-01A	NONE DETECTED (Drywall) <1% CHRYSOTILE (Joint Compound #1) NONE DETECTED (Joint Compound #2) <1% CHRYSOTILE (Composite) (Results Confirmed by 400 Point Count)	Drywall and Joint Compound / Storage Room, SW Corner
ECG-18-4748-01B	NONE DETECTED (Drywall) <1% CHRYSOTILE (Joint Compound #1) NONE DETECTED (Joint Compound #2) <1% CHRYSOTILE (Composite) (Results Confirmed by 400 Point Count)	Drywall and Joint Compound / Storage Room, NE Corner
ECG-18-4748-01C	NONE DETECTED	Drywall and Joint Compound / Pump Room, SW Corner



BULK ASBESTOS MATERIAL *Analysis Report*

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mainoffice@entekgroup.com

Date of Sampling: 4-20-18

Lab: Asbestech

Job Number: 18-4748

Collected by: Andy Roed

Client Name: Nevada UHS

Site Address: 11761 Ridge Road
Grass Valley, CA 95945

SAMPLE #	RESULTS	MATERIAL DESCRIPTION/LOCATION
ECG-18-4748-01D	NONE DETECTED (Drywall) <1% CHRYSOTILE (Joint Compound #1) <1% CHRYSOTILE (Joint Compound #2) <1% CHRYSOTILE (Composite) (Results Confirmed by 400 Point Count)	Drywall and Joint Compound / Pump Room, SE Corner
ECG-18-4748-02A	NONE DETECTED	Smooth Texture / Storage Room, East Wall
ECG-18-4748-02B	NONE DETECTED	Smooth Texture / Storage Room, West Wall
ECG-18-4748-02C	NONE DETECTED	Smooth Texture / Pump Room, East Wall
ECG-18-4748-03A	NONE DETECTED	Plaster / Boy's Locker Room, Near Door
ECG-18-4748-03B	NONE DETECTED	Plaster / Boy's Locker Room, Middle
ECG-18-4748-03C	NONE DETECTED	Plaster / Boy's Locker Room, Near Showers
ECG-18-4748-03D	NONE DETECTED	Plaster / Girl's Locker Room, Middle
ECG-18-4748-03E	NONE DETECTED	Plaster / Girl's Locker Room, Near Showers
ECG-18-4748-04A	NONE DETECTED	4"x4" White with Brown Streak Ceramic Wall Tile with White Grout / Boy's Locker Room, Near Entrance



BULK ASBESTOS MATERIAL *Analysis Report*

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Date of Sampling: 4-20-18

Lab: Asbestech

Job Number: 18-4748

Collected by: Andy Roed

Client Name: Nevada UHS

Site Address: 11761 Ridge Road
Grass Valley, CA 95945

SAMPLE #	RESULTS	MATERIAL DESCRIPTION/LOCATION
ECG-18-4748-05A	NONE DETECTED	1"x1" Brown and Tan Ceramic Floor Tile and Black Grout / Boy's Locker Room, Near Sink
ECG-18-4748-06A	NONE DETECTED	6"x6" White with Brown Streaks Ceramic Cove Tile and White Grout / Girls Locker Room, Middle
ECG-18-4748-07A	NONE DETECTED	White Boiler Tank Insulation / Large Boiler, SE Corner of Pump Room
ECG-18-4748-07B	NONE DETECTED	White Boiler Tank Insulation / Large Boiler, SE Corner of Pump Room
ECG-18-4748-08A	NONE DETECTED	Black Vibration Damper Cloth / Pump Room, HVAC Duct above Boiler
ECG-18-4748-09A	NONE DETECTED	Concrete / Entrance to Pump Room
ECG-18-4748-10A	NONE DETECTED	Outdoor, Multi color mosaic tile with white grout / Exterior Wall, Near Water Fountain
ECG-18-4748-11A	NONE DETECTED	Asphalt Shingles of Rolled Roofing / Roof, South
ECG-18-4748-11B	NONE DETECTED	Asphalt Shingles of Rolled Roofing / Roof, Middle
ECG-18-4748-11C	NONE DETECTED	Asphalt Shingles of Rolled Roofing / Roof, North
ECG-18-4748-12A	NONE DETECTED (Penetration Sealant) 1-5% CHRYSOTILE (Gray Sealant)	Black Penetration Sealant / Roof North
ECG-18-4748-12B	1-5% CHRYSOTILE	Black Penetration Sealant / Roof, South

Z:\Clients\Nevada JUHSD\18-4748 Nevada UHS - Pool House - Pre-Reno Asb & Pb\Bulk Sample Asb\Bulk Report 04-20-18.wpd

ASBESTECH
 6825 Fair Oaks Blvd., Suite 103
 Carmichael, California 95608
 Tel.(916) 481-8902 Fax (916) 481-3975

Client:
 Entek Consulting Group, Inc.
 4200 Rocklin Rd., Suite 7
 Rocklin, CA 95677

Job:
 18-4748 Nevada UHS
 11761 Ridge Rd.
 Grass Valley, Ca

BULK ASBESTOS ANALYSIS REPORT

LAB JOB # 65404-1
 Date/Time Collected: 4/20/18
 Date Received: 4/23/18

NVLAP Lab Code 101442-0
 CDPH # 1153
 Date Analyzed: 4/24/18

<i>Sample No.</i>	<i>Color/Description</i>	<i>% Type Asbestos</i>	<i>Other Materials</i>
ECG-18-4748-01A	White drywall, storage room SW corner	NONE DETECTED	Gypsum Cellulose
	White joint compound 1	<1 CHRYSOTILE	Calcite
	White joint compound 2	NONE DETECTED	Calcite
	Composite	<1 CHRYSOTILE	Gypsum Cellulose Calcite
01B	White drywall, storage room NE corner	NONE DETECTED	Gypsum Cellulose
	White joint compound 1	<1 CHRYSOTILE	Calcite
	White joint compound 2	NONE DETECTED	Calcite
	Composite	<1 CHRYSOTILE	Gypsum Cellulose Calcite
01C	White drywall, pump room SW corner	NONE DETECTED	Gypsum Cellulose

THE ANALYSIS USES POLARIZED LIGHT MICROSCOPY AND DISPERSION STAINING FOLLOWING E.P.A. METHOD 600/R-93/116. NON-FRIABLE MATERIALS WERE ANALYZED APPLYING THE SAME METHOD. THE LOWER DETECTION LIMIT IS <1 % WITH THE PROVISIO THAT PLM MAY NOT DETECT FIBERS <0.25 MICRONS IN DIAMETER THAT MAY BE PRESENT IN SAMPLES SUCH AS FLOOR TILES. IN ACCORDANCE WITH TITLE 22, CCR, SECTION 66261.24(a)(2)(A), THE MCL IS 1%. SAMPLES WERE NOT COLLECTED BY ASBESTECH. THIS REPORT MUST NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE APPROVAL OF ASBESTECH. THIS REPORT RELATES ONLY TO THE ITEMS TESTED. THIS REPORT MUST NOT BE USED TO CLAIM PRODUCT ENDORSEMENT BY N.V.L.A.P. OR ANY AGENCY OF THE U.S. GOVERNMENT. ASBESTECH ACCEPTS TECHNICAL RESPONSIBILITY FOR THIS REPORT AND DATE OF ISSUE.



ASBESTECH
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 Carmichael, California 95608
 Tel.(916) 481-8902 Fax (916) 481-3975

Client:
 Entek Consulting Group, Inc.
 4200 Rocklin Rd., Suite 7
 Rocklin, CA 95677

Job:
 18-4748 Nevada UHS
 11761 Ridge Rd.
 Grass Valley, Ca

BULK ASBESTOS ANALYSIS REPORT

LAB JOB # 65404-2
 Date/Time Collected: 4/20/18
 Date Received: 4/23/18

NVLAP Lab Code 101442-0
 CDPH # 1153
 Date Analyzed: 4/24/18

<i>Sample No.</i>	<i>Color/Description</i>	<i>% Type Asbestos</i>	<i>Other Materials</i>
ECG-18-4748-01D	White drywall, pump room SE corner	NONE DETECTED	Gypsum Cellulose
	White joint compound 1	<1 CHRYSOTILE	Calcite
	White joint compound 2	<1 CHRYSOTILE	Calcite
	Composite	<1 CHRYSOTILE	Gypsum Cellulose Calcite
02A	White smooth texture, storage room east wall	NONE DETECTED	Opagues
02B	White smooth texture, storage room west wall	NONE DETECTED	Calcite
02C	White smooth texture, pump room east wall	NONE DETECTED	Opagues
03A	White plaster, boy's locker room near door	NONE DETECTED	Granular Mins.
	Gray plaster	NONE DETECTED	Granular Mins.
03B	White plaster, boy's locker room middle	NONE DETECTED	Granular Mins.
	Gray plaster	NONE DETECTED	Granular Mins.

THE ANALYSIS USES POLARIZED LIGHT MICROSCOPY AND DISPERSION STAINING FOLLOWING E.P.A. METHOD 600/R-93/116. NON-FRIABLE MATERIALS WERE ANALYZED APPLYING THE SAME METHOD. THE LOWER DETECTION LIMIT IS <1 % WITH THE PROVISO THAT PLM MAY NOT DETECT FIBERS <0.25 MICRONS IN DIAMETER THAT MAY BE PRESENT IN SAMPLES SUCH AS FLOOR TILES. IN ACCORDANCE WITH TITLE 22, CCR, SECTION 66261.24(a)(2)(A), THE MCL IS 1%. SAMPLES WERE NOT COLLECTED BY ASBESTECH. THIS REPORT MUST NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE APPROVAL OF ASBESTECH. THIS REPORT RELATES ONLY TO THE ITEMS TESTED. THIS REPORT MUST NOT BE USED TO CLAIM PRODUCT ENDORSEMENT BY N.V.L.A.P. OR ANY AGENCY OF THE U.S. GOVERNMENT. ASBESTECH ACCEPTS TECHNICAL RESPONSIBILITY FOR THIS REPORT AND DATE OF ISSUE.

ASBESTECH
 6825 Fair Oaks Blvd., Suite 103
 Carmichael, California 95608
 Tel.(916) 481-8902 Fax (916) 481-3975

Client:
 Entek Consulting Group, Inc.
 4200 Rocklin Rd., Suite 7
 Rocklin, CA 95677

Job:
 18-4748 Nevada UHS
 11761 Ridge Rd.
 Grass Valley, Ca

BULK ASBESTOS ANALYSIS REPORT

LAB JOB # 65404-3
 Date/Time Collected: 4/20/18
 Date Received: 4/23/18

NVLAP Lab Code 101442-0
 CDPH # 1153
 Date Analyzed: 4/24/18

<i>Sample No.</i>	<i>Color/Description</i>	<i>% Type Asbestos</i>	<i>Other Materials</i>
ECG-18-4748-03C	White plaster, boy's locker room near showers	NONE DETECTED	Granular Mins.
	Gray plaster	NONE DETECTED	Granular Mins.
03D	White plaster, girl's locker room middle	NONE DETECTED	Granular Mins.
	Gray plaster	NONE DETECTED	Granular Mins.
03E	White plaster, girl's locker room near showers	NONE DETECTED	Granular Mins.
	Gray plaster	NONE DETECTED	Granular Mins.
04A	White w/ brown streak 4"x4" ceramic wall tile, boy's locker room near entrance	NONE DETECTED	Granular Mins.
	White grout	NONE DETECTED	Granular Mins.
05A	Brown & tan 1"x1" ceramic floor tile, boy's locker room near sink	NONE DETECTED	Granular Mins.
	Black grout	NONE DETECTED	Granular Mins.

THE ANALYSIS USES POLARIZED LIGHT MICROSCOPY AND DISPERSION STAINING FOLLOWING E.P.A. METHOD 600/R-93/116. NON-FRIABLE MATERIALS WERE ANALYZED APPLYING THE SAME METHOD. THE LOWER DETECTION LIMIT IS <1 % WITH THE PROVISIO THAT PLM MAY NOT DETECT FIBERS <0.25 MICRONS IN DIAMETER THAT MAY BE PRESENT IN SAMPLES SUCH AS FLOOR TILES. IN ACCORDANCE WITH TITLE 22, CCR, SECTION 66261.24(a)(2)(A), THE MCL IS 1 %. SAMPLES WERE NOT COLLECTED BY ASBESTECH. THIS REPORT MUST NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE APPROVAL OF ASBESTECH. THIS REPORT RELATES ONLY TO THE ITEMS TESTED. THIS REPORT MUST NOT BE USED TO CLAIM PRODUCT ENDORSEMENT BY N.V.L.A.P. OR ANY AGENCY OF THE U.S. GOVERNMENT. ASBESTECH ACCEPTS TECHNICAL RESPONSIBILITY FOR THIS REPORT AND DATE OF ISSUE.

ASBESTECH
 6825 Fair Oaks Blvd., Suite 103
 Carmichael, California 95608
 Tel.(916) 481-8902 Fax (916) 481-3975

Client:
 Entek Consulting Group, Inc.
 4200 Rocklin Rd., Suite 7
 Rocklin, CA 95677

Job:
 18-4748 Nevada UHS
 11761 Ridge Rd.
 Grass Valley, Ca

BULK ASBESTOS ANALYSIS REPORT

LAB JOB # 65404-4
 Date/Time Collected: 4/20/18
 Date Received: 4/23/18

NVLAP Lab Code 101442-0
 CDPH # 1153
 Date Analyzed: 4/24/18

<i>Sample No.</i>	<i>Color/Description</i>	<i>% Type Asbestos</i>	<i>Other Materials</i>
ECG-18-4748-06A	White w/ brown streaks 6"x6" ceramic cove tile, girl's locker room middle entrance	NONE DETECTED	Granular Mins.
	White grout	NONE DETECTED	Granular Mins.
07A	White boiler tank insulation, large boiler SE corner of pump room	NONE DETECTED	Granular Mins. Synthetics
	Gray insulation	NONE DETECTED	Calcite Fibrous Glass
	White wrap	NONE DETECTED	Cellulose
07B	White boiler tank insulation, large boiler SE corner of pump room	NONE DETECTED	Granular Mins. Synthetics
	Gray insulation	NONE DETECTED	Calcite Fibrous Glass
	White wrap	NONE DETECTED	Cellulose
08A	Black vibration damper cloth, pump room HVAC duct above boiler	NONE DETECTED	Fibrous Glass Opagues
	White coating	NONE DETECTED	Opagues
09A	Gray concrete, entrance to pump room	NONE DETECTED	Granular Mins.

THE ANALYSIS USES POLARIZED LIGHT MICROSCOPY AND DISPERSION STAINING FOLLOWING E.P.A. METHOD 600/R-93/116. NON-FRIABLE MATERIALS WERE ANALYZED APPLYING THE SAME METHOD. THE LOWER DETECTION LIMIT IS <1 % WITH THE PROVISO THAT PLM MAY NOT DETECT FIBERS <0.25 MICRONS IN DIAMETER THAT MAY BE PRESENT IN SAMPLES SUCH AS FLOOR TILES. IN ACCORDANCE WITH TITLE 22, CCR, SECTION 66261.24(a)(2)(A), THE MCL IS 1%. SAMPLES WERE NOT COLLECTED BY ASBESTECH. THIS REPORT MUST NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE APPROVAL OF ASBESTECH. THIS REPORT RELATES ONLY TO THE ITEMS TESTED. THIS REPORT MUST NOT BE USED TO CLAIM PRODUCT ENDORSEMENT BY N.V.L.A.P. OR ANY AGENCY OF THE U.S. GOVERNMENT. ASBESTECH ACCEPTS TECHNICAL RESPONSIBILITY FOR THIS REPORT AND DATE OF ISSUE.

ASBESTECH
6825 Fair Oaks Blvd., Suite 103
Carmichael, California 95608
Tel.(916) 481-8902 Fax (916) 481-3975

Client:
Entek Consulting Group, Inc.
4200 Rocklin Rd., Suite 7
Rocklin, CA 95677

Job:
18-4748 Nevada UHS
11761 Ridge Rd.
Grass Valley, Ca

BULK ASBESTOS ANALYSIS REPORT

LAB JOB # 65404-5
Date/Time Collected: 4/20/18
Date Received: 4/23/18

NVLAP Lab Code 101442-0
CDPH # 1153
Date Analyzed: 4/24/18

<i>Sample No.</i>	<i>Color/Description</i>	<i>% Type Asbestos</i>	<i>Other Materials</i>
ECG-18-4748-10A	Outdoor multicolor mosaic tile, exterior wall near water fountain	NONE DETECTED	Granular Mins.
	White grout	NONE DETECTED	Granular Mins.
11A	Black asphalt shingles of rolled roofing, roof south	NONE DETECTED	Tar Binder Fibrous Glass
11B	Black asphalt shingles of rolled roofing, roof middle	NONE DETECTED	Tar Binder Fibrous Glass
11C	Black asphalt shingles of rolled roofing, roof north	NONE DETECTED	Tar Binder Fibrous Glass
12A	Black penetration sealant, roof north	NONE DETECTED	Tar Binder Calcite
	Gray sealant	1-5 CHRYSOTILE	Tar Binder Calcite
12B	Black penetration sealant, roof south	1-5 CHRYSOTILE	Tar Binder Calcite

THE ANALYSIS USES POLARIZED LIGHT MICROSCOPY AND DISPERSION STAINING FOLLOWING E.P.A. METHOD 600/R-93/116. NON-FRIABLE MATERIALS WERE ANALYZED APPLYING THE SAME METHOD. THE LOWER DETECTION LIMIT IS <1 % WITH THE PROVISIO THAT PLM MAY NOT DETECT FIBERS <0.25 MICRONS IN DIAMETER THAT MAY BE PRESENT IN SAMPLES SUCH AS FLOOR TILES. IN ACCORDANCE WITH TITLE 22, CCR, SECTION 66261.24(a)(2)(A), THE MCL IS 1 %. SAMPLES WERE NOT COLLECTED BY ASBESTECH. THIS REPORT MUST NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE APPROVAL OF ASBESTECH. THIS REPORT RELATES ONLY TO THE ITEMS TESTED. THIS REPORT MUST NOT BE USED TO CLAIM PRODUCT ENDORSEMENT BY N.V.L.A.P. OR ANY AGENCY OF THE U.S. GOVERNMENT. ASBESTECH ACCEPTS TECHNICAL RESPONSIBILITY FOR THIS REPORT AND DATE OF ISSUE.

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Carmichael, California 95608
Tel.(916) 481-8902 Fax (916) 481-3975

Client:
Entek Consulting Group, Inc.
4200 Rocklin Rd., Suite 7
Rocklin, CA 95677

Job:
18-4748 Nevada UHS
11761 Ridge Rd.
Grass Valley, Ca

BULK ASBESTOS ANALYSIS REPORT

LAB JOB # 65415
Date/Time Collected: 4/20/18
Date Received: 4/23/18

NVLAP Lab Code 101442-0
CDPH # 1153
Date Analyzed: 4/26/18

<i>Sample No.</i>	<i>Color/Description</i>	<i>% Type Asbestos</i>	<i>Other Materials</i>
ECCG-18-4748-01A	White drywall/ joint compound composite , storage room SW corner	TRACE CHRYSOTILE	Gypsum Cellulose Calcite
01B	White drywall/ joint compound composite , storage room NE corner	<1 CHRYSOTILE	Gypsum Cellulose Calcite
01D	White drywall/ joint compound composite , pump room SE corner	<1 CHRYSOTILE	Gypsum Cellulose Calcite

NOTE: These samples were analyzed by quantitative Point Counting using a Chalkley Point Array over 400 non-empty points.

THE ANALYSIS USES POLARIZED LIGHT MICROSCOPY AND DISPERSION STAINING FOLLOWING E.P.A. METHOD 600/R-93/116. NON-FRIABLE MATERIALS WERE ANALYZED APPLYING THE SAME METHOD. THE LOWER DETECTION LIMIT IS <1 % WITH THE PROVISO THAT PLM MAY NOT DETECT FIBERS <0.25 MICRONS IN DIAMETER THAT MAY BE PRESENT IN SAMPLES SUCH AS FLOOR TILES. IN ACCORDANCE WITH TITLE 22, CCR, SECTION 66261.24(a)(2)(A), THE MCL IS 1%. SAMPLES WERE NOT COLLECTED BY ASBESTECH. THIS REPORT MUST NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE APPROVAL OF ASBESTECH. THIS REPORT RELATES ONLY TO THE ITEMS TESTED. THIS REPORT MUST NOT BE USED TO CLAIM PRODUCT ENDORSEMENT BY N.V.L.A.P. OR ANY AGENCY OF THE U.S. GOVERNMENT. ASBESTECH ACCEPTS TECHNICAL RESPONSIBILITY FOR THIS REPORT AND DATE OF ISSUE.

**THREE-YEAR REINSPECTION
HOMOGENEOUS ACBM RECORDS**

Date of Inspection: October 3, 2013

District: Nevada Joint Union High School District

Inspector: Cory Sanders

School: Nevada Union High School

Building: P

Material Class	Material	Homo. Mat. #	% Asb.	Ft ² /L.F.	Location	Condition: Code & Comments	Friable Yes/No
T	TANK INSULATION	34	NONE DETECTED	100 S	BOILER ROOM	(13) TWO ADDITIONAL SAMPLES COLLECTED HMS-C546B-04A & B ON 6-30-95 TO CONFIRM PREVIOUS NEGATIVE RESULTS.	N/A
T	BOILER BLOCK INSULATION	35	10-15%	35 S	BOILER ROOM-BOILER CLOSEST TO SODA ASH TANK INSIDE UNIT	(7) REMOVED	N/A
T	BOILER BLOCK INSULATION	36	10-15%	35 S	BOILER ROOM-BOILER BETWEEN TANK AND OTHER BOILER	(1) (4)	Y

Z:\Clients\Nevada JUHSD\13-2865 3 year Reinspections\Nevada HSI\Nevada HMR 2013.wpd

CONDITION CODE

General Condition: (1) Good (2) Damaged (3) Significantly Damaged (25% or more)
Change in Condition: (4) No (5) Yes (If Yes, explain under comments)
Abated: (6) Repaired (7) Removed (8) Encapsulated (9) Enclosed (10) Isolated & Restricted
Miscellaneous: (11) Inaccessible, no inspection data (12) Other (Explain under comments) (13) Non-Asbestos/Not Inspected

CONSULT ORIGINAL AND SUPPLEMENTARY INSPECTION REPORTS FOR MATERIALS WITH TRACE AMOUNTS OF ASBESTOS



65404

BULK ASBESTOS MATERIAL *Analysis Request*

ENTEK CONSULTING GROUP, INC.

4200 ROCKLIN ROAD, SUITE 7
ROCKLIN, CA 95677
(916) 632-6800 PHONE
(916) 632-6812 FAX
mainoffice@entekgroup.com

Date of Sampling: 4-20-18

Lab: Asbestech

Job Number: 18-4748

Collected by: Andy Roed

Client Name: Nevada UHS

Turnaround Time: Day: Thurs
Date: 4 / 26 / 18 Time: 5 pm

Site Address: 11761 Ridge Road
Grass Valley, CA 95945

ANALYSIS REQUESTED: Asbestos by PLM
with Dispersion Staining

Special Instruction: *Stop Analysis upon first positive result (>1%) for sample in a series. Also stop analysis upon first positive result (>1%) in the joint compound for sample series.*

Please e-mail results as soon as available and include copy of submittal with those results.

SAMPLE #	MATERIAL DESCRIPTION/LOCATION
ECG-18-4748-01A	Drywall and Joint Compound / Storage Room, SW Corner
ECG-18-4748-01B	Drywall and Joint Compound / Storage Room, NE Corner
ECG-18-4748-01C	Drywall and Joint Compound / Pump Room, SW Corner
ECG-18-4748-01D	Drywall and Joint Compound / Pump Room, SE Corner
ECG-18-4748-02A	Smooth Texture / Storage Room, East Wall
ECG-18-4748-02B	Smooth Texture / Storage Room, West Wall
ECG-18-4748-02C	Smooth Texture / Pump Room, East Wall
ECG-18-4748-03A	Plaster / Boy's Locker Room, Near Door
ECG-18-4748-03B	Plaster / Boy's Locker Room, Middle
ECG-18-4748-03C	Plaster / Boy's Locker Room, Near Showers

Delivered by: [Signature] **Date:** 4/23/18 **Time:** 2 **AM/PM**

Received by: [Signature] **Date:** 4/23/18 **Time:** 2 **AM/PM**



65404

BULK ASBESTOS MATERIAL *Analysis Request*

ENTEK CONSULTING GROUP, INC.

4200 ROCKLIN ROAD, SUITE 7
ROCKLIN, CA 95677
(916) 632-6800 PHONE
(916) 632-6812 FAX
mainoffice@entekgroup.com

Date of Sampling: 4-20-18

Lab: Asbestech

Job Number: 18-4748

Collected by: Andy Roed

Client Name: Nevada UHS

Turnaround Time: Day: Thurs
Date: 4 / 26 / 18 Time: 5 pm

Site Address: 11761 Ridge Road
Grass Valley, CA 95945

ANALYSIS REQUESTED: Asbestos by PLM
with Dispersion Staining

Special Instruction: *Stop Analysis upon first positive result (>1%) for sample in a series. Also stop analysis upon first positive result (>1%) in the joint compound for sample series.*

Please e-mail results as soon as available and include copy of submittal with those results.

SAMPLE #	MATERIAL DESCRIPTION/LOCATION
ECG-18-4748-03D	Plaster / Girl's Locker Room, Middle
ECG-18-4748-03E	Plaster / Girl's Locker Room, Near Showers
ECG-18-4748-04A	4"x4" White with Brown Streak Ceramic Wall Tile with White Grout / Boy's Locker Room, Near Entrance
ECG-18-4748-05A	1"x1" Brown and Tan Ceramic Floor Tile and Black Grout / Boy's Locker Room, Near Sink
ECG-18-4748-06A	6"x6" White with Brown Streaks Ceramic Cove Tile and White Grout / Girls Locker Room, Middle
ECG-18-4748-07A	White Boiler Tank Insulation / Large Boiler, SE Corner of Pump Room
ECG-18-4748-07B	White Boiler Tank Insulation / Large Boiler, SE Corner of Pump Room
ECG-18-4748-08A	Black Vibration Damper Cloth / Pump Room, HVAC Duct above Boiler
ECG-18-4748-09A	Concrete / Entrance to Pump Room
ECG-18-4748-10A	Outdoor, Multi color mosaic tile with white grout / Exterior Wall, Near Water Fountain

Delivered by:  **Date:** 4/23/18 **Time:** 2 **AM/PM** (P)

Received by:  **Date:** 4/23/18 **Time:** 2 **AM/PM**

BULK ASBESTOS MATERIAL *Analysis Request*

ENTEK CONSULTING GROUP, INC.

4200 ROCKLIN ROAD, SUITE 7
 ROCKLIN, CA 95677
 (916) 632-6800 PHONE
 (916) 632-6812 FAX
mainoffice@entekgroup.com

Date of Sampling: 4-20-18

Lab: Asbestech

Job Number: 18-4748

Collected by: Andy Roed

Client Name: Nevada UHS

Turnaround Time: Day: Thurs
 Date: 4/26 / 18 Time: 5 pm

Site Address: 11761 Ridge Road
 Grass Valley, CA 95945

ANALYSIS REQUESTED: Asbestos by PLM
 with Dispersion Staining

Special Instruction: *Stop Analysis upon first positive result (>1%) for sample in a series. Also stop analysis upon first positive result (>1%) in the joint compound for sample series.*

Please e-mail results as soon as available and include copy of submittal with those results.

SAMPLE #	MATERIAL DESCRIPTION/LOCATION
ECG-18-4748-11A	Asphalt Shingles of Rolled Roofing / Roof, South
ECG-18-4748-11B	Asphalt Shingles of Rolled Roofing / Roof, Middle
ECG-18-4748-11C	Asphalt Shingles of Rolled Roofing / Roof, North
ECG-18-4748-12A	Black Penetration Sealant / Roof North
ECG-18-4748-12B	Black Penetration Sealant / Roof, South

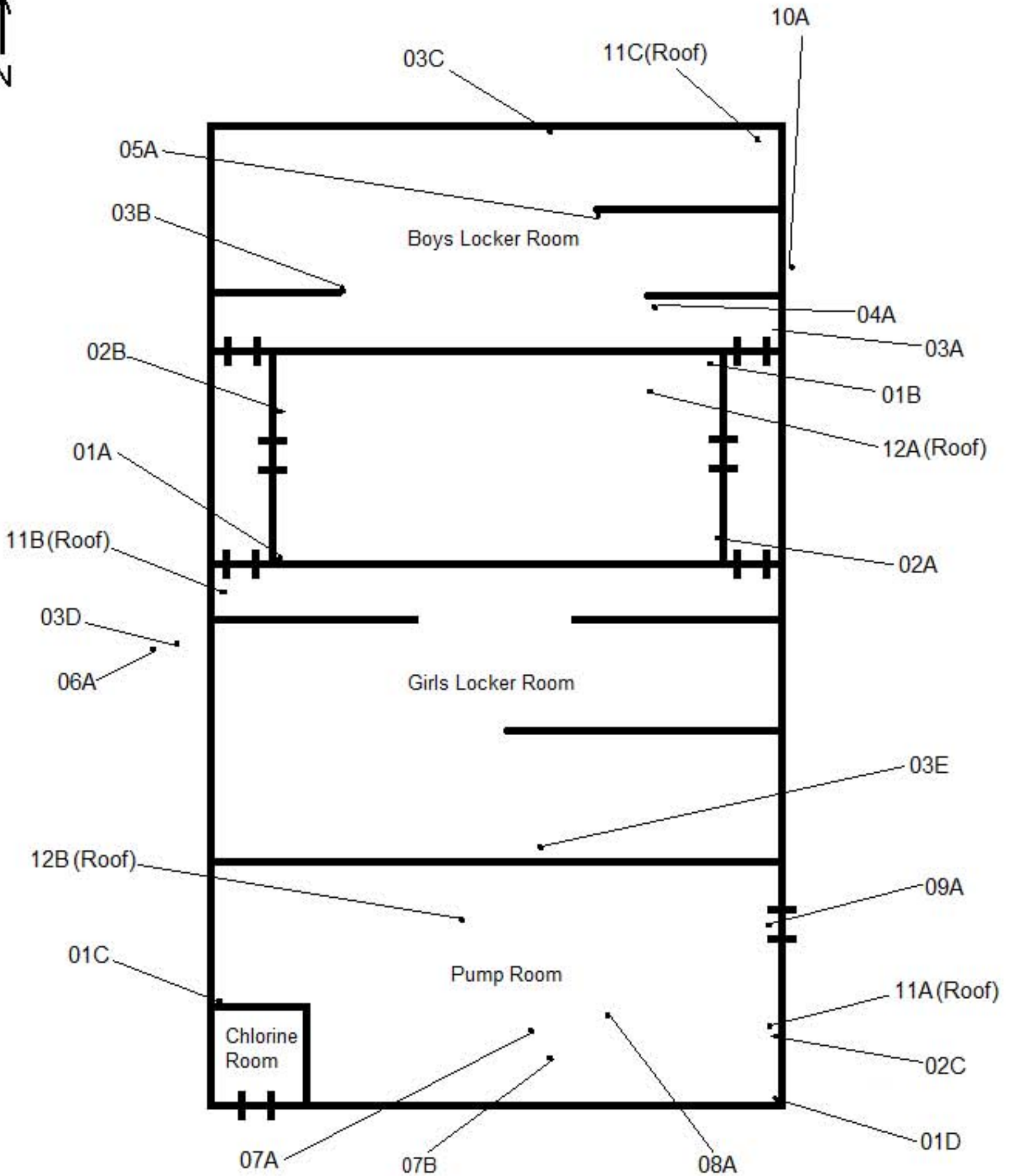
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Delivered by: 

Date: 4/23/18 Time: 2: AM/PM

Received by: 

Date: 4/23/18 Time: 2 AM/PM



Sample Numbers are Preceded by ECG-18-4748

Nevada Joint Union High School District
Nevada Union High School
11761 Ridge Road
Grass Valley, CA 95945

Entek Consulting Group, Inc.
4200 Rocklin Road, Suite 7
Rocklin, CA 95677
Map Not to Scale

Asbestos Bulk Sample Locations
Collected by Andy Roed
on April 20, 2018
Project Number 18-4748



APPENDIX B

LEAD RELATED DOCUMENTS

- Bulk Lead Material Analysis Report Form for Entek
- Lead in Paint Samples Analysis Report From Asbestech
- Bulk Lead Material Analysis Request Form for Entek
- Lead Bulk Sample Location Drawing
- Lead Hazard Evaluation Report (CDPH 8552)



BULK LEAD MATERIAL *Analysis Report*

ENTEK CONSULTING GROUP, INC.

4200 ROCKLIN ROAD, SUITE 7
ROCKLIN, CA 95677
(916) 632-6800 PHONE
(916) 632-6812 FAX
mainoffice@entekgroup.com

Date of Sampling: 4-20-18

Lab: Asbestech

Job Number: 18-4748

Collected by: Andy Roed

Client Name: Nevada JUHSD

Site Address: Pool House
11761 Ridge Road
Grass Valley

SAMPLE #	LEAD RESULT (PPM)	RESULT IN WT%	MATERIAL DESCRIPTION/LOCATION
ECG-18-4748-01Pb	66	0.0066	White Paint on Interior Walls
ECG-18-4748-02Pb	230	0.023	Glaze on 4"x4" White with Brown Streaks Ceramic Wall Tile
ECG-18-4748-03Pb	< 50	< 0.0050	White Paint on Wood Ceiling
ECG-18-4748-04Pb	< 50	< 0.0050	Gray Paint on Concrete Flooring
ECG-18-4748-05Pb	< 50	< 0.0050	Blue Paint on Wood Doors and Door Frames
ECG-18-4748-06Pb	< 50	< 0.0050	Multicolor Mosaic Wall Tiles at Water Fountain
ECG-18-4748-07Pb	790	0.079	6"x6" White with Brown Streaks Ceramic Cove Base Tile

Z:\Clients\Nevada JUHSD\18-4748 Nevada UHS - Pool House - Pre-Reno Asb & Pb\Bulk Sample Pb\Bulk Report Pb 04-20-18.wpd

ASBESTECH
6825 Fair Oaks Blvd., Suite 103
Carmichael, California 95608
Tel (916) 481-8902
Fax (916) 481-3975

FLAME ATOMIC ABSORPTION SPECTROMETRY
LEAD (Pb) IN PAINT SAMPLES
METHOD SW846-3050B-7420

CLIENT:
Entek Consulting Group, Inc.
4200 Rocklin Rd., Suite 7
Rocklin, CA 95677

CDPH ELAP#1153
ELPAT#101801

JOB I.D: 18-4748 Nevada JUHSD,
11761 Ridge Rd.,
Grass Valley, Ca

DATE RECEIVED: 4/23/18

DATE ANALYZED: 4/25/18

LAB JOB NO: 11393

DATE REPORTED: 4/26/18

SAMPLE DATE	SAMPLE NUMBER	DESCRIPTION	PPM	RESULT IN WT%	RL	Q.C. BATCH
4/20/18	ECG-18-4748-01Pb	White paint on interior walls	66	0.0066	0.0050%	56
4/20/18	ECG-18-4748-02Pb	Glaze on 4"x4" white w/ brown streaks ceramic wall tile	230	0.023	0.0050%	56
4/20/18	ECG-18-4748-03Pb	White paint on wood ceiling	<50	<0.0050	0.0050%	56
4/20/18	ECG-18-4748-04Pb	Gray paint on concrete flooring	<50	<0.0050	0.0050%	56
4/20/18	ECG-18-4748-05Pb	Blue paint on wood doors & door frames	<50	<0.0050	0.0050%	56
4/20/18	ECG-18-4748-06Pb	Multicolor mosaic wall tiles at water fountain	<50	<0.0050	0.0050%	56
4/20/18	ECG-18-4748-07Pb	White w/ brown streaks 6"x6" ceramic cove base tile	790	0.079	0.0050%	56

Analytical results and reports are generated at the request and for the exclusive use of the client. This report applies only to the items tested. Samples were not collected by ASBESTECH. This report must not be reproduced except in full, and only with the express permission of ASBESTECH. This report must not be used to claim product endorsement by any agency of the U.S. Government.





11393

BULK LEAD MATERIAL *Analysis Request*

ENTEK CONSULTING GROUP, INC.

4200 ROCKLIN ROAD, SUITE 7
ROCKLIN, CA 95677
(916) 632-6800 PHONE
(916) 632-6812 FAX
mainoffice@entekgroup.com

Date of Sampling: 4-20-18

Lab: Asbestech

Job Number: 18-4748

Collected by:

Client Name: Nevada JUHSD

Turnaround Time: Day: Thursda
Date: 4 / 26 / 18 Time: 5 PM

Site Address: 11761 Ridge Road
Grass Valley

ANALYSIS REQUESTED: Lead by Atomic
Absorption Spectrometry

Special Instruction: *Please report result in PPM and % by weight. Please email results as soon as possible.*

BS6

SAMPLE #	MATERIAL DESCRIPTION/LOCATION	
ECG-18-4748-01Pb	White Paint on Interior Walls	66 / 0066
ECG-18-4748-02Pb	Glaze on 4"x4" White with Brown Streaks Ceramic Wall Tile	230 / 023
ECG-18-4748-03Pb	White Paint on Wood Ceiling	<
ECG-18-4748-04Pb	Gray Paint on Concrete Flooring	<
ECG-18-4748-05Pb	Blue Paint on Wood Doors and Door Frames	<
ECG-18-4748-06Pb	Multicolor Mosaic Wall Tiles at Water Fountain	<
ECG-18-4748-07Pb	6"x6" White with Brown Streaks Ceramic Cove Base Tile	790 / 079

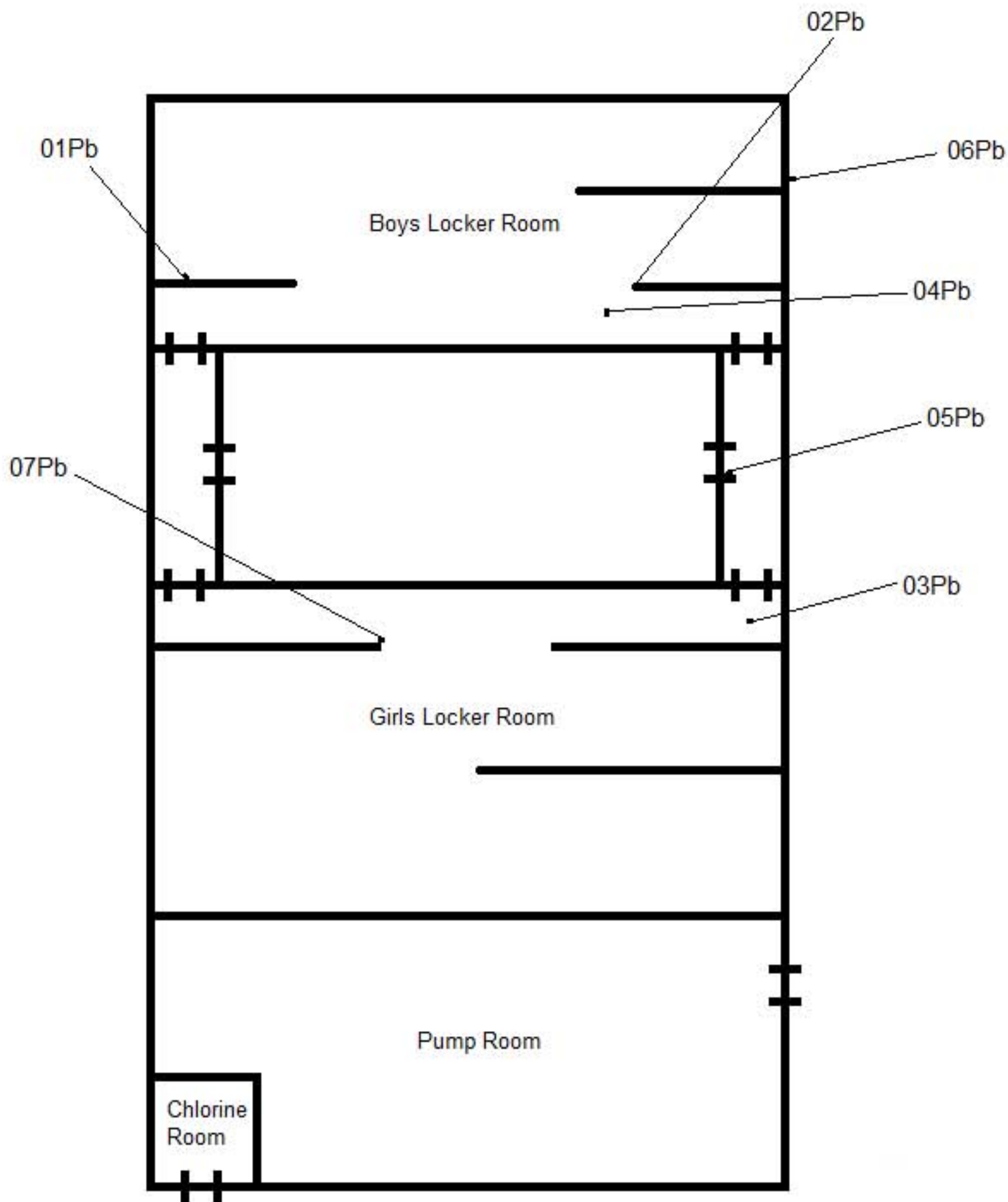
Z:\Clients\Nevada JUHSD\18-4748 Nevada UHS - Pool House - Pre-Reno Asb & Pb\Bulk Sample Pb\Bulk Request Pb 00-00-00.wpd

Delivered by: _____

Date: 4/23/18 **Time:** 2 AM/PM

Received by: Jon G...

Date: 4/23/18 **Time:** 2 AM/PM



Sample Numbers are Preceded by ECG-18-4748

Nevada Joint Union High School District
Nevada Union High School
11761 Ridge Road
Grass Valley, CA 95945

Entek Consulting Group, Inc.
4200 Rocklin Road, Suite 7
Rocklin, CA 95677
Map Not to Scale

Lead Bulk Sample Locations
Collected by Andy Roed
on April 20, 2018
Project Number 18-4748


LEAD HAZARD EVALUATION REPORT**Section 1 – Date of Lead Hazard Evaluation** April 20, 2018**Section 2 – Type of Lead Hazard Evaluation** (Check one box only)
 Lead Inspection
 Risk Assessment
 Clearance Inspection
 Other (specify) See Attached Letter dated April 21, 2015
Section 3—Structure Where Lead Hazard Evaluation Was Conducted

Address [number, street, apartment (if applicable)] 11761 Ridge Road		City Grass Valley	County Nevada	Zip Code 95945
Construction date (year) of structure Pre 1985	Type of structure <input type="checkbox"/> Multi-unit building <input checked="" type="checkbox"/> School or daycare <input type="checkbox"/> Single family dwelling <input type="checkbox"/> Other (specify) _____		Children living in structure? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Don't Know	

Section 4—Owner of Structure (If business/agency, list contact person)

Name Nevada JUHSD		Telephone Number (530) 273-3351		
Address [number, street, apartment (if applicable)] 11645 Ridge Road		City Grass Valley	State California	Zip Code 5945

Section 5—Results of Lead Hazard Evaluation (Check all that apply)
 No lead-based paint detected
 Intact lead-based paint detected.
 Deteriorated lead-based paint detected
 No lead hazards detected
 Lead-contaminated dust found
 Lead contaminated soil found
 Other _____
Section 6—Individual Conducting Lead Hazard Evaluation

Name Entek Consulting Group, Inc. - Andy Roed		Telephone Number (916) 632-6800		
Address [number, street, apartment (if applicable)] 4200 Rocklin Road, Suite 7		City Rocklin	State CA	Zip Code 95677
CDPH certification number 29001	Signature 			Date 5-1-18

Name and CDPH certification number of any other individuals conducting sampling or testing (if applicable)

N/A

Section 7—Attachments

- A. A foundation diagram or sketch of the structure indicating the specific locations of each lead hazard or presence of lead-based paint;
- B. Each testing method, device, and sampling procedure used;
- C. All data collected, including quality control data, laboratory results, indicating laboratory name, address, and phone number.

First copy and attachments retained by inspector

Third copy only (no attachments) mailed or faxed to:

Second copy and attachments retained by owner

 California Department of Public Health
 Childhood Lead Poisoning Prevention Branch Reports
 850 Marina Bay Parkway, Building P, Third Floor
 Richmond, CA 94804-6403
 Fax: (510) 620-5656



ENTEK CONSULTING GROUP, INC.

4200 Rocklin Road, Suite 7, Rocklin, CA 95677 Telephone (916) 632-6800 Fax (916) 632-6812 www.entekgroup.com

April 21, 2015

State of California
Health and Human Services Agency
California Department of Public Health
Childhood Lead Poisoning Prevention Branch Reports
850 Marina Parkway, Building P, Third Floor
Richmond, CA 94804-6403

RE: Lead Hazard Evaluation Report (CDPH 8552 - 6/07)

To Whom it May Concern:

In a memorandum issued to all "California Department of Health Services Certified Inspector/Assessors and Project Monitors", by the State of California - Health and Human Services Agency, Department of Health Services (CDPH), dated June 5, 2006, and signed by Mr. Paul Fitzmaurice, Chief, Lead Hazard Reduction Section, Childhood Lead Poisoning Prevention Branch, it was made clear that "... the on-site investigation, for compensation, of lead-based paint or lead hazards..." includes "... conducting testing and/or sampling activities as part of a non-'abatement' project (e.g. painting remodeling, etc.)."

As a result of this directive, Entek Consulting Group, Inc. (Entek) is providing you with the current CDPH Form 8552 (06/07) documenting an inspection/assessment performed by Entek.

The investigation results being reported on the attached CDPH Form 8552 do not reflect a "Lead Inspection/Assessment" as defined in Title 17. As a result the "Other" box, in "Section 2 - Type of Lead Hazard Evaluation", is checked. This is being done to make it clear this investigation does not meet the definition of a "Lead Inspection/Assessment", and submission of the attached CDPH Form 8552 is not meant to reflect that it does.

CDPH Form 8552, Section 5 - Results of Lead Hazard Evaluation, does not allow for an appropriate option pertaining to the results of the investigation/assessment performed and being reported (i.e. for the purpose of compliance with Cal/OSHA, Title 8 1532.1 Lead), or an assessment being performed in an unregulated structure. While one of or more of the four boxes is checked to reflect the results of the inspection/assessment. The lead inspection/assessment was not required under Title 17.

This letter is not intended to disagree whether a CDPH Form 8552 must be submitted, but is for clarification as to the information included on the CDPH Form 8552, and its intended purpose, namely to reflect the goal of the services performed by Entek.

Sincerely,

Richard A. Beall, CIH, CSP
President

Z:\Lead\Lead Hazard Evaluation Report CDPH 8552 Ltr 4-21-15.wpd

APPENDIX C

BACK UP DOCUMENTATION

- Inspector Accreditations and Certifications
- Laboratory Accreditations for Asbestos and Lead Analysis

PHOTO LOG



View of non-asbestos containing boiler insulation. Two bulk samples were collected as part of this assessment and two samples were collected as part of a previous assessment.



View of green boiler with white asbestos containing insulations inside. This material is assumed to contain asbestos based on previous sample results. No Samples were collected during this inspection.

State of California
Division of Occupational Safety and Health
Certified Asbestos Consultant



Andrew R Roed

Name

Certification No. **16-5695**

Expires on **08/17/18**

This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7100 et seq. of the Business and Professions Code.

State of California Department of Public Health

Lead-Related
Construction
Certificate

Certificate
Type

Expiration
Date

Inspector/Assessor	09/06/2018
Sampling Technician	09/06/2017



Andrew R. Roed

ID #: 29001

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 101442-0

ASBESTECH
Carmichael, CA

is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2017-07-01 through 2018-06-30

Effective Dates

A handwritten signature in black ink, appearing to read "Peter S. Lamm". The signature is written in a cursive style with a large, looped "P" and "L".

For the National Voluntary Laboratory Accreditation Program



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

ASBESTECH

6825 Fair Oaks Blvd., Suite 103

Carmichael, CA 95608

Mr. Tommy Conlon

Phone: 916-481-8902 Fax: 916-481-3975

Email: asbestech@sbcglobal.net

<http://www.asbestechlab.com>

ASBESTOS FIBER ANALYSIS

NVLAP LAB CODE 101442-0

Bulk Asbestos Analysis

Code

Description

18/A01

EPA -- Appendix E to Subpart E of Part 763 -- Interim Method of the Determination of Asbestos in Bulk Insulation Samples

18/A03

EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code

Description

18/A02

U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

A handwritten signature in black ink, appearing to read "Dana S. Laman".

For the National Voluntary Laboratory Accreditation Program

IHPAT Round 212
 Proficiency Testing Performance for Participant ID: PAT-101801

 Page 1 of 2
 Report Issue Date: 02/21/2018

 Asbestech
 6825 Fair Oaks Blvd Ste 103
 Carmichael, CA 95608-3836

This report contains your organization's IHPAT Proficiency Analytical Testing results for **IHPAT Round 212**. It is the participant's responsibility to thoroughly review the information in this final report and to immediately contact the AIHA Proficiency Analytical Testing Programs in writing, if any errors are found.

IHPAT Results

The final report is comprised of two sections relating to IHPAT Round 212. The first section contains your organization's results listed per analyte, per sample. The second section contains your current performance and performance from the two previous rounds, respectively (where applicable). Summary results for all participants for IHPAT Round 212 are located in a separate report.

Testing Results for IHPAT Round 212

This part of the report contains your organization's results listed per analyte, per sample.

Contaminant	Unit	#	Result	Ref. Value	Lower Limit	Upper Limit	z-Score	Rating
Asbestos (ASB)	f/mm ²	1	65	106	52	178	-1.9	A
	f/mm ²	2	164	145	71	245	0.7	A
	f/mm ²	3	205	204	100	345	0	A
	f/mm ²	4	88	74	36	125	0.9	A

Statistical Analysis Interpretation Note:

Reference value is the mean of the reference group.

Lower limit = reference value - 3 standard deviations; Upper limit = reference value + 3 standard deviations

z-Score = (reported result - reference value)/standard deviation. Note: z-Scores indicate how far a particular score is away from the mean. A - Acceptable* Analysis; U - Unacceptable Analysis

Fiber data are positively skewed therefore transformations are used to obtain approximately normal distributions. Both the assigned values and acceptance limits are based on consensus of the reference group. *The acceptability of reported results is based on upper and lower acceptance limits. This is why a reported result may appear unacceptable according to z-Score, but be identified as acceptable. Any non-participation or non-reporting of PAT data will result in unacceptable results (see PAT Programs Participation Policies, Section 2.1.6.2.).

Measurement uncertainty of any assigned value is also available on the respective certificate of analysis for the round.

Technical Comment: Asbestos sample 1 was not scored because the data from the Reference Group had an unacceptable standard deviation and the resulting mean was significantly different from the expected result. All asbestos participants who submitted data for sample 1 received full credit for this sample. Validation mean for asbestos sample 1 was 106 f/mm².



STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

CALIFORNIA STATE



ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

CERTIFICATE OF ENVIRONMENTAL ACCREDITATION

Is hereby granted to

Asbestech

6825 Fair Oaks Boulevard, Suite 103

Carmichael, CA 95608

Scope of the certificate is limited to the
"Fields of Testing"
which accompany this Certificate.

Continued accredited status depends on successful completion of on-site inspection,
proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **1153**

Expiration Date: **3/31/2018**

Effective Date: **4/1/2016**

A handwritten signature in cursive script, appearing to read "Christine Sotelo".

Sacramento, California
subject to forfeiture or revocation

Christine Sotelo, Chief
Environmental Laboratory Accreditation Program



**CALIFORNIA STATE
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
Accredited Fields of Testing**



Asbestech

6825 Fair Oaks Boulevard, Suite 103
Carmichael, CA 95608
Phone: (916) 481-8902

**Certificate No. 1153
Expiration Date 3/31/2018**

Field of Testing: 114 - Inorganic Chemistry of Hazardous Waste

114.130 001 Lead EPA 7420

Field of Testing: 115 - Extraction Test of Hazardous Waste

115.021 001 TCLP Inorganics EPA 1311

115.030 001 Waste Extraction Test (WET) CCR Chapter11, Article 5, Appendix II

Field of Testing: 121 - Bulk Asbestos Analysis of Hazardous Waste

121.010 001 Bulk Asbestos EPA 600/M4-82-020

Environmental Lead Round 102
 Proficiency Testing Performance for Participant ID: PAT-101801

 Page 1 of 2
 Report Issue Date: 03/15/2018

 Asbestech
 6825 Fair Oaks Blvd Ste 103
 Carmichael, CA 95608-3836

This report contains your organization's Environmental Lead Proficiency Analytical Testing results for **ELPAT Round 102**. It is the participant's responsibility to thoroughly review the information in this final report and to immediately contact the AIHA Proficiency Analytical Testing Programs in writing, if any errors are found.

Environmental Lead Proficiency Analytical Testing Results

The final report is comprised of two sections relating to ELPAT Round 102. The first section contains your organization's results listed per analyte, per sample. The second section contains your current performance and performance from the two previous rounds, respectively (where applicable). Summary results for all participants for ELPAT Round 102 are located in a separate report.

Testing Results for ELPAT Round 102

This part of the report contains your organization's results listed per analyte, per sample.

Contaminant	Unit	#	Result	Ref. Value	Lower Limit	Upper Limit	z-Score	Rating
Paint Chips (PAINT)	%	1	0.891	0.927	0.743	1.11	-0.6	A
	%	2	0.0381	0.0399	0.0308	0.0491	-0.6	A
	%	3	0.463	0.471	0.378	0.563	-0.3	A
	%	4	2.57	2.78	2.27	3.29	-1.2	A

Statistical Analysis Interpretation Note:

Reference value is the mean of the reference group.

Lower limit = reference value - 3 standard deviations; Upper limit = reference value + 3 standard deviations

z-Score = (reported result - reference value)/standard deviation. Note: z-Scores indicate how far a particular score is away from the mean.

A - Acceptable* Analysis; U - Unacceptable Analysis

Both the assigned values and acceptance limits are based on consensus of the reference group.

*The acceptability of reported results is based on upper and lower acceptance limits. This is why a reported result may appear unacceptable according to z-Score, but be identified as acceptable.

Any non-participation or non-reporting of PAT data will result in unacceptable results (see PAT Programs Participation Policies, Section 2.1.6.2.).

Technical Comment: No remarkable observations.

SECTION 03 30 53 – MISC. CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

- A. Organization and Trade Standards
 - 1. State of California, Department of Transportation (CalTrans), Standard Specifications as adopted by local jurisdictional authority, latest edition, including amendments.
 - 2. Local jurisdictional and agency engineering and public works regulations and standards.
 - 3. American Concrete Institute (ACI) *ACI 301, Specifications for Structural Concrete and ACI 318*, Building Code Requirements for Structural Concrete

1.3 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.
 - 2. Division 31 Section "Concrete Paving" for concrete pavement and walks.
- C. Construct in accordance with Organization and Trade Standards of the authority having jurisdiction and in the presence of a representative of that agency.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Other Action Submittal:
 - 1. Design Mixtures: For each concrete mixture.

1.5 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Comply with the following sections of ACI 301, unless modified by requirements in the Contract Documents:
 - 1. "General Requirements."
 - 2. "Formwork and Formwork Accessories."
 - 3. "Reinforcement and Reinforcement Supports."
 - 4. "Concrete Mixtures."
 - 5. "Handling, Placing, and Constructing."
 - 6. "Lightweight Concrete."
- C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 - PRODUCTS

2.1 FORMWORK

- A. Furnish formwork and formwork accessories according to ACI 301.

2.2 STEEL REINFORCEMENT

- A. Recycled Content: Provide steel reinforcement with an average recycled content of steel products so that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
- E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

2.3 CONCRETE MATERIALS

- A. Class C per Sections 73 and 90, Caltrans Standard Specifications.
- B. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, Type II, low alkali per ASTM C150 and produced within the United States
 - a. Fly Ash: ASTM C 618, Class C or F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- C. Normal-Weight Aggregate: ASTM C 33, Table 3, Class 4M.
- D. Lightweight Aggregate: ASTM C 330, 1-inch nominal maximum aggregate size.
- E. Water-Cement ratio: 0.55 maximum.
- F. Synthetic Fiber: fibrillated polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

2.4 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 RELATED MATERIALS

- A. Vapor Retarder: Plastic sheet, ASTM E 1745, Class A or B.
- B. Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick; or plastic sheet, ASTM E 1745, Class C.
- C. Joint-Filler Strips: ¼ inch thick, premolded joint filler conforming to Caltrans Specifications Section 51-1.12C, "Premolded Expansion Joint Fillers".
- D. CURING MATERIALS
- E. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- F. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.

- G. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
 - H. Water: Potable.
 - I. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
 - J. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- 2.6 CONCRETE MIXTURES: Paving/flatwork/ramps/stairs:
- A. Comply with ACI 301 requirements for concrete mixtures.
 - B. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:
 - 1. Minimum Compressive Strength: 3250 psi at 28 days. Strength selected for durability. Concrete is non structural and does not require special inspection.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.55 maximum.
 - 3. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, maximum 25 percent.
 - 4. Slump Limit: 4 inches, plus or minus 1 inch.
 - 5. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.
 - 6. Cement Content: 560 pounds per cubic yard concrete.
- 2.7 CONCRETE MIXTURES: Curbing, gutters and related drainage components.:
- A. Comply with ACI 301 requirements for concrete mixtures.
 - B. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:
 - 1. Minimum Compressive Strength: 2500 psi at 28 days. Strength selected for durability. Concrete is non structural and does not require special inspection.
 - 2. Slump Limit: 4 inches, plus or minus 1 inch.
 - 3. Cement Content: 520 pounds per cubic yard concrete.
- 2.8 CONCRETE MIXTURES: Exposed Aggregate Paving/flatwork:
- A. Comply with ACI 301 requirements for concrete mixtures.

1. Minimum Compressive Strength: 3000 psi at 28 days. Strength selected for durability. Concrete is non structural and does not require special inspection.
2. Slump Limit: 3 inches, plus or minus 1 inch.
3. Cement Content: 520 pounds per cubic yard concrete.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

- A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.
 1. Lap joints 6 inches and seal with manufacturer's recommended adhesive or joint tape.

3.4 STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Locate and install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation / Expansion Joints : Install joint-filler strips at locations as shown on the drawings, and as follows:
 - 1. Beginning and end of curves in curbs and curbs and gutter assemblies, and at 60 feet on center.
 - 2. At junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, building foundation slabs or footings.
 - 3. At break with vertical plane at top and bottom of ramps.
 - 4. Within 5' of top of stair and bottom of stair.
 - 5. Joint filler shall be shaped to fit the cross section of the concrete that is being placed.
 - 6. Tool all edges adjacent to expansion material with maximum 1/8 inch radius tool.
 - 7. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

3.6 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Consolidate concrete with mechanical vibrating equipment.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding 1/2 inch.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.
 - 1. Apply to concrete surfaces exposed to public view,.
- C. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301, to smooth-formed finished as-cast concrete where indicated:
 - 1. Smooth-rubbed finish.
 - 2. Grout-cleaned finish.
 - 3. Cork-floated finish.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
 - 1. Do not further disturb surfaces before starting finishing operations.

- C. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes, unless otherwise indicated.
- D. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.
- E. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
- F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- G. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than

seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301.
 1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: One composite sample shall be obtained for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

3.11 REPAIRS

- A. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION 03 30 53

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Shop Drawings, Shop/Welder Certifications.

PART 2 - PRODUCTS

2.1 METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), black finish.
- C. Slotted Channel Framing: Cold-formed steel channels complying with MFMA-4, 1-5/8 by 1-5/8 inches by 0.067-inch minimum thickness, hot-dip galvanized after fabrication.
- D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 240/A 240M or ASTM A 666, Type 304. Provide .635 mm thickness with #4 finish at new drinking fountain.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.

2.3 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107; recommended by manufacturer for exterior applications.

2.4 FABRICATION

- A. General: Shear and punch metals cleanly and accurately. Remove burrs and ease exposed edges. Form bent-metal corners to smallest radius possible without impairing work.
- B. Welding: Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. At exposed connections, finish welds and surfaces smooth, with contour of welded surface matching those adjacent.

- C. Comply with AWS for recommended practices in shop brazing. Braze behind finished surfaces without distorting or discoloring exposed side. Clean exposed brazed joints of flux, and dress exposed and contact surfaces.
- D. Fabricate pipe bollards from Schedule 80 steel pipe. Cap bollards with 1/4-inch- minimum steel plate.

2.5 HANDRAILS AND GUARDRAILS

- A. Hot-dip galvanize all handrails and guardrails.
- B. Comply with ASTM A384, Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
- C. Develop shop drawings and plan the fabrication of the work as required to anticipate the hot-dip galvanizing process, and its possible impacts on the work, including, but not limited to:
 - 1. Place welds near to and symmetrically around the neutral axis - align welds so shrinkage and opposing forces are balanced rather than all pulling in the same direction.
 - 2. Weld the assembly from inside to outside to avoid high shrinking stresses.
 - 3. Avoid the need to force, spring, or restrain components during welding.
 - 4. Avoid over-welding and use as few weld passes as possible.
 - 5. Continuously weld thick sections; however, thin sections may benefit from staggered welding. For staggered welding of 1/8 in or lighter material, weld centers should be closer than 4 in.
 - 6. Steel thicknesses should vary as little as possible throughout the assembly.
 - 7. Consult with the galvanizer to consider length variations of the assembly and plan for thermal expansion conditions. Consult with the galvanizer to coordinate maximum lengths the work may need to be cut into prior to the galvanizing process.
 - 8. Design drainage/venting holes per ASTM A385 and maximize drainage for hollow sections.
 - 9. Arrange products flat and free from external forces during the cool-down phase. Use additional supports underneath the mid-section of products to prevent sagging.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide anchorage devices and fasteners where needed to secure items to in-place construction.
- B. Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation, with edges and surfaces level, plumb, true, and free of rack.
- C. Fit exposed connections accurately together to form hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers.
- D. Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- E. Anchor bollards in concrete and fill solidly with concrete, mounding top surface.

END OF SECTION 055000

SECTION 055113 – STAIR NOSING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product data and color samples.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. National Guard Products Inc. Safety Tread Stair Nosing # 3231, 3” wide by ½” tall, continuous hook anchor design.

2.2 PERFORMANCE REQUIREMENTS

- A. Coefficient of friction .94 dry, .86 wet.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete." Install abrasive nosings with anchors fully embedded in concrete.

END OF SECTION 055113

SECTION 05 70 00 SKATE DETERRENT CLEATS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and color/finish charts.

PART 2 - PRODUCTS

2.1 Skateboard deterrent cleat.

- A. 6061-T6 Aluminum, clear anodized, chamfered profile to match formed concrete.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. (2) offset blind holes for manufacturer's pins, anchored in impact-resistant two-part epoxy.
- B. Set units level and true to line and anchor securely in place.
- C. So not attach at joint lines.
- D. Correct deficiencies in or remove and reinstall installations that do not comply with requirements.

END OF SECTION 05700

SECTION 061000 - ROUGH CARPENTRY

PART 1 - PRODUCTS

1.1 WOOD PRODUCTS, GENERAL

- A. Lumber: Provide dressed lumber, S4S, marked with grade stamp of inspection agency.
- B. All lumber to be Kiln-dried.

1.2 TREATED MATERIALS

- A. Preservative-Treated Materials: AWWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground.
 - 1. Use treatment containing no arsenic or chromium.
 - 2. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- B. Provide preservative-treated materials for items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing members that are less than 18 inches above the ground.
 - 4. Wood floor plates that are installed over concrete slabs-on-grade.
- C. Fire-Retardant-Treated Materials: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Use Exterior type for exterior locations and where indicated.
 - 2. Use Interior Type A unless otherwise indicated.
 - 3. For enclosed roof framing, framing in attic spaces, and where high-temperature fire-retardant treatment is indicated, provide material with design adjustment factors of not less than 0.85 for modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.
 - 4. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
 - 5. Identify with appropriate classification marking of a testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Provide fire-retardant treated materials for items indicated on Drawings.

1.3 FRAMING

- A. Certified Wood: Wood framing shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- B. Dimension Lumber:
 - 1. Maximum Moisture Content: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness.
 - 2. Non-Load-Bearing Interior Partitions: Construction or No. 2, WCLIB or WWPA.
 - 3. Framing Other Than Non-Load-Bearing Interior Partitions: Construction, Stud, or No. 3: Douglas fir, WCLIB, or WWPA.
 - 4. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

1.4 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, Exterior, AC, fire-retardant treated, not less than 3/4-inch nominal thickness.

1.5 MISCELLANEOUS PRODUCTS

- A. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
 - 1. Power-Driven Fasteners: CABO NER-272.
 - 2. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- B. Sill Sealer: Glass-fiber insulation, 1 inch thick, compressible to 1/32 inch or Closed-cell neoprene foam, 1/4 inch thick.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Do not splice structural members between supports unless otherwise indicated.

END OF SECTION 061000

SECTION 061600 - SHEATHING

PART 1 - PRODUCTS

1.1 WOOD PANEL PRODUCTS, GENERAL

- A. Plywood: DOC PS 1.
- B. Oriented Strand Board: DOC PS 2.
- C. Certified Wood: Wood-based materials shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

1.2 TREATED PLYWOOD

- A. Preservative-Treated Plywood: AWPA U1; Use Category UC2.
 - 1. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- B. Provide preservative-treated plywood for items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

1.3 WALL SHEATHING

- A. Plywood Wall Sheathing: Exterior, Structural I sheathing.
- B. Cementitious Backer Units: ASTM C 1325, Type A.

1.4 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural I sheathing.

1.5 MISCELLANEOUS PRODUCTS

- A. Fasteners: Size and type indicated.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.
 - 2. Power-Driven Fasteners: CABO NER-272.
- B. Adhesives for Field Gluing Panels to Framing: APA AFG-01.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. Securely attach to substrates, complying with the following:
 - 1. CABO NER-272 for power-driven fasteners.
- B. Fastening Methods:
 - 1. Wall and Roof Sheathing:
 - a. Nail to wood framing.
- C. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

END OF SECTION 061600

SECTION 062000 - FINISH CARPENTRY

PART 1 - PRODUCTS

1.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.
- B. Softwood Plywood: DOC PS 1.
- C. MDF: ANSI A208.2, Grade 130.
- D. Particleboard: ANSI A208.1.
- E. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper.
- F. Certified Wood: Wood-based materials produced from tropical forests shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

1.2 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Stainless-steel.
- B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. Condition interior finish carpentry in installation areas for 24 hours before installing.
- B. Prime and backprime lumber for painted finish exposed on the exterior. Cut to length and prime ends.
- C. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Scribe and cut to fit adjoining work. Refinish and seal cuts.
 - 1. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.

- D. Install standing and running trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary. Stagger joints in adjacent and related trim. Cope at returns and inside corners and miter at outside corners.
- E. Nail siding at each stud. Do not allow nails to penetrate more than one thickness of siding, unless otherwise recommended by siding manufacturer. Seal joints at inside and outside corners and at trim locations.
- F. Select and arrange paneling for best match of adjacent units. Install with uniform tight joints.

END OF SECTION 062000

SECTION 070150.19 - PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Use infill materials matching existing roofing system materials unless otherwise indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect existing roofing system that is not to be reroofed.
- B. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.
- C. Maintain roof drains in functioning condition. Prevent debris from entering or blocking roof drains. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday.

3.2 ROOF TEAR-OFF

- A. Full Roof Tear-Off: Remove existing roofing and other roofing system components down to the deck.

3.3 DECK PREPARATION

- A. If broken or loose fasteners that secure decking to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect. Do not proceed with installation until directed by Architect.
- B. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.

3.4 INFILL MATERIALS INSTALLATION

- A. Immediately after roof tear-off and, if needed, inspection and repair of deck, fill in tear-off areas to match existing roofing system construction.
- B. Install new roofing patch over roof infill area. If new roofing is installed the same day tear-off is made, roofing patch is not required.

3.5 BASE FLASHING REMOVAL

- A. Remove existing base flashings. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.
- B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings specified in Section 076200 "Sheet Metal Flashing and Trim."

END OF SECTION 070150.19

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Surface-Burning Characteristics: According to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

PART 2 - PRODUCTS

2.1 INSULATION PRODUCTS

- A. Extruded-Polystyrene Board Insulation: ASTM C 578.
- B. Molded-Polystyrene Board Insulation: ASTM C 578.
- C. Foil-Faced Polyisocyanurate Board Insulation: ASTM C 1289, Type I.
- D. Glass-Fiber-Blanket Insulation: ASTM C 665.
- E. Mineral-Fiber-Blanket Insulation: ASTM C 665 with flame-spread index of 25 or less.
- F. Self-Supported, Spray-Applied, Cellulosic Insulation: ASTM C 1149, wood-based cellulosic fiber, chemically treated for flame-resistance, processing, and handling characteristics.
- G. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, minimum density of 1.5 lb/cu. ft.
- H. Open-Cell Polyurethane Foam Insulation: Spray-applied polyurethane foam using water as a blowing agent, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, and minimum density of 0.4 lb/cu. ft.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install insulation in areas and in thicknesses indicated or required to produce R-values indicated. Cut and fit tightly around obstructions and fill voids with insulation.
- B. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

- C. Except for loose-fill insulation and insulation that is friction fitted in stud cavities, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- D. Place loose-fill insulation to comply with ASTM C 1015.
 - 1. Comply with the CIMA's Special Report #3, "Standard Practice for Installing Cellulose Insulation."
- E. Spray-Applied Insulation: Apply insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs.
- F. Install sheet radiant barriers according to ASTM C 1158.
- G. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage. Locate seams at framing members, overlap, and seal with tape. Seal joints caused by pipes, conduits, electrical boxes, and similar items with tape.

END OF SECTION 072100

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Samples, and ICC-ES evaluation reports.
- B. Warranties: Manufacturer's standard written warranty, signed by manufacturer agreeing to promptly repair or replace asphalt shingles that fail in materials for a period of 50 years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A. Identify products with appropriate markings of testing and inspecting agency acceptable to authorities having jurisdiction.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip, SBS-Modified Asphalt Shingles: ASTM D 3462/D 3462M, laminated, multi-layer overlay construction, mineral-granule surfaced, and self-sealing; complying with UL 2218, Class 4.

2.3 ACCESSORIES

- A. Felts: ASTM D 4869/D 4869M, Type II, asphalt-saturated organic felts.
- B. Self-Adhering Sheet Underlayment: ASTM D 1970/D 1970M, SBS-modified asphalt; mineral-granule or slip-resisting-polyethylene surfaced; with release paper backing; cold applied.
- C. Asphalt Roofing Cement: ASTM D 4586/D 4586M, Type II, asbestos free.
- D. Roofing Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel shingle nails, minimum 0.120-inch diameter, of sufficient length to extend at least 1/8 inch through plywood sheathing.
 - 1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- E. Felt-Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.
- F. Sheet Metal Flashing and Trim: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

1. Sheet Metal: Aluminum.
2. Drip Edge: Formed sheet metal with at least a 2-inch roof deck flange and a 1-1/2-inch fascia flange with a 3/8-inch drip at lower edge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with recommendations in ARMA's "Residential Asphalt Roofing Manual" and with asphalt shingle recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems."
- B. Apply self-adhering sheet underlayment at eaves and rakes from edges of roof to at least 36 inches inside exterior wall line.
- C. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment.
- D. Install metal flashings to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
- E. Install first and remaining courses of asphalt shingles, stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses and maintaining uniform exposure.

END OF SECTION 073113

**SECTION 07 54 30 MECHANICALLY-ATTACHED THERMOPLASTIC MEMBRANE ROOFING
FEATURING PLATES & SCREWS IN THE SEAM**

PART 1 - GENERAL CONDITIONS

1.01 DESCRIPTION

A. Scope of Work:

To install a mechanically-attached 60 mil PVC Roofing Membrane with flashings and other components to comprise a roofing system as follows:

1. Base Bid – Remove existing roof system down to the existing substrate. Repair and/or replace any damages or wet substrate to match existing thickness.
2. Provide and install new layer of 1/4" Dens Deck over the existing substrate, stagger all joints and mechanically attach per FM 1-75 attachment requirements utilizing a #12 fastener and approved insulation plate. Provide and install new 60 Mil PVC Membrane over new 1/4" Dens Deck and mechanically attach through to the existing substrate conforming to FM 1-75 fastening pattern and per the PVC manufacturer's standard written and detail requirements utilizing a #15 XP fastener and XPN membrane disc.
3. Flash each penetration with a cone flashing membrane per PVC manufacturer's standard written and detail requirements. All pitch pans are to be removed and each penetration flashed individually.
4. Remove and dispose existing sleepers and replace with new redwood sleepers, flashing each per PVC manufacturer's standard detail and installation requirements.

B. Related Work

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

1. Substrate Preparation
2. Wood Blocking
3. Roof Membrane
4. Fasteners
5. Adhesive for Flashings
6. Roof Membrane Flashings
7. Metal Flashings
8. Sealants
10. Separation Board

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

1. Manufacturer's 20 Year Standard Warranty
2. Roofing Contractor Warranty – 2 Year

1.02 QUALITY ASSURANCE

- A.** This roofing system shall be applied only by a Roofing Contractor authorized by the PVC membrane manufacturer prior to bid ("Applicator"). The Roofing Contractor shall have at least 5 (five) years of documented experience as an applicator with the submitted PVC membrane manufacturer as certified by the manufacturer.

- B. Upon completion of the installation and the delivery to manufacturer by the Applicator of a certification that all work has been done in strict accordance with the contract specifications and the manufacturer's requirements, an inspection shall be made by a Technical Representative of manufacturer to review the installed roof system.
- C. There shall be no deviation made from the Project Specification without prior written approval by the Owner, the Owner's Representative and the manufacturer.
- D. All work pertaining to the installation of the membrane and flashings shall only be completed by Applicator personnel trained and authorized by the manufacturer in those procedures.
- E. Membrane to have a consistent formulation for the last fifteen (15) years as certified by the manufacturer. **No private labeled PVC membranes will be accepted or reviewed.**
- F. Periodic in-progress inspections shall be performed for the duration of this project. The inspections shall be performed by a Technical Representative of the Roofing Manufacturer.
- G. Track Record – Install only PVC Roof Systems from manufacturer's able to demonstrate the product on 5 existing functional roofs =>15 Year old roofs with the same membrane formulation within 100 miles of the proposed project.
- H. Use only a Manufacturer who has initiated a post consumer recycling program and can demonstrate a minimum of five projects where the existing PVC roof has been removed and recycled into new roofing membrane or PVC components.

1.03 SUBMITTALS

- A. Submittals with bid shall include the following:
 - 1. A list of each primary component to be used in the roof system and the Manufacturer's current literature for each component.
 - 2. Sample copy of Roofing Manufacturer's warranty.
 - 3. Sample copy of Contractor's warranty.
 - 4. Letter from Roofing Manufacturer confirming that the Contractor is an authorized applicator of the specified roof system.
- B. Submittals of equals:

Submit proposed equals to be considered for use on this project no less than ten (10) days prior to bid date. Proposed roof systems which have been reviewed and accepted will be listed in an addendum prior to bid date; only then will roof systems be accepted at bidding. Submittals shall include the following:

 - 1. Copies of Specification including physical properties.
 - 2. Samples of each primary component to be used in the roof system and the manufacturer's current literature for each component.
 - 3. Written approval by the insulation manufacturer (as applicable) for use and performance of the product in the proposed system.
 - 4. Sample copy of manufacturer's warranty including **no exclusion for ponding water** without time limit.

5. Sample copy of Applicator's warranty.
6. Certifications by manufacturers of roofing and insulating materials that all materials supplied comply with all requirements of the identified ASTM and industry standards or practices and requirements of this specification including membrane and polymer thicknesses as described in Section 2.01.
7. Certification from the Applicator that the system specified meets all identified code and insurance requirements as required by the Specification.
8. Letter from the submitted PVC manufacturer documenting the contractor's five (5) years of experience installing the PVC membrane manufacturer's membrane.
9. Letter from the submitted manufacturer documenting consistency of product formulation for 15 years and confirming the number of years it has directly manufactured the proposed PVC roof system under the trade names and/or trademarks as proposed **No private labeled membrane will reviewed or accepted.**
10. Material and Safety Data Sheets.

1.04 CODE REQUIREMENTS

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

- A. Factory Mutual Research Corporation (FM) - Norwood, MA
 1. Class 1-75 (Attachment Criteria)
- B. Underwriters Laboratories, Inc. - Northbrook, IL
 1. Class A assembly

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All products delivered to the job site shall be in the original unopened containers or wrappings bearing all seals and approvals.
- B. Handle all materials to prevent damage. Place all materials on pallets and fully protect from moisture.
- C. Membrane rolls shall be stored lying down on pallets and fully protected from the weather with clean canvas tarpaulins. Unvented polyethylene tarpaulins are not accepted due to the accumulation of moisture beneath the tarpaulin in certain weather conditions that may affect the ease of membrane weldability.
- D. All adhesives shall be stored at temperatures between 40° F (5° C) and 80° F (27° C).
- E. All flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.
- F. All materials which are determined to be damaged by the Owner's Representative or the manufacturer are to be removed from the job site and replaced at no cost to the Owner.

1.06 JOB CONDITIONS

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

- O. All rooftop contamination that is anticipated or that is occurring shall be reported to the manufacturer to determine the corrective steps to be taken.
- P. The Applicator shall verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Applicator shall report any such blockages in writing (letter copy to the manufacturer) to the Owner's Representative for corrective action prior to installation of the roof system.
- Q. Applicator shall immediately stop work if any unusual or concealed condition is discovered and shall immediately notify Owner of such condition in writing for correction at the Owner's expense (letter copy to the manufacturer).
- R. Site cleanup, including both interior and exterior building areas that have been affected by construction, shall be completed to the Owner's satisfaction.
- S. All landscaped areas damaged by construction activities shall be repaired at no cost to the Owner.
- T. The Applicator shall conduct fastener pullout tests in accordance with the latest revision of the SPRI/ANSI Fastener Pullout Standard to help verify condition of deck/substrate and to confirm expected pullout values.
- U. The adhered membrane shall not be installed under the following conditions without consulting the manufacturer's technical department for precautionary steps:
 - 1. The roof assembly permits interior air to pressurize the membrane underside.
 - 2. Any exterior wall has 10% or more of the surface area comprised of opening doors or windows.
 - 3. The wall/deck intersection permits air entry into the wall flashing area.
- V. Precautions shall be taken when using adhesives at or near rooftop vents or air intakes. Adhesive odors could enter the building. Coordinate the operation of vents and air intakes in such a manner as to avoid the intake of adhesive odor while ventilating the building. Keep lids on unused cans at all times.
- W. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.

1.07 BIDDING REQUIREMENTS

A. Pre-Bid Meeting:

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

B. Site Visit:

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

1.08 WARRANTIES

- A. 20 Year Standard Warranty (only products purchased from the manufacturer are covered under Standard Warranty)

Upon successful completion of the work to the Roofing Manufacturer's and Owner's satisfaction, and receipt of final payment, the twenty (20) Year Standard Warranty shall be issued. The Standard Warranty shall provide for the roof membrane, all accessories that comprise a roof system, and contractor labor. The Warranty shall be Non-Prorated provide for No Dollar Limit (NDL), and **shall not exclude ponding water and no time limited shall be assigned for any such ponding water during the warranty period.**

- B. Applicator/Roofing Contractor 2 Year Warranty

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

- C. Owner Responsibility

Owner shall notify both the manufacturer and the Applicator of any leaks as they occur during the time period when both warranties are in effect.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The components/basis of design of the specified PVC mechanically-attached roof system are to be products approved PVC membrane as indicated on the specified in the Contract Documents or approved equal.
- B. Components to be used that are other than those supplied or manufactured by the approved PVC membrane manufacturer may be submitted for review and acceptance by PVC manufacturer. PVC Manufacturer's acceptance of any other product is only for a determination of compatibility with PVC products and not for inclusion in the manufacturer's warranty. The specifications, installation instructions, limitations, and/or restrictions of the respective manufacturers must be reviewed by the Owner's Representative for acceptability for the intended use with PVC manufacturer's products.
- C. Membrane shall be certified by the PVC manufacturer to be with three (3) mils of the specified membrane thickness as stated in this section. ASTM minimum standards of +/- 10% will not be accepted.

2.02 MEMBRANE

- A. Basis of Design - Sika Sarnafil® S327 polyester reinforced membrane with a factory-applied, integral lacquer coating to repel dirt and sustain reflectivity.
- B. Membrane shall conform to ASTM D4434-96 (or latest revision), "Standard for Polyvinyl Chloride Sheet Roofing," Classification: Type III.
1. Sika Sarnafil S327, 60 mil , thermoplastic membrane with polyester reinforcement.

2. or Pre-Approved Equal. Equal must be a PVC thermoplastic membrane.
 - Private labeled products will not be accepted or reviewed.
 - Products with KEE or Evaloy will not be accepted or reviewed.

C. Color of Membrane

1. EnergySmart (white), initial reflectivity of 0.83, initial emissivity 0.90, solar reflective index (SRI) of >104.

D. Typical Physical Properties

<u>Parameters</u>	<u>ASTM Test Method</u>	<u>Minimum ASTM Requirement</u>	<u>Sarnafil Typical Physical Properties</u>
Reinforcing Material	-		Polyester
Overall Thickness, min., inches (mm)	D751	0.045	[0.060 nches]
Breaking Strength, min., lbf/in. (KN/m)	D751	200 (35.0)	230 (40.0)
Elongation at Break, min.	D751	15%	20%
Seam strength*, min. (% of breaking strength)	D751	75	85
Retention of Properties After Heat Aging	D3045	-	-
Breaking Strength, min., (% of original)	D751	90	95
Elongation, min., (% of original)	D751	90	90
Tearing Strength, min., lbf (N)	D1004	45.0 (200)	50 (220)
Low Temperature Bend, -40°F (-40°C)	D2136	Pass	Pass
Accelerated Weathering Test (Xenson Arc)	D2565	5,000 Hours	10,000 Hours
Cracking (7x magnification)	-	None	None
Discoloration (by observation)	-	Negligible	Negligible
Crazing (7 x magnification)	-	None	None
Linear Dimensional Change	D1204	0.5% max.	0.1%
Weight Change After Immersion in Water	D570	± 3.0% max.	2.5%
Static Puncture Resistance, 33 lbf (15 kg)	D5602	Pass	Pass
Dynamic Puncture Resistance, 14.7 ft-lbf (20 J)	D5635	Pass	Pass

*Failure occurs through membrane rupture not seam failure. Physical Properties shown are prior to applying feltbacked, if specified.

2.03 FLASHING MATERIALS

A. Wall/Curb Flashing

1. Adhered Flashing Membrane

A fiberglass reinforced membrane adhered to approved substrate using adhesive.

2. Mechanically Attached Flashing Membrane

A polyester reinforced membrane used for mechanically-attached flashings to approved substrate using Disc.

3. Clad

A PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Clad is a 25 gauge, G90 galvanized metal sheet with a 20 mil (1 mm) unsupported membrane laminated on one side.

B. Perimeter Edge Flashing

1. Clad

A PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Clad is a 25 gauge, G90 galvanized metal sheet with a 20 mil (1 mm) unsupported membrane laminated on one side.

2. Non-Typical Edge

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

C. Miscellaneous Flashing

1.

1. Reglet

A heavy-duty, extruded aluminum flashing termination reglet used at walls and large curbs. Reglet is produced from 6063-T5, 0.10 inch - 0.12 inch (2.5 mm - 3.0 mm) thick extruded aluminum. Reglet has a 2¼ inch (57 mm) deep profile, and is provided in 10 foot (3 m) lengths. Use prefabricated Reglet mitered inside and outside corners where walls intersect.

2. Stack

A prefabricated vent pipe flashing made from 0.048 inch (48 mil/1.2 mm) thick G410 membrane.

3. Corner

Prefabricated outside and inside flashing corners made of 0.060 inch (60 mil/1.5 mm) thick membrane that are heat-welded to membrane or clad base flashings.

4. Multi-Purpose Sealant

A sealant used at flashing terminations.

5. Flashing Adhesive

A low VOC reactivating-type adhesive used to attach membrane to flashing substrate.

6. Felt

A non-woven polyester or polypropylene mat cushion layer that is necessary behind PVC Flashing Membrane when the flashing substrates are rough-surfaced or incompatible with the flashing membrane.

2.04 SEPARATION AND INSULATION BOARD

A. Dens-Deck – (1/4" minimum)

A siliconized gypsum, fire-tested hardboard with glass-mat facers. Dens-Deck is provided in a 4 ft x 8 ft (1.2 m x 2.4 m) board size and in thicknesses. Use 1/4" board on horizontal application.

B. Rigid Insulation (if required)

Rigid isocyanurate foam insulation with black mat facer.

2.05 ATTACHMENT COMPONENTS

A. Insulation plate – Insulation/recovery board attachment

Used with various Fasteners to attach insulation boards to roof deck. Plate is a 3 inch (75 mm) square or round, 26 gauge stamping of SAE 1010 steel with an AZ 55 Galvalume coating.

B. Insulation Fastener #12 – Insulation/recovery board attachment

A #12 corrosion-resistant fastener used with Plates to attach insulation boards to steel or wood roof decks. Fastener #12 has a modified buttress thread, a shank diameter of approximately 0.168 inch (4 mm) and a thread diameter of approximately 0.214 inch (5 mm). The driving head has a diameter of approximately 0.435 inch (11 mm) with a #3 Phillips recess for positive engagement.

D. Membrane Fastener XP – Membrane Attachment

A specially designed, heavy duty, corrosion resistant fastener used with a Sarnadisc XPN to attach S327 membrane to roof decks. Fastener-XP has a shank diameter of approximately 0.21 inch (5.3 mm) and the thread diameter is approximately 0.26 inch (6.6 mm). The driving head has a diameter of approximately 0.435 inch (11 mm) with a #3 Phillips recess for positive engagement.

E. Membrane Disc XPN – Membrane Attachment

A high strength plate used with the XP Fastener to attach PVC membrane to 22-24 gauge steel deck and 1/2-5/8 wood roof decks. The XPN disc is an 18 gauge, oblong corrosion resistant steel plate.

2.06 WALKWAY PROTECTION

A. Walk-Tred (color: Light Gray)

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

2.07 MISCELLANEOUS ACCESSORIES

A. Aluminum Tape

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

2.08 MISCELLANEOUS FASTENERS AND ANCHORS

- A. All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1¼ inch (32 mm) and shall be approved for such use by the fastener manufacturer. All miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 inch (25 mm) and shall be approved for such use by the fastener manufacturer.

2.09 RELATED MATERIALS

- A. Wood Nailer

Treated wood nailers shall be installed at the perimeter of the entire roof and around such other roof projections and penetrations as specified on Project Drawings. Thickness of nailers must match the insulation thickness to achieve a smooth transition. Wood nailers shall be treated for fire and rot resistance (wolmanized or osmose treated) and be #2 quality or better lumber. Creosote or asphalt-treated wood is not acceptable. Wood nailers shall conform to Factory Mutual Loss Prevention Data Sheet 1-49. All wood shall have a maximum moisture content of 19% by weight on a dry-weight basis.

- B. Plywood

When bonding directly to plywood, a minimum ½ inch (12 mm) CDX (C side out), smooth-surfaced exterior grade plywood with exterior grade glue shall be used. Rough-surfaced plywood or high fastener heads will require the use of Felt behind the flashing membrane. Plywood shall have a maximum moisture content of 19% by weight on a dry weight basis.

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION CONFERENCE

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

3.02 SUBSTRATE CONDITION

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

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

3.03 SUBSTRATE PREPARATION

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

- A. Re-Roofing over an existing Bitumen System
1. On smooth surface roofs, the surface must be clean and dry. All blisters shall be removed and sealed and cut, fastened down and sealed. All debris and loose gravel shall be removed.
- C. Re-roofing with removal of existing single ply
1. All existing roofing, base flashing, deteriorated wood blocking or deteriorated metal flashings shall be removed. Remove only that amount of roofing and flashing which can be made watertight with new materials during a one-day period or before the onset of inclement weather.

3.04 SUBSTRATE INSPECTION

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

3.05 WOOD NAILER INSTALLATION (if required)

- A. Install continuous wood nailers at the perimeter of the entire roof and around roof projections and penetrations as shown on the Detail Drawings.
- B. Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches (0.3 m) on center or 16 inches (0.4 m) on center if necessary to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of each end. Two fasteners shall be installed at ends of nailer lengths. Nailer attachment shall meet this requirement and that of the current Factory Mutual Loss Prevention Data Sheet 1-49.

- C. Thickness shall be as required to match substrate or insulation height to allow a smooth transition.
- D. Any existing nailer woodwork which is to remain shall be firmly anchored in place to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction and shall be free of rot, excess moisture or deterioration. Only woodwork shown to be reused in Detail Drawings shall be left in place. All other nailer woodwork shall be removed.

3.06 SEPARATION/INSULATION BOARD INSTALLATION

General Criteria:

- A. Separation Board shall be installed according to insulation manufacturer's instructions.
- B. Separation Board shall be neatly cut to fit around penetrations and projections.
- C. Install tapered insulation in accordance with insulation manufacturer's shop drawings.
- D. Install tapered insulation around drains creating a drain sump.
- E. Do not install more insulation board than can be covered with membrane by the end of the day or the onset of inclement weather.
- F. Use at least 2 layers of insulation when the total insulation thickness exceeds 2½ inches (64 mm). Stagger joints at least 12 inches (0.3 m) between layers.
- G. Mechanical Attachment
 - 1. Separation Board shall be mechanically fastened to the deck with approved fasteners and plates at a rate according to the separation board manufacturer's, FM's and the membrane manufacturer recommendations for fastening rates and patterns. The quantity and locations of the fasteners and plates shall also cause the insulation boards to rest evenly on the roof deck/substrate so that there are no significant and avoidable air spaces between the boards and the substrate. Each insulation board shall be installed tightly against the adjacent boards on all sides.
 - 2. Fasteners are to be installed consistently in accordance with fastener manufacturer's recommendations. Fasteners are to have minimum penetration into structural deck recommended by the fastener and membrane manufacturers.
 - 3. Use fastener tools with a depth locator and torque-limiting attachment as recommended or supplied by fastener manufacturer to ensure proper installation.

3.07 INSTALLATION OF PVC MEMBRANE

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

A. General

1. PVC membrane is to be attached with Fasteners and Disc according to the manufacturer and Factory Mutual's requirements.
2. Membrane overlaps shall be shingled with the flow of water where possible.
3. Membrane full-width (120 inch) rolls shall be fastened perpendicular to the direction of the steel deck flutes, wood plank, precast or cementitious wood fiber panel where possible.
4. **Tack welding of PVC full or half-width rolls for purposes of temporary restraint during installation is not permitted.** Consult Manufacturer's Technical Department for further information.

B. Perimeter and Corner Areas

1. Over the properly installed and prepared substrate surface, PVC half-width (60 inches) rolls are to be installed parallel with the entire perimeter edge. The number of adjacent half-rolls will be determined by building height and width and other conditions according to FM guidelines and Technical requirements. Fasteners and Discs are installed along the edge of the membrane on the fastening line at a spacing determined by the manufacturer and the Owner's Representative/Designer. Discs are held-back 1 inch (25 mm) from the outer edge of the membrane. The adjacent half-roll is positioned to overlap the fastened edge of the first half-roll by 5-1/2 inches (140 mm) in accordance with the overlap lines marked on it's edge. The 5-1/2 inch (140 mm) overlap will allow the top membrane to extend 2-1/2 inches (63 mm) past the Discs for heat-welding. Fasteners shall clamp the PVC membrane tightly to the substrate. In corner areas where perimeter half-rolls intersect, add rows of Fasteners and Discs over the top the half-rolls and weld a (PVC) coverstrip above them for watertightness. See Detail Drawings.

Notes:

- a) Perimeter area is defined as the outer boundary of the roof. If the roof is broken into different levels, each roof area shall be treated as an individual roof with its outer boundary being treated as a perimeter. Typically, internal expansion joints and firewalls are not considered to be full perimeters. Refer to Factory Mutual's Data Sheet 1-28 for more information.
 - b) The ridge area is defined as the high point in the roof area formed by two intersecting planes. When the sum of the slopes is a minimum of 4 inches in 12 inches (30 degrees), each side of the ridge shall be treated as a perimeter area.
2. **Hot-air weld overlaps according to manufacturer's requirements. Seam test cuts shall be taken at least 3 times per day.**

C. Interior Area

1. Over the properly installed and prepared substrate surface, PVC full-width (78-5/8 inches or 2 meter) rolls are to be installed perpendicular to the steel deck flutes, wood plank or wood or concrete panels. Fasteners and Discs are installed along the edge of the membrane on the fastening line at a spacing determined by the manufacturer and the Owner's Representative/Designer. Discs are held-back 1 inch (25 mm) from the outer edge of the membrane. The adjacent full-roll is positioned to overlap the fastened edge of the first full-roll by 5-1/2 inches (140 mm) in accordance with the overlap lines marked on it's edge. The 5-1/2 inch (140 mm) overlap will allow the top membrane to extend 2-1/2 inches (63 mm) past the discs for heat-welding. Fasteners shall clamp the PVC membrane tightly to the substrate. See Detail Drawings.

2. **Hot-air weld overlaps according to PVC Manufacturer's recommendations. Seam test cuts shall be taken at least 3 times per day.**

D. Securement Around Rooftop Penetrations

1. Around all perimeters, at the base of walls, drains, curbs, vent pipes, or any other roof penetrations, Fasteners and Discs shall be installed according to perimeter rate of attachment. Fasteners shall be installed according to the manufacturer's instructions. Fasteners shall be installed using the fastener manufacturer's recommended torque-sensitive fastening tools with depth locators. Fasteners shall clamp the membrane tightly to the substrate.
2. Membrane flashings shall extend 2-1/2 inches (63 mm) past the Discs and be hot-air welded to the deck membrane.

3.08 HOT-AIR WELDING OF SEAM OVERLAPS

A. General

1. All seams shall be hot-air welded. Seam overlaps should be 3 inches (75 mm) wide when automatic machine-welding and 4 inches (100 mm) wide when hand-welding, except for certain details.
2. Welding equipment shall be provided by or approved by the manufacturer. All mechanics intending to use the equipment shall have successfully completed a training course provided by a manufacturer's Technical Representative prior to welding.
3. All membrane to be welded shall be clean and dry.

B. Hand-Welding

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

1. The back edge of the seam shall be welded with a narrow but continuous weld to prevent loss of hot air during the final welding.
2. The nozzle shall be inserted into the seam at a 45 degree angle to the edge of the membrane. Once the proper welding temperature has been reached and the membrane begins to "flow," the hand roller is positioned perpendicular to the nozzle and pressed lightly. For straight seams, the 1½ inch (40 mm) wide nozzle is recommended for use. For corners and compound connections, the ¾ inch (20 mm) wide nozzle shall be used.

C. Machine Welding

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

D. Quality Control of Welded Seams

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

3.09 MEMBRANE FLASHINGS

- A. Metal details, fabrication practices and installation methods shall conform to the applicable requirements of the following:
1. Factory Mutual Loss Prevention Data Sheet 1-49 (latest issue).
 2. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - latest issue.
- B. Metal, other than that provided by the manufacturer, is not covered under the warranty.
- C. Complete all metal work in conjunction with roofing and flashings so that a watertight condition exists daily.
- D. Metal shall be installed to provide adequate resistance to bending to allow for normal thermal expansion and contraction.
- E. Metal joints shall be watertight.
- F. Metal flashings shall be securely fastened into solid wood blocking. Fasteners shall penetrate the wood nailer a minimum of 1 inch (25 mm).
- H. Airtight and continuous metal hook strips are required behind metal fascias. Hook strips are to be fastened 12 inches (0.3 m) on center into the wood nailer or masonry wall.
- I. Counter flashings shall overlap base flashings at least 4 inches (100 mm).
- J. Hook strips shall extend past wood nailers over wall surfaces by 1½ inch (38 mm) minimum and shall be securely sealed from air entry.

3.10 TEMPORARY CUT-OFF

All flashings shall be installed concurrently with the roof membrane in order to maintain a watertight condition as the work progresses. All temporary waterstops shall be constructed to provide a 100% watertight seal. The stagger of the insulation joints shall be made even by installing partial panels of insulation. The new membrane shall be carried into the waterstop. The waterstop shall be sealed to the deck and/or substrate so that water will not be allowed to travel under the new or existing roofing. The edge of the membrane shall be sealed in a continuous heavy application of sealant as described in Section 2.10. When work resumes, the contaminated membrane shall be cut out. All sealant, contaminated membrane, insulation fillers, etc. shall be removed from the work area and properly disposed of off site. None of these materials shall be used in the new work.

If inclement weather occurs while a temporary waterstop is in place, the Applicator shall provide the labor necessary to monitor the situation to maintain a watertight condition.

If any water is allowed to enter under the newly-completed roofing, the affected area shall be removed and replaced at the Applicator's expense.

3.11 COMPLETION

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

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

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Coordinate installation of sheet metal flashing and trim with adjoining roofing and wall materials, joints, and seams to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless otherwise indicated. Conform to dimensions and profiles shown unless more stringent requirements are indicated.

2.2 SHEET METAL

- A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, not less than 0.032 inch thick.

2.3 ACCESSORIES

- A. Felt Underlayment: ASTM D 226, asphalt-saturated organic felts.
- B. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. minimum.
- C. Fasteners: Wood screws, annular-threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners.
 - 1. Exposed Fasteners: Heads matching color of sheet metal roofing using plastic caps or factory-applied coating.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- D. Butyl Sealant: ASTM C 1311, solvent-release butyl rubber sealant.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FABRICATION

- A. Fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to the design, dimensions, geometry, metal thickness, and other characteristics of item indicated.

- B. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that are capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with cited sheet metal standards. Allow for thermal expansion; set true to line and level. Install Work with laps, joints, and seams permanently watertight and weatherproof; conceal fasteners where possible.
- B. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- C. Seams: Fabricate nonmoving seams with flat-lock seams. For aluminum, form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- D. Metal Protection: Where dissimilar metals contact each other, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating.
 - 1. Coat concealed side of aluminum with bituminous coating where it contacts wood, ferrous metal, or cementitious construction.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Warranties: Provide manufacturer's standard written warranty, without monetary limitation, signed by manufacturer agreeing to promptly repair or replace roof specialties that show evidence of deterioration of factory-applied finishes for the period of 20 years.

PART 2 - PRODUCTS

2.1 ROOF SPECIALTIES

- A. Copings: Manufactured coping system consisting of formed-metal coping cap, concealed anchorage, corner units, end cap units, and concealed splice plates.
1. Formed or Extruded Aluminum: 0.080 inch thick.
 2. Stainless Steel: 0.031 inch thick.
 3. Prepainted, Zinc-Coated Steel: 0.034 inch thick.
- B. Canted Roof-Edge Fascia and Gravel Stop: Manufactured, two-piece, roof-edge fascia consisting of snap-on or compression-clamped metal fascia cover and a continuous-formed, galvanized-steel sheet cant, 0.028 inch thick, minimum, with extended vertical leg terminating in a drip-edge cleat.
1. Aluminum: 0.080 inch thick.
 2. Prepainted, Zinc-Coated Steel: 0.034 inch thick.
- C. Gutters and Downspouts:
1. Gutters: "Leaf-Guard" as manufactured by Englert, or equal, in uniform section lengths, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish expansion joints and expansion-joint covers.
 - a. Sloped and curved solid metal debris screen.
 - b. Prepainted, Zinc-Coated Steel: 0.032 inch thick.
 - c. Gutter Supports: Brackets, Straps, or Spikes and ferrules or Manufacturer's standard supports with finish matching the gutters.
 2. Downspouts: 3" x 4", mitered elbows, furnish wall brackets of same material and finish as downspouts, with anchors.
 - a. Formed Aluminum: 0.063 inch thick.
 - b. Extruded Aluminum: 0.125 inch thick.
 - c. Prepainted, Zinc-Coated Steel: 0.034 inch thick.

2.2 MATERIALS

- A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper as recommended by manufacturer for use and finish indicated.
- C. Felt Underlayment: ASTM D 226/D 226M, Type II (No. 30) asphalt-saturated organic felts.
- D. Self-Adhering Sheet Underlayment, High Temperature: Butyl or SBS-modified asphalt; slip-resisting-polyethylene surfaced; with release paper backing; cold applied. Stable after testing at 240 deg F and passes after testing at minus 20 deg F; ASTM D 1970.
- E. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements.
 - 1. Exposed Penetrating Fasteners: Gasketed screws with heads matching color of metal.
 - 2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel.
- F. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant.
- G. Butyl Sealant: ASTM C 1311, solvent-release butyl rubber sealant.
- H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement.
- B. Coat back side of aluminum and stainless-steel roof specialties with bituminous coating where they will contact wood, ferrous metal, or cementitious construction.
- C. Separate dissimilar metals with a bituminous coating or polymer-modified, bituminous sheet underlayment.
- D. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- E. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless indicated.
- F. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Prein edges of sheets to be soldered to a width of 1-1/2 inches, except where pretinned surface would show in finished Work.
- H. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 12 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
- I. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.

END OF SECTION 077100

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data: Shop Drawings, color Samples.
- B. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Metallic-Coated Steel Sheet: Galvanized steel, ASTM A 653/A 653M, G90, or aluminum-zinc alloy-coated steel, ASTM A 792/A 792M, AZ50.
 - 1. Prepainted, Metallic-Coated Steel Sheet: Coil-coated with manufacturer's standard two-coat, thermocured system consisting of inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
- B. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and finish. Coil-coat finish as follows:
 - 1. Factory Prime Coating: Pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat; with a minimum dry film thickness of 0.2 mil.
 - 2. Baked-Enamel or Powder-Coat Finish Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils, medium gloss.
 - 3. High-Performance Organic Finish: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

2.2 ROOF ACCESSORIES

- A. Roof Curbs and Equipment Supports: Fabricate from 0.090-inch- thick aluminum with welded corner joints.
 - 1. Provide units with cant strips and base profile coordinated with roof insulation thickness and roof deck slope. Equip units for sloping decks with water diverter.
 - 2. Provide preservative-treated wood nailers at tops of curbs.
 - 3. Provide manufacturer's standard rigid or semirigid insulation.
 - 4. Finish: High-performance organic coating.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation: Unless otherwise indicated, install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual." Coordinate with installation of roof deck, vapor barriers, roof insulation, roofing, and flashing to ensure combined elements are secure, waterproof, and weathertight.

END OF SECTION 077200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and Installer certificates signed by Installer certifying that products have been installed in compliance with requirements.

PART 2 - PRODUCTS

2.1 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping materials that are compatible with one another, substrates, and penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls and Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating at Fire-Resistance-Rated Walls: Not less than that of construction penetrated.
 - 2. F-Rating at Horizontal Assemblies: At least 1 hour, but not less than that of construction penetrated.
 - 3. T-Rating at Horizontal Assemblies: At least 1 hour, but not less than the fire-resistance rating of construction penetrated except for penetrations within the cavity of a wall.
- C. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 2. Designation of applicable testing and inspecting agency.
 3. Manufacturer's name.
 4. Installer's name.
- C. Owner will engage a qualified testing agency to perform tests and inspections.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and color Samples.
- B. Environmental Limitations: Do not proceed with installation of joint sealants when ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under service and application conditions.

2.2 MISCELLANEOUS MATERIALS

- A. Provide sealant backings of materials 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, of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.
- D. 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with ASTM C 1193.
- B. Install sealant backings to support sealants during application and to produce cross-sectional shapes and depths of installed sealants that allow optimum sealant movement capability.

- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and Shop Drawings.

PART 2 - PRODUCTS

2.1 HOLLOW METAL DOORS AND FRAMES

- A. Doors: Complying with SDI A250.8 for level and model and SDI A250.4 for physical-endurance level indicated, 1-3/4 inches thick unless otherwise indicated.
 - 1. Interior Doors: Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
 - 2. Exterior Doors: Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless), metallic-coated steel sheet faces.
 - 3. Hardware Reinforcement: Fabricate according to SDI A250.6 with reinforcement plates from same material as door face sheets.
- B. Frames: ANSI A250.8; conceal fastenings unless otherwise indicated.
 - 1. Steel Sheet for Interior Frames: 0.042-inch-minimum thickness.
 - 2. Steel Sheet for Exterior Frames: 0.067-inch-minimum thickness, metallic coated.
 - 3. Interior Frame Construction: Knocked down.
 - 4. Exterior Frame Construction: Face welded.
 - 5. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.
 - 6. Frame Anchors: Not less than 0.042 inch thick.
- C. Door Louvers: Sight proof per SDI 111C.
- D. Door Silencers: Three on strike jambs of single-door frames and two on heads of double-door frames.
- E. Grout Guards: Provide where mortar might obstruct hardware operation.
- F. Prepare doors and frames to receive mortised and concealed hardware according to SDI A250.6 and BHMA A156.115.
- G. Reinforce doors and frames to receive surface-applied hardware.

- H. Prime Finish: Manufacturer's standard, factory-applied coat of lead- and chromate-free primer complying with SDI A250.10 acceptance criteria.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, free of scale, pitting, or surface defects.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, G60 or A60.
- D. Frame Anchors: ASTM A 879/A 879M, 4Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, sheet steel complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install hollow metal frames to comply with SDI A250.11.
- B. Install doors to provide clearances between doors and frames as indicated in SDI A250.11.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying rust-inhibitive primer. Use galvanizing repair paint for metallic coated surfaces.

END OF SECTION 081113

SECTION 08 7100

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. This Section includes the following, but is not necessarily limited to:
 - 1. Door Hardware, including electric hardware.
 - 2. Gate Hardware.
 - 3. Low-energy door operators plus sensors and actuators.
 - 4. Thresholds, gasketing and weather-stripping.
 - 5. Door silencers or mutes.
- C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.
 - 1. Division 8: Section - Steel Doors and Frames.
 - 2. Division 8: Section - Wood Doors.
 - 3. Division 28: Section - Fire/Life-Safety Systems & Security Access Systems.

1.03 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

- A. 2016 California Building Code, CCR, Title 24.
- B. BHMA – Builders' Hardware Manufacturers Association
- C. DHI – Door and Hardware Institute
- D. NFPA - National Fire Protection Association.
 - 1. NFPA 80 - Fire Doors and Other Opening Protectives
 - 2. NFPA 105 - Smoke and Draft Control Door Assemblies
- E. UL - Underwriters Laboratories.
 - 1. UL 10C - Fire Tests of Door Assemblies
 - 2. UL 305 - Panic Hardware
- F. WHI - Warnock Hersey Incorporated
- G. SDI - Steel Door Institute

1.04 SUBMITTALS & SUBSTITUTIONS

- A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.
- B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Submit six (6) copies of schedule organized vertically into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
 - 1. Include a Cover Sheet with;
 - a. Job Name, location, telephone number.
 - b. Architects name, location and telephone number.
 - c. Contractors name, location, telephone number and job number.
 - d. Suppliers name, location, telephone number and job number.
 - e. Hardware consultant's name, location and telephone number.
 - 2. Job Index information included;
 - a. Numerical door number index including; door number, hardware heading number and page number.
 - b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
 - c. Manufacturers' names and abbreviations for all materials.
 - d. Explanation of abbreviations, symbols, and codes used in the schedule.
 - e. Mounting locations for hardware.
 - f. Clarification statements or questions.
 - g. Catalog cuts and manufacturer's technical data and instructions.
 - 3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)					
			(a) 1 Single Door #1 - Exterior from Corridor 101	(b) 90°	(c) RH
			(d) 3' 0"x7' 0" x 1-3/4" x (e) 20 Minute (f) WD x HM		
(g) 1	(h)	(i) ea	(j) Hinges - (k) 5BB1HW 4.5 x 4.5 NRP (l) ½ TMS	(m) 626	(n) IVE
2	6AA	1 ea	Lockset - ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(a) - Single or pair with opening number and location. (b) - Degree of opening (c) - Hand of door(s) (d) - Door and frame dimensions and door thickness. (e) - Label requirements if any. (f) - Door by frame material. (g) - (Optional) Hardware item line #. (h) - Keypad Symbol. (i) - Quantity. (j) - Product description. (k) - Product Number. (l) - Fastenings and other pertinent information. (m) - Hardware finish codes per ANSI A156.18. (n) - Manufacture abbreviation.

- D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.

- E. Wiring Diagrams: Provide product data and wiring and riser diagrams for all electrical products listed in the Hardware Schedule portion of this section.
- F. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
- G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- H. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.

1.05 QUALITY ASSURANCE

- A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
 - 1. Responsible for detailing, scheduling and ordering of finish hardware.
 - 2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
 - 3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.
- C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.
 - 1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".
- E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.

- B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.
- C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.
- D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.07 WARRANTY

- A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
 - 1. Locksets: Three (3) years.
 - 2. Electronic: One (1) year.
 - 3. Closers: Thirty (30) years.
 - 4. Exit devices: Three (3) years.
 - 5. All other hardware: Two (2) years.

1.08 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.09 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference at least one week prior to beginning work of this section.
- B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.
- C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

<u>Item</u>	<u>Manufacturer</u>	<u>Acceptable Substitutes</u>
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	Or Approved Equal
Exit Devices	Von Duprin	Or Approved Equal
Closers	LCN	Or Approved Equal
Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI

Flush Bolts	Ives	Trimco, BBW, DCI
Dust Proof Strikes	Ives	Trimco, BBW, DCI
Coordinators	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard

2.02 MATERIALS

- A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
 - 1. Hinges shall be sized in accordance with the following:
 - a. Height:
 - 1) Doors up to 42" wide: 4-1/2" inches.
 - 2) Doors 43" to 48" wide: 5 inches.
 - b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
 - c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
 - 2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.
- B. Continuous Hinges: As manufactured by Ives, an Allegion Company. UL rated as required.
- C. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Rhodes" design, fastened with through-bolts and threaded chassis hubs.
 - 1. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
 - a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access
 - b. Offset lever pull – minimum 1,600 foot pounds without gaining access
 - c. Vertical lever impact – minimum 100 impacts without gaining access
 - 2. Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers
 - 3. UL 10C for 4'-0" x 10'-0" 3-hour fire door.
 - 4. Cylinders: Refer to "KEYING" article, herein.
 - 5. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
 - 6. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
 - 7. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw capable of UL listing of 3 hours on a 4' x 10' opening. Provide proper latch throw for UL listing at pairs.
 - 8. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.

9. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
 10. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
 11. Provide wired electrified options as scheduled in the hardware sets.
 - a. 12 through 24 volt DC operating capability, auto-detecting
 - b. Selectable EL (fail safe)/EU (fail secure) operating mode via switch on chassis
 - c. 0.230A (230mA) maximum current draw
 - d. 0.010A (10mA) holding current
 - e. Modular / "plug in" request to exit switch
 12. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
- D. Exit devices: Von Duprin as scheduled.
1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
 2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
 3. Mechanism case shall have an average thickness of .140".
 4. Compression spring engineering.
 5. Non-handed basic device design with center case interchangeable with all functions.
 6. All devices shall have quiet return fluid dampeners.
 7. All latchbolts shall be deadlocking with ¾" throw and have a self-lubricating coating to reduce friction and wear.
 8. Device shall bear UL label for fire and or panic as may be required.
 9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
 10. All Exit Devices to be sex-bolted to the doors.
 11. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
 - a. Provide exit devices UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4, and UL listed for Panic Exterior Fire Exit Hardware.
- E. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.
1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
 2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
 3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
 4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
 5. Closers shall be installed to permit doors to swing 180 degrees.
 6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.

7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
 8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.
- F. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.
1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
 2. Provide dust proof strikes at openings using bottom bolts.
- G. Door Stops:
1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
 2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
 3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.
- H. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.
- I. Thresholds: As Scheduled and per details.
1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
 2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 "Thermal and Moisture Protection".
 3. Use 1/4" fasteners, red-head flat-head sleeve anchors (SS/FHSL).
 4. Thresholds shall comply with CBC Section 11B-404.2.5.
- J. Seals: Provide silicone gasket at all rated and exterior doors.
1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
 2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
 3. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on "S" labeled Positive Pressure door assemblies.

- K. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.
- L. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

- A. Furnish a Schlage masterkey system as directed by the owner or architect.
- B. A detailed keying schedule is to be prepared by the owner and/or architect in consultation with a representative of Allegion or an Authorized Key Center or Authorized Security Center. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.
- C. Extend the original Schlage masterkey system.
- D. Furnish all cylinders in the Schlage conventional style except the exit device and removable mullion cylinders which will be supplied in Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI).
- E. Furnish mechanical keys as follows:
 - 1. Furnish 2 cut change keys for each different change key code.
 - 2. Furnish 1 uncut key blank for each change key code.
 - 3. Furnish 6 cut masterkeys for each different masterkey set.
 - 4. Furnish 3 uncut key blanks for each masterkey set.
 - 5. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.
 - 6. Furnish 1 cut control key cut to each SKD combination.
- F. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.

2.04 FINISHES

- A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.
- B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.
- C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.
- D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.05 FASTENERS

- A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
- B. Screws for butt hinges shall be flathead, countersunk, full-thread type.

- C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
- D. Provide expansion anchors for attaching hardware items to concrete or masonry.
- E. All exposed fasteners shall have a phillips head.
- F. Finish of exposed screws to match surface finish of hardware or other adjacent work.
- G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions.
- C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) 2016 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.
- B. Use the templates provided by hardware item manufacturer.
- C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.
- G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

- H. Hardware Installer shall coordinate with security contractor to route cable to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.
- I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing of the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.
- J. All wiring for electro-mechanical hardware mounted on the door shall be connected through the power transfer and terminated in the interface junction box specified for in the Electrical Section.
- K. Conductors shall be minimum 18 gage stranded, multicolored. A minimum 12 in. loop of conductors shall be coiled in the interface junction box. Each conductor shall be permanently marked with its function.
- L. If a power supply is specified in the hardware sets, all conductors shall be terminated in the power supply. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacturer's technical documentation.

3.03 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surface soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.
- E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.04 HARDWARE LOCATIONS

- A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

- A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and

its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.06 SCHEDULE

- A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.
- B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.
- C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

GLY	=	Glynn-Johnson Corporation	Overhead Door Stops
IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
LCN	=	LCN	Door Closers
LOC	=	Lockinox	Gate Closers
SCE	=	Schlage Electronics	Electronic Door Components
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping

SPEXTRA: 431088

HARDWARE GROUP NO. 01

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 TW8	630	IVE
1	EA	ELEC PANIC HARDWARE	RX-LC-QEL-PA-99-EO	626	VON
1	EA	ELEC EXIT DEVICE TRIM	AD-400-993R-70-MT-RHO-PD (FURNISHED IN ACCESS CONTROL SECTION 28 10 00)	626	SCE
1	EA	MORTISE CYLINDER	20-001 114 (KEY SWITCH)	626	SCH
1	EA	SURF. AUTO OPERATOR	9542 MS	ANCLR	LCN
4	EA	ACTUATOR, WALL MOUNT	8310-853T	630	LCN
4	EA	SURFACE MOUNT BOX	8310-867S	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18L	BLK	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL	A	ZER
1	EA	KEY SWITCH	653-1414 L2 (MOUNT INSIDE ADJACENT TO TOP ACTUATOR)	630	SCE
1	EA	POWER SUPPLY	PS902 900-4RL		VON

KEY SWITCH USED TO SHUT OFF OUTSIDE ACTUATOR SWITCHES FOR AFTER HOURS NON-OPERATION/SECURITY

HARDWARE GROUP NO. 02

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	630	IVE
1	EA	ELEC CLASSROOM LOCK	AD-400-CY-70-MT-RHO-PD (FURNISHED IN ACCESS CONTROL SECTION 28 10 00)	626	SCE
1	EA	OH STOP & HOLDER	100H	630	GLY
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	154A	A	ZER
1	EA	THRESHOLD	PER DETAIL	A	ZER

HARDWARE GROUP NO. 03

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
5	EA	HINGE	5BB1 4.5 X 4.5	630	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	630	IVE
1	EA	CONST LATCHING BOLT	FB51T	630	IVE
1	EA	ELEC CLASSROOM LOCK	AD-400-CY-70-MT-RHO-PD (FURNISHED IN ACCESS CONTROL SECTION 28 10 00)	626	SCE
2	EA	OH STOP	90S	630	GLY
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	MEETING STILE	44SP	STST	ZER

HARDWARE GROUP NO. 04

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700	630	IVE
1	EA	PANIC HARDWARE	PA-AX-99-NL-OP-110MDWH	628	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	ELECTRIC STRIKE	6111 FSE	630	VON
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	GATE CLOSER	VERTICLOSE - STD	AL	LOC
1	EA	FLOOR STOP	FS18L	BLK	IVE
2	EA	MULTITECH READER	MT11 (FURNISHED IN ACCESS CONTROL SECTION 28 10 00)	BLK	SCE

HARDWARE GROUP NO. 05

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 TW8	630	IVE
1	EA	ELEC PANIC HARDWARE	QEL-PA-99-EO	626	VON
1	EA	SURF. AUTO OPERATOR	9542 MS	ANCLR	LCN
2	EA	ACTUATOR, WALL MOUNT	8310-853T	630	LCN
2	EA	SURFACE MOUNT BOX	8310-867S	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18L	BLK	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL	A	ZER
1	EA	POWER SUPPLY	PS902 900-4RL		VON

SECTION 092900 - GYPSUM BOARD

PART 1 - PRODUCTS

1.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assemblies per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.2 PANEL PRODUCTS

- A. Provide in maximum lengths available to minimize end-to-end butt joints.
- B. Interior Gypsum Board: ASTM C 1396/C 1396M, in thickness indicated, with manufacturer's standard edges. Type X where indicated.
- C. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, in thickness indicated. Type X where required for fire-resistance-rated assemblies and where indicated.
- D. Glass-Mat, Water-Resistant Gypsum Backing Board: ASTM C 1178/C 1178M, of thickness indicated. Type X where required for fire-resistance-rated assemblies and where indicated.
- E. Cementitious Backer Units: ANSI A118.9, ASTM C 1288, or ASTM C 1325.

1.3 ACCESSORIES

- A. Trim Accessories: ASTM C 1047, formed from galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet. For exterior trim, use accessories formed from hot-dip galvanized-steel sheet, plastic, or rolled zinc.
 - 1. Provide cornerbead at outside corners unless otherwise indicated.
 - 2. Provide LC-bead (J-bead) at exposed panel edges.
 - 3. Provide control joints where indicated.
- B. Joint-Treatment Materials: ASTM C 475/C 475M.
 - 1. Joint Tape: Paper unless otherwise recommended by panel manufacturer.
 - 2. Cementitious Backer Unit Joint-Treatment Materials: Products recommended by cementitious backer unit manufacturer.
- C. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant complying with ASTM C 834.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. Install gypsum board to comply with ASTM C 840.
 - 1. Isolate gypsum board assemblies from abutting structural and masonry work. Provide edge trim and acoustical sealant.
- B. Install cementitious backer units to comply with ANSI A108.11.
- C. Fire-Resistance-Rated Assemblies: Comply with requirements of listed assemblies.
- D. Finishing Gypsum Board: ASTM C 840.
 - 1. At concealed areas, unless a higher level of finish is required for fire-resistance-rated assemblies, provide Level 1 finish: Embed tape at joints.
 - 2. Unless otherwise indicated, provide Level 5 finish: All joints and interior angles shall have tape embedded in joint compound and immediately wiped with a joint knife or trowel, leaving a thin coating of joint compound over all joints and interior angles.

Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound shall be trowel applied to the entire surface.

Excess compound is immediately sheared off, leaving a film or skim coating of compound completely covering the paper. As an alternative to a skim coat, a material manufactured especially for this purpose may be applied.

The surface must be smooth and free of tool marks and ridges. The prepared surface shall be covered with a drywall primer prior to the application of the final decoration.
- E. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.
- G. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product data and Samples.
- B. Obtain tile of each type and color or finish from same production run for each contiguous area.
- C. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling ceramic tile packages.

PART 2 - PRODUCTS

2.1 CERAMIC TILE

- A. Ceramic tile that complies with ANSI A137.1.
- B. Ceramic Tile Type CT-1: glazed ceramic wall tile.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by the following:
 - a. **Daltile.**
 2. Composition: Natural clay.
 3. Surface: Smooth, without abrasive admixture.
 4. Module Size: 4 ¼ x 4 ¼ inches.
 5. Finish: Semi-gloss glaze.
 6. Color and Pattern: 0138 “Golden Granite”.
 7. Grout Color: Bostik H196 “Lunar”.
 8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile and matching characteristics of adjoining flat tile:
 - a. Ceramic Tile Type (CT-3) Base: Flat top cove, A-3401, Color and Pattern: 0138 “Golden Granite”.
 - b. Base Cap for Thinset Mortar Installations: Surface bullnose.
 - c. Wainscot Cap for Thinset Mortar Installations: Surface bullnose.
 - d. External Corners for Thinset Mortar Installations: Surface bullnose.
 - e. Internal Corners: Field-buttet square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.
- C. Ceramic Tile Type CT-2: Factory-mounted glazed ceramic mosaic floor tile (at shower floors).
 1. **Manufacturers:** Subject to compliance with requirements, provide products by the following:

- a. Daltile.
 2. Composition: Porcelain.
 3. Surface: Slip resistant, with abrasive admixture.
 4. Module Size: 2 by 2 inches.
 5. Finish: Unglazed.
 6. Color and Pattern: Custom mix: 60% D325 “Marble”, 20% D142 “Luminary Gold”, 20% D182 “Suede Gray”.
 7. Grout Color: Bostik H196 “Lunar”.
 8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile and matching characteristics of adjoining flat tile:
 - a. Base Cap for Portland Cement Mortar Installations: Bead (bullnose), Color and Pattern: D325 “Marble”.
 - b. Base Cap for Thinset Mortar Installations: Surface bullnose Color and Pattern: D325 “Marble”.
 - c. External Corners for Portland Cement Mortar Installations: Radius bullnose.
 - d. Internal Corners: Field-buttet square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.
- D. Ceramic Tile Type CT-4: glazed ceramic floor tile (at locker room and toilet area floors).
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Daltile.
 2. Composition: Porcelain.
 3. Surface: Slip resistant, “Volume 1.0” / “Stepwise”.
 4. Module Size: 6 by 6 inches.
 5. Finish: Matte glazed.
 6. Color and Pattern: VL71 Degrees Silver”
 7. Grout Color: Bostik H196 “Lunar”.
 8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile:
- E. Ceramic Tile Type CT-5: glazed ceramic wall tile (blue accent band).
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Daltile.
 2. Composition: Natural clay.
 3. Surface: Smooth, without abrasive admixture.
 4. Module Size: 4 ¼ x 4 ¼ inches.
 5. Finish: Glossy glazed.
 6. Color and Pattern: K189 “Navy”.
 7. Grout Color: Bostik H196 “Lunar”.
 8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile and matching characteristics of adjoining flat tile:
 - a. External Corners for Thinset Mortar Installations: Surface bullnose.
 - b. Internal Corners: Field-buttet square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.
- F. Ceramic Tile Type CT-6: glazed ceramic wall tile (gold accent band).

1. **Manufacturers:** Subject to compliance with requirements, provide products by the following:
 - a. **Daltile.**
 1. Composition: Natural clay.
 2. Surface: Smooth, without abrasive admixture.
 3. Module Size: 4 ¼ x 4 ¼ inches.
 4. Finish: Glossy glazed.
 5. Color and Pattern: Q102 "Mustard".
 6. Grout Color: Bostik H196 "Lunar".
 7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile and matching characteristics of adjoining flat tile:
 - a. External Corners for Thinset Mortar Installations: Surface bullnose.
 - b. Internal Corners: Field-buttet square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.

INSTALLATION MATERIALS

- G. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, 1/2 inch thick.
- H. Fiber-Cement Underlayment: ASTM C 1288, 1/2 inch thick.
- I. Low-Emitting Materials: Adhesives and fluid-applied waterproofing membranes shall comply Sustainable Design Requirements - National Green Building Standard.
- J. Waterproofing Membranes for Thinset Installations: ANSI A118.10, unreinforced elastomeric polymer product .
- K. Sealant at coves, corners, and joints shall be 100% silicone.
- L. Setting and Grouting Materials: Comply with material standards in ANSI's "Specifications for the Installation of Ceramic Tile" that apply to materials and methods indicated.
 1. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
 2. Thinset Mortar Type: Standard dry-set, ANSI A118.1, Modified dry-set, ANSI A118.4, Improved modified dry-set, ANSI A118.15.
 - a. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) **Custom Building Products.**
 3. Grout Type: Commercial Epoxy grout.
 - a. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- 1) Custom Building Products. “CEG-Lite 100% Solids Commercial Epoxy Grout” or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in finish schedule. Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, are specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight, aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- C. Lay tile in grid pattern unless otherwise indicated. Align joints where adjoining tiles on floor, base, walls, and trim are the same size.
- D. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's specifications.
- E. Install waterproofing to comply with ANSI A108.13.
- F. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.
- G. Install movement joints throughout the interior and exterior work in accordance with TCNA EJ171 "movement Joint Guidelines for Ceramic, Glass, and Stone"
- H. Exterior Wall Tile Installation Method(s):
 1. Exterior Wall, Wood or Metal Studs: TCNA W244E; thinset mortar on cementitious backer units over vapor-retarder membrane.
- I. Interior Floor Tile Installation Method(s):
 1. Over Concrete Subfloors: Use TCNA Method F125 Full-17 with Custom Building Products CEGLite Epoxy Grout- RedGuard Waterproof / Crack Isolation Membrane and Versa Bond Flex Modified Thinset Mortar.
 2. Curbless Shower receptors- Recessed Slab: Use TCNS method B422-17 Cement Backer Board, Bonded waterproof membrane with integrated drain flange, products include Schluter Drain and Drain Flange or equal, VersaBond Flex Modified Thinset Mortar or equal.
 3. Interior Walls, Wet Areas: Use TCNA Method W244C-17 with Vapor Retarder Membrane, Red Guard Waterproof membrane, Versa Bond Flex Modified Thinset Mortar, and CEG Lite Epoxy Grout, all by Custom Building Products or equal.

4. Interior Walls, Dry Areas: Use TCNA Method W244C-17 with Vapor Retarder Membrane, Versa Bond Flex Modified Thinset Mortar, and CEG Lite Epoxy Grout, all by Custom Building Products or equal.

END OF SECTION 093013

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and Samples.
- B. Extra Materials: Deliver to Owner at least 10 linear feet of each type and color of resilient wall base installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

- A. Per ASTM E-648, products shall have an average minimum critical radiant flux of 0.45 watts per square centimeter.
- B. Thermoset Rubber Base: ASTM F 1861, Type TS.
- C. Thermoplastic Rubber Base: ASTM F 1861, Type TP.
- D. Vinyl Base: ASTM F 1861, Type TV.
- E. Style: Cove (base with toe) or Straight (flat or toeless).
- F. Minimum Thickness: 0.125 inch.
- G. Height: 2-1/2 inches 4 inches 6 inches.
- H. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard lengths.
- I. Outside Corners: preformed.
- J. Inside Corners: preformed.
- K. Color: Roppe # 139 "Deep Navy" or equal.

2.2 INSTALLATION ACCESSORIES

- A. Adhesives: Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare horizontal surfaces according to ASTM F 710. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
- B. Adhesively install resilient wall base and accessories.
- C. Install wall base in maximum lengths possible. Apply to walls, columns, pilasters, casework, and other permanent fixtures in rooms or areas where base is required.

END OF SECTION 096513

SECTION 09 67 00 FLUID APPLIED FLOORING

PART 1.00 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. Work of this Section as shown or specified shall be in accordance with the requirements of the Contract Documents.

1.02 WORK INCLUDED

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete epoxy flooring incorporating ceramic coated colored inorganic quartz aggregate and integral base as selected on drawings and/or specified herein.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - B. Product Data: Submit manufacturer's technical data application instructions and general recommendations for decorative quartz epoxy flooring specified herein.
 - C. Samples for initial selection purposes in form of manufacturer's color charts showing range of standard colors available.
 - 1. Submit 2-1/2" x 4" samples in color and quartz aggregate combination as selected.
 - D. Material certificates signed by manufacturer certifying that the decorative quartz epoxy flooring submitted complies with requirements specified herein.
 - E. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has a minimum of 5 years experience installing similar materials, and who is certified as factory trained by manufacturer of primary materials. Contractor must demonstrate he is a qualified in the installation of epoxy flooring material types similar to those specified for this Project and who offers a joint labor and material warranty with manufacturer of primary materials.
- B. Single-Source Responsibility: Obtain epoxy component of flooring materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer. Obtain ceramic-coated quartz aggregate from primary manufacturer of that product.

1.05 DELIVERY STORAGE AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.

- B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions: Comply with epoxy resin composition flooring manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect work.
- B. Lighting: Permanent lighting will be in place and working before installing decorative quartz epoxy flooring.

PART 2:00 - PRODUCTS

2.01 MATERIALS

- A. Basis of Design: Epoxy resin composition flooring shall be Dex-O-Tex Decor-Flor with Quik-Glaze finish and EPA-Licensed Dexcide Antimicrobial/Antibacterial System as manufactured by Crossfield Products Corp.; Rancho Dominguez, California and Roselle Park, New Jersey.
- B. Vapor Control System shall be Dex-O-Tex Vapor Control Primer 200 as manufactured by Crossfield Products Corp.; Rancho Dominguez, California and Roselle Park, New Jersey. The requirement to furnish vapor control primer shall not be waived under any circumstances.
- C. Joint filler for joints and cracks exceeding 1/16" shall be Dex-O-Tex Cheminert SC Membrane as manufactured by Crossfield Products Corp.; Rancho Dominguez, California and Roselle Park, New Jersey.
- D. Topcoat shall be Dex-O-Tex Quik-Glaze as manufactured by Crossfield Products Corp.; Rancho Dominguez, California and Roselle Park, New Jersey.
- E. (Optional) Antimicrobial/Antibacterial shall be Dex O Tex Dexcide as manufactured by Crossfield Products Corp.; Rancho Dominguez, California and Roselle Park, New Jersey. This system has long-term service life in the cured epoxy, is not simply an "in-can preservative" and is effective against bacteria, microbes, fungi and mildew.

2.02 PROPERTIES

- A. Colors: Dex-O-Tex "DFS-B-01".
- B. Physical Properties:
Provide flooring system that meet or exceed the listed minimum physical property requirements when tested according to the referenced standard test method in parentheses.

DECORATIVE QUARTZ EPOXY FLOORING:

Thickness	1/8"
Compressive Strength (ASTM C 579):	11,000 psi.
Compressive Strength – Resin only (ASTM D 695):	12,900 psi
Tensile Strength (ASTM C 307):	1,800 psi.
Flexural Strength (ASTM C 580):	4,000 psi.
Surface Hardness (ASTM D 2240):	Durometer "D" 80-85
Abrasion Resistance (ASTM D 4060):	0.9 gr. loss
Indentation (MIL-D-3134):	0.011"

Adhesion (A.C.I. Comm. No. 503.1): >400 psi (100% failure in concrete)
Flammability (ASTM D 635): Self-Extinguishing

HIGH SOLIDS ALIPHATIC POLYUREA TOPCOAT:

Thickness 8 mils
Tensile Strength (ASTM D 412): 2,400 psi.
Tensile Elongation (ASTM D 412): 100%
Surface Hardness (ASTM D 2240): Shore A 85-90
Abrasion Resistance (ASTM D 4060): 8 mg loss
Solid Percent by Weight (Calculated): 95%

VAPOR CONTROL PRIMER:

Adhesion ASTM D4541 >400 psi (100% failure in concrete)
Compressive Strength ASTM D695 21,000 psi
Tensile Strength ASTM D638 5600 psi
Tensile Elongation ASTM D638 2.7%
Permeability Rating ASTM E96 Dry <0.18....Wet <0.80
Microbial Resistance ASTM G21 Passes
Alkali Resistance ASTM D1308 Resistant

2.03 SUPPLEMENTAL MATERIALS

- A. Anti-Microbial Additive: Incorporate antimicrobial chemical additive to control growth of most bacteria, fungi, algae and actinomycetes. (Note to Specifier: The use of antimicrobial additive is optional. Its use poses no health hazard.)

PART 3.00 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions where decorative quartz epoxy flooring is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.
- B. Moisture Test: Perform moisture test in conformance with ASTM F 1869 and ASTM F 2170. Report Moisture test results to decorative quartz epoxy flooring manufacturer for recommendation.

3.02 PREPARATION

- A. Substrate: Perform preparation and cleaning procedures according to flooring manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry, and neutral substrate for flooring application.
- B. Concrete Surfaces: Shot-blast or diamond grind as required to obtain optimum bond of flooring to concrete. Remove sufficient material to provide a sound surface, free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents. Remove grease, oil, and other penetrating contaminates. Repair damaged and deteriorated concrete to acceptable condition. Leave surface free of dust, dirt, laitance, and efflorescence.

- C. Materials: Mix epoxy resin components when required, and prepare materials according to flooring system manufacturer's instructions.

3.03 APPLICATION

- A. General: Apply each component of the vapor control primer, waterproof membrane and epoxy mosaic composition flooring system according to manufacturer's directions to produce a uniform monolithic flooring surface of thickness indicated.
- B. Bond Coat: Apply vapor control primer over prepared substrate at manufacturer's recommended spreading rate. Stripe all cracks and joints 6" wide with manufacturer's anti-fracture joint sealer.
- C. Broadcast Coats: Apply liberal application of clear epoxy resin mixture, allow to self-level, broadcast (by hand or spray machine) ceramic coated quartz aggregate, allow to set to hardness, sweep off excess unbonded aggregate and repeat process to achieve total nominal thickness of 1/8".
- D. Finish or Sealing Coats: After quartz filled broadcast coats have cured sufficiently, apply finish coats with synthetic non-skid aggregate to produce finish matching approved submittal sample and in number of coats and spreading rates recommended by manufacturer.
 - 1. Finished floor shall be 1/8" thick, uniform in color and free of trowel marks.

3.04 CURING, PROTECTION AND CLEANING.

- A. Cure decorative quartz epoxy flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.

END OF SECTION

SECTION 09720 RIGID PROTECTIVE WALL COVERING

Part 1 - General

1.01 Scope:

Pre-finished FRP (Fiberglass Reinforced Plastic) wall panels.

1.02 Reference

- A. Installed products shall conform to the following ASTM International and pertinent tests:
1. ASTM E84 Standard Test Method for Surface Burning Characteristics
 2. ASTM D790 Flexural Strengths (psi) & Flexural Modulus (psi)
 3. ASTM D2583 Barcol Hardness
 4. ASTM D638 Tensile Strengths (psi) & Tensile Modulus (psi)
 5. ASTM D256 Izod Impact Strengths (ft #/in)
 6. ASTM D696 Thermal Coefficient of Lineal Expansion (in/in/F°)
 7. ASTM D570 Water Absorption (%)
 8. ASTM D792 Specific Gravity
 9. ASTM D5319 Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.

1.03 Submittals

- A. General: Submit listed submittals in accordance with Section 01300 Administrative Requirements.
- B. Product Data: Submit product data, including manufacturer's product sheet, for specified products.
- C. Samples: Submit selection and verification samples for finishes, colors and textures. Submit 2 samples of each type of panel, trim and fastener.
- D. Quality Assurance Submittals: Submit Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- E. Closeout Submittals: Submit the following:
1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 01 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
 2. Warranty: Warranty documents specified herein.

1.04 Delivery, Storage & Handling

- A. Comply with Section 01600 Product Requirements.
- B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged

containers with identification labels intact. Package sheets on skids or pallets for shipment to site.

- D. Storage and Protection: Store panels and accessories dry and indoors. Store material to protect from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
- E. Handling: Remove foreign matter from face of panel by using a soft cloth or brush to avoid scratching or abrasions.

1.05 Project Conditions

A. Environmental Requirements:

- 1. Installation shall not begin until building is fully enclosed, permanent heating and cooling equipment is in operation for a period of time sufficient to stabilize interior temperature and humidity.
- 2. During installation, and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used.
- 3. Provide ventilation to disperse fumes during application of adhesive as recommended by manufacturer's adhesive instructions.

PART 2 - PRODUCTS

2.01 Fiberglass Reinforced Plastic (FRP) Panels

- a. Color: White.
- b. Surface Pebbled.
- c. Fire Rating Class A.

2.02 Product Accessories

- A. All trim shall be extruded rigid PVC.
- B. PVC plastic moldings. All PVC Base Molding shall be a rigid extruded PVC with integral color, Color coordinating with trim.
- C. Adhesives and sealants
 - a. Water-resistant, non-flammable adhesive, meeting ASTM Specification C557.
 - b. Silicone Sealant – White

2.03 Source Quality

- A. Obtain fiberglass reinforced plastic (FRP) panels from a single manufacturer. Provide panels and molding only from manufacturer specified to ensure warranty and color harmonization of accessories.

Part 3 – EXECUTION

3.02 Preparation

- A. FRP Panels must be applied over a smooth, solid, flat, clean sub-wall such as drywall.

3.03 Conditioning

- A. Panels should be opened and allowed to acclimate for 48 hours prior to installation. The building shall be closed and conditioned to final use ambient humidity and temperature. Room temperature should be approximately 65° F or above before beginning installation.

3.04 Installation

- A. Install all products and accessories in strict accordance with the manufacturer's installation instructions, using recommended adhesives and sealants.
- B. All moldings must provide for manufacturer's minimum panel expansion at joints and edges, to insure proper installation

END OF SECTION 09720

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Extra Materials: Deliver to Owner 1 gal. of each color and type of finish-coat paint used on Project, in containers, properly labeled and sealed.

PART 2 - PRODUCTS

2.1 PAINT

- A. MPI Standards: Provide materials that comply with MPI standards indicated and listed in its "MPI Approved Products List."
- B. Provide antimicrobial paint additive for all interior paint.
- C. Material Compatibility: Provide materials that are compatible with one another and with substrates.
 - 1. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with recommendations in MPI's "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, lighting fixtures, and similar items that are not to be painted. Mask items that cannot be removed. Reinstall items in each area after painting is complete.
- C. Clean and prepare surfaces in an area before beginning painting in that area. Schedule painting so cleaning operations will not damage newly painted surfaces.

3.2 APPLICATION

- A. Comply with recommendations in MPI's "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Paint exposed surfaces as indicated.

1. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces.
 2. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint the back side of access panels.
 4. Do not paint prefinished items, items with an integral finish, operating parts, and labels unless otherwise indicated.
- C. Apply paints according to manufacturer's written instructions.
1. Use brushes only where the use of other applicators is not practical.
 2. Use rollers for finish coat on interior walls and ceilings.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
1. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

END OF SECTION 099123

SECTION 09915 EXTERIOR REPAINTING

PART 1 - GENERAL

1.1 Description:

Section Includes: All labor, materials, tools and other equipment, services and supervision required to complete all exterior repainting work as indicated on Finish Schedules and to the full extent of the drawings and specifications.

Work under this Contract shall also include, but not necessarily be limited to:

1. High pressure washing and abrasive blasting.
2. Moisture testing of substrates.
3. Surface preparation of substrates as required for acceptance of paint, including cleaning, small crack repair, patching, caulking, and making good surfaces and areas to the limits defined under MPI Repainting Manual Preparation requirements.
4. Specific pre-treatments noted herein or specified in the MPI Repainting Manual.
5. Sealing / priming surfaces for repainting in accordance with MPI Repainting Manual requirements.

Refer to drawings for type, location and extent of exterior repainting required, and include all touch-ups necessary to complete work shown, scheduled or specified.

This Section, along with the drawings, forms part of the Contract documents and is to be read, interpreted and coordinated with all other parts.

1.2 Quality Assurance:

This Contractor shall have a minimum of five (5) years proven satisfactory experience and shall show proof before commencement of work that he will maintain a qualified crew of painters throughout the duration of the work. When requested, Contractor shall provide a list of the last three comparable exterior repainting jobs including, name, location, specifying authority / project manager, start / completion dates and value of the work.

Only qualified journeypersons, as defined by local jurisdiction, shall be engaged in exterior repainting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyperson in accordance with trade regulations.

All materials, preparation and workmanship shall conform to the standards contained in the latest edition of the Master Painters Institute (MPI) Maintenance and Repainting Manual (herein referred to as the MPI Repainting Manual) as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.

All surfaces requiring repainting shall be inspected by the Painting Subcontractor who shall notify the Owner, the Architect, and the General Contractor in writing of any defects or problems, prior to commencing repainting or after preparation work.

1. Conform to work place safety regulations for storage, mixing, application and disposal of all paint related materials to requirements of those authorities having jurisdiction.
2. Conform to safety precautions in accordance with the latest requirements to Industrial Health and Safety Regulations, latest edition, of authorities having jurisdiction.
3. To reduce the amount of contaminants entering waterways, sanitary / storm drain systems or into the ground the following procedures shall be strictly adhered to:
 - .a Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
 - .b Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .c Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .d Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
 - .e Empty paint cans are to be dry prior to disposal or recycling.
 - .f Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.
4. Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

1.5 Mock-Ups:

.1 Prepare and repaint a designated exterior surface area or item to requirements specified herein, with specified paint or coating showing selected colors, gloss / sheen, texture and workmanship to MPI Repainting Manual standards for review and approval. When approved, exterior surface area and/or item shall become acceptable standard of finish quality and workmanship for similar on-site repainting work.

1.6 Submittals:

1. All submittals shall be in accordance with the requirements of the Project Manual and Specifications.
2. Submit two sets of Material Safety Data Sheets (MSDS) prior to commencement of work for review and for posting at job site as required.
3. Submit invoice list of all paint materials ordered for project work to Paint Inspection Agency indicating manufacturer, types and quantities for verification and compliance with specification and design requirements if requested.
4. At project completion provide an itemized list complete with manufacturer, paint type and color coding for all colors used for Owner's later use in maintenance.

5. At project completion provide properly packaged maintenance materials as noted herein and obtain a signed receipt.

1.7 Product Delivery, Storage and Handling:

.1 Deliver all painting materials in sealed, original labeled containers bearing manufacturer's name, brand name, type of paint or coating and color designation, standard compliance, materials content as well as mixing and/or reducing and application requirements.

.2 Store all paint materials in original labeled containers in a secure (lockable), dry, heated and well ventilated single designated area meeting the minimum requirements of both paint manufacturer and authorities having jurisdiction and at a minimum ambient temperature of 45°F. Only material used on this project is to be stored on site.

.3 Where toxic and/or volatile / explosive / flammable materials are being used, provide adequate fireproof storage lockers and take all necessary precautions and post adequate warnings (e.g. no smoking) as required.

.4 Take all necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect the environment from hazard spills. Materials that constitute a fire hazard (paints, solvents, drop clothes, etc.) shall be stored in suitable closed and rated containers and removed from the site on a daily basis.

.5 Comply with requirements of authorities having jurisdiction, in regard to the use, handling, storage and disposal of hazardous materials.

1.8 Project / Site Requirements:

1. Unless specifically pre-approved in writing by the applied product manufacturer, perform no exterior repainting work when the ambient air and substrate temperatures are below 50°F.
2. Perform no exterior repainting work unless environmental conditions are within MPI and paint manufacturer's requirements or until adequate weather protection is provided. Where required, suitable weatherproof covering and sufficient heating facilities shall be in place to maintain minimum ambient air and substrate temperatures for 24 hours before, during and after paint application.
3. Perform no exterior repainting work when the relative humidity is above 85% or when the dew point is less than 5°F variance between the air / surface temperature.
4. Perform no exterior repainting work when the maximum moisture content of the substrate exceeds 15% for wood.
5. Conduct all moisture tests using a properly calibrated electronic Moisture Meter.
6. Test concrete and masonry surfaces for alkalinity as required.
7. Apply paint only to dry, clean, and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

1.9 Scheduling: Schedule repainting operations to prevent disruption of Owner's operations or building occupants. Obtain written authorization from Consultant / Owner for changes in work schedule.

1.10 Maintenance Materials:

.1 At project completion provide [a minimum of [4 liters (1 gallon)] of each type and color of paint from same production run (batch mix) used in unopened cans, properly labeled and identified for Owner's later use in maintenance. Store where directed.

PART 2 - PRODUCTS

2.1 Materials:

.1 All materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be products listed in the latest edition of the MPI Approved Product List and shall be from a single manufacturer for each system used.

.3 All materials and paints shall be lead and mercury free.

.4 Paint products shall meet MPI Environmentally Friendly" [E1] [E2] [E3] ratings based on VOC (EPA Method 24) content levels.

1. All paint materials shall have good flowing and brushing properties and shall dry or cure free of blemishes, sags, air entrapment, etc.

2. Equipment:

.1 Painting Equipment: to best trade standards for type of product and application.

.2 Spray-Painting Equipment: of ample capacity, suited to the type and consistency of paint or coating being applied and kept clean and in good working order at all times.

3. Mixing and Tinting:

.1 Unless otherwise specified or pre-approved, all paints shall be ready-mixed and pre-tinted. Re-mix all paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and color and gloss uniformity.

.2 Where thinner is used, addition shall not exceed paint manufacturer's recommendations.

.3 If required, thin paint for spraying in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Consultant.

4. Finish and Colors:

.1 Unless otherwise specified herein, all exterior repainting work shall be done in accordance with MPI Premium Grade requirements.

.2 Colors shall be as selected by the Architect from a manufacturer's full range of colors.

Generally and unless otherwise specified herein or noted on Finish Schedules the quantity of colors and finishes shall be based on the following criteria:

Exterior doors, frames and trim shall be repainted a different color than walls. Unless otherwise noted all doors, frames and trim shall be repainted using a semi-gloss finish.

PART 3 - EXECUTION

1. Prior to commencement of repainting work, thoroughly examine (and test as required) all exterior conditions and surfaces scheduled to be repainted and report in writing to the [Consultant] [Owner] [and General Contractor where applicable] any conditions or surfaces that will adversely affect work of this section.
2. The degree of surface deterioration (DSD) shall be assessed using the assessment criteria indicated in the MPI Maintenance Repainting Manual. In general the MPI DSD ratings and descriptions are as follows:

Condition	Description
DSD-0	Sound Surface (may include visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (may show fading; gloss reduction, slight surface contamination, minor pin holes scratches, etc.) / Minor cosmetic defects (runs, sags, etc.).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, staining, etc.).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD-4	Substrate Damage (repair or replacement of surface required by others).

3. Other than the repair of DSD-1 to DSD-3 defects included under this scope of work, structural and DSD-4 substrate defects discovered prior to and after surface preparation or after first coat of paint shall be made good and sanded by others ready for painting, unless otherwise agreed to by the Owner and painter to be included in this Work.
4. No repainting work shall commence until all such DSD-4 adverse conditions and defects have been corrected and surfaces and conditions are acceptable to the Painting Subcontractor. The Painting Subcontractor shall not be responsible for the condition of the substrate or for correcting defects and deficiencies in the substrate, which may adversely affect the painting work except for minimal work normally performed by the Painting Subcontractor and as, indicated herein. It shall always, however, be the responsibility of the Painting Subcontractor to see that surfaces are properly prepared before any paint or coating is applied. It shall also be the Painting Subcontractor's responsibility to paint the surface as specified providing that the owner accepts responsibility for uncorrected DSD-4 substrate conditions.

3.2 Preparation of Surfaces:

.1 Prepare all exterior surfaces for repainting in accordance with MPI Repainting Manual requirements. Refer to the MPI Repainting Manual in regard to specific requirements for the following:

1. environmental conditions.
 2. rust stain removal.
 3. mildew removal.
 4. structural steel and miscellaneous metals.
 5. galvanized and zinc coated metal.
 6. aluminum surfaces.
 7. dimension and dressed lumber.
-
2. Where required, pressure wash exterior surfaces prior to repainting in accordance with MPI standards for type of surfaces and recommended pressures to ensure complete removal of all loose paint, stains, dirt, and other foreign matter. This work shall be carried out only by qualified tradesman experienced in pressure water cleaning. The use of water hose cleaning will not be considered satisfactory, unless specifically specified. Allow sufficient drying time and test all surfaces using an electronic moisture meter before commencing work.
 3. Sand, clean, dry, etch, neutralize and/or test all surfaces under adequate illumination, ventilation and temperature requirements.
 4. Remove and securely store all miscellaneous hardware and surface fittings / fastenings (e.g. electrical lights, mechanical louvers, door and window hardware (e.g. hinges, knobs, locks, trim, frame stops) and, removable hazard / instruction labels. from wall and soffit surfaces, doors and frames, prior to repainting and replace upon completion. Carefully clean and replace all such items upon completion of repainting work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes (e.g. lacquer finishes). Doors shall be removed before repainting to paint bottom and top edges and then re-hung.
 5. Protect all exterior surfaces and areas, including landscaping, walks, drives, all adjacent building surfaces (including glass, aluminum surfaces, etc.) and equipment and any labels and signage from repainting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.

3.3 Application:

.1 Do not commence repainting unless substrates and all environmental conditions are acceptable for the application of products.

.2 Apply primer, paint or stain in accordance with MPI Painting Manual Premium Grade finish requirements.

.3 Apply primer, paint or stain in a workmanlike manner using skilled and trade qualified applicators as noted under Quality Assurance.

- .4 Apply primer, paint or stain within an appropriate time frame after cleaning and preparation to prevent weathering or water staining of substrate or before environmental conditions encourage flash-rusting, rusting, contamination or when the manufacturer's paint specifications require earlier applications.
- .5 Primer, paint or stain coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations.
- .6 Tint each coat of paint progressively lighter to enable confirmation of number of coats.
- .7 Unless otherwise approved by the painting inspection agency, apply a minimum of four coats of paint where deep or bright colors are used to achieve satisfactory results.
- .8 Sand and dust between each coat to provide an anchor for next coat and to remove defects (runs, sags, etc.) visible from a distance up to 39".
- .9 Do not apply finishes on exterior surfaces that are not sufficiently dry. Unless manufacturer's directions state otherwise, each coat shall be sufficiently dry and hard before a following coat is applied.
- .10 To avoid air entrapment in applied coats, apply materials in strict accordance with manufacturer's spread rates and application requirements.
- .11 Repainted exterior surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent:
 1. brush / roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
 2. evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
 3. damage due to touching before paint is sufficiently dry or any other contributory cause.
 4. damage due to application on moist surfaces or caused by inadequate protection from the weather.
 5. damage and/or contamination of paint due to wind blown contaminants (dust, sand blast materials, salt spray, etc.).
- .12 Repainted exterior surfaces shall be considered unacceptable if any of the following are evident under natural lighting conditions:
 1. visible defects are evident on vertical surfaces when viewed at 90 degrees to the surface from a distance of 39".
 2. visible defects are evident on horizontal surfaces when viewed at 45 degrees to the surface from a distance of 39".
 3. visible defects are evident on soffit and other overhead surfaces when viewed at 45 degrees to the surface
 4. when the final coat on any surface exhibits a lack of uniformity of sheen across full surface area.

.13 Repainted surfaces rejected shall be made good at the expense of the Contractor. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

3.5 Protection:

1. Protect all newly repainted exterior surfaces from rain and snow, condensation, contamination, dust, salt spray and freezing temperatures until paint coatings are completely dry. Curing periods shall exceed the manufacturer's recommended minimum time requirements.
2. Erect barriers or screens and post signs to warn, limit or direct traffic away or around work area as required.

3.6 Clean-up:

3. Remove all paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
4. Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
5. Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
6. Clean equipment and dispose of wash water / solvents as well as all other cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), paints, thinners, paint removers/strippers in accordance with the safety requirements of authorities having jurisdiction.

END OF SECTION 09 91 50

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, and Samples.

PART 2 - PRODUCTS

2.1 SIGNS, GENERAL

- A. Regulatory Requirements: Comply with applicable provisions in the California Building Code.
- B. All signage must be field inspected after installation (2016 CBC 11b-703.1.1.2).

2.2 PANEL SIGNS

- A. Panel Signs: Matte-finished opaque acrylic with adhesively applied vinyl film copy with square-cut edges and rounded corners.
 - 1. Finishes and Colors: As selected from manufacturer's full range.
 - 2. Tactile Characters: Characters and Grade 2 Braille with contrasting colors.

2.3 MATERIALS

- A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
- B. Plastic Laminate: High-pressure laminate engraving stock with face and core in contrasting colors.
- C. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils with pressure-sensitive adhesive backing, suitable for exterior applications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate signs where indicated or directed by Architect. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
- B. Wall-Mounted Signs:

1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes.

END OF SECTION 101400

SECTION 10 21 13.19 SOLID PLASTIC TOILET PARTITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes
Furnish, deliver and install all Toilet Partitions and Urinal Screens as indicated on the drawings and as required by actual conditions at the building. The Toilet Partitions shall include the furnishing of all necessary screws, special screws, bolts, special bolts, expansion shields and all other devices necessary for the proper installation and application of the Toilet Partitions.
- B. Related Sections
Section: 105080 Metal Lockers
Section: 102800 Accessories

1.02 REFERENCES

- A. Standard
All Toilet Partitions must be scheduled, supplied and installed in accordance with: California Building Code, ANSI (American National Standards Institute), and the ADA (Americans with Disabilities Act). In all cases the above references shall be taken to mean the latest edition of that particular standard including all revisions.

1.03 SUBMITTALS

- A. General Requirements
Make all submittals in accordance with applicable sections of the Project Manual.
- B. Shop Drawings
1. Submit detailed shop drawings for the Architect's review.
- C. Product Data
1. Submit (2) copies of product sheets and/or catalogue cuts of all products listed in the shop drawings.
- D. Samples
1. Upon request, a returnable sample of the Toilet Partitions shall be submitted to the Consultant/Owner for approval not later than (10) days after requested. All samples must be properly identified including: name of supplier, and name of manufacturer.
- E. Operations and Maintenance Data
1. At completion of the job, furnish to the owner (2) copies of an Owners Operation and Maintenance Manual. The Manual shall consist of a hard cover three ring binder with the project name in the front. Include in the manual the following information: Maintenance instructions, Catalogue pages for each product, Name/Address and phone number of the Manufacturer and their Sales Agent, Copy of the final shop drawings.

1.04 QUALITY ASSURANCE

- A. Substitutions

1. Manufacturers and model number listed are to establish a standard of quality. Similar items by approved manufacturers that are equal in design, function, quality and finish may be accepted upon prior written approval from the Architect.

- B. Supplier Qualifications
1. Toilet Partition shop drawings and Toilet Partitions shall be procured from a source of supply approved by the Architect. Supplier is responsible for the complete Toilet Partition subcontract.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Marking and Packaging
1. Toilet Partitions must be delivered to the job site in the manufacturers' original packages and marked to correspond with the approved shop drawings.

1.06 WARRANTY

- A. Written Guarantee
1. The Toilet Partition manufacturer shall guarantee all Solid Plastic Toilet Partitions by written certification, for a period of 25 years against breakage, delamination, and corrosion of solid plastic parts. Warranty is for manufacturer's material only and does not include installation errors, improper usage or vandalism.

1.07 FIRE RATINGS REQUIREMENT

- A.** California Building Code Interior Finish – Fire-rating requirements
1. All material by submitted HDPE manufacturer must have tested and passed the NFPA 286 fire test requirements. Any finish submitted, must be accompanied by independent laboratory testing illustrating that the said manufacturer has tested and passed for both the HDPE material, and the color/finish being submitted for approval. Material tested by ASTM-84 fire-testing standards are unacceptable, and no longer meet CBC requirements.

1.08 MAINTENANCE

- A. Maintenance
1. At completion of the project, the Toilet Partition supplier is required to brief Owner's maintenance staff regarding proper care of Toilet Partitions, such as: required lubrications, adjustments, cleaning, etc.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Approved Manufacturers
Only those manufacturers names and product numbers listed herein are approved for use on this project. All other manufacturers must request approval as described in the Project Manual.

Approved manufacturer(s):

1. Hadrian Manufacturing Inc. as Represented by R.E. Edwards & Assoc. 925 366 1966

2.02 MATERIALS

- A. Construction: Doors, panels and pilasters shall be certified CLASS B polyethylene solid plastic. The material shall contain no foaming agents, which can cause the formation of

air pockets. The self-lubricating surface is resistant to marking and can be maintained effectively with ordinary cleaners.

- B. Doors: Shall be 1” thick by 55” high straight cut with fine radius edges.
- C. Panels: Shall be 1” thick by 55” high straight cut with fine radius edges.
- D. Pilasters: Shall be 1” thick by 82” high straight cut with fine radius edges.
- E. Headrail: Shall be (1.25”) by (1.75”) extruded anodized aluminum with anti-grip design. Wall thickness to be (0.060”) and shall be securely attached to wall and pilasters with manufacturer’s fittings in such a way as to make a rigid installation. All joints in headrails shall be made at a pilaster.
- F. Hardware and Fittings: Doors are installed with heavy duty 14-gauge stainless steel continuous hinges that feature a stainless steel hinge pin. Hinges shall be fastened to door and pilaster with tamper-proof 6-lobe security head stainless steel through-bolts. Strike-keeper and throw latch shall be of cast stainless steel. Full height stainless steel channels are used at the panel to wall, panel to pilaster, and pilaster to wall connections. Inswing doors shall be fitted with a zinc die cast, #4 brushed combined coat hook and bumper. Outswing doors shall be fitted with a #4 brushed stainless steel flat coat hook. Fasteners are theft-proof 6-lobe security head stainless steel screws. Pilasters shall be securely and rigidly fastened to the floor with 3” high stainless steel anchor shoes.

2.03 **FINISH**

- A. Finish to be NFPA 286 compliant, Color: #212 “Blueberry”

PART 3 **EXECUTION**

3.01 **EXAMINATION**

- A. Site Preparation
 1. The contractor must examine all site conditions that would prevent the proper application and installation of Toilet Partitions. Any defect must be immediately identified and corrected, prior to the installation of the Toilet Partitions.

3.02 **INSTALLATION**

- A. Mounting
 1. Provide blocking as required.
 2. All Toilet Partitions must be mounted according to manufacturer’s standard locations and those specified on the drawings.
 3. Install all partitions secure, rigid, plumb, and level in accordance with manufacturer’s instructions.
 4. Maximum variation from true: ¼ inch, maximum variation from plumb: 1/8 inch.
 5. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
 6. Adjust adjacent components for consistency of line or plane.

3.03 **FIELD QUALITY CONTROL**

- A. Inspection
1. After installation has been completed, provide for a site inspection of all Toilet Partitions to determine that all items have been supplied and installed as per the enclosed details. Also, check the operation and adjustment of all Toilet Partitions. Any discrepancies, or malfunctioning product, must be reported to the Architect immediately.

3.04 **ADJUSTMENT AND CLEANING**

- A. Final Preparation
1. At final completion, Toilet Partitions shall be left clean and free from disfigurement. Make all final adjustments. Where Toilet Partitions are found defective, repair or replace or otherwise correct as directed.

3.05 **PROTECTION**

- A. Site Protection
1. The Contractor must provide for the proper protection of all Toilet Partitions until the owner accepts the project as complete.

END OF SECTION 10 21 13.19

SECTION 102800 - ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 TOILET AND BATH ACCESSORIES

- A. E1 Chalk Rail:

1. Arch Hardware Inc, CR 92-6.
2. Type: 6'-0" length.
3. Mounting: Surface mounted.
4. Material: Satin Stainless steel.

- B. E2, E3 Mirror Unit:

1. ASI model 0620
2. Frame: Stainless-steel, 20 gauge.
3. Glazing option "B" (1/4" tempered glass)

- C. (Not used)

- D. (Not used)

- E. J Storage

Cabinet:

1. Lyon model PP1091 36" w x 24" d x 78" h, lyonworkspace.com

- F. M Storage Cubby:

1. Bradley "Lenoxcubby"
2. Width: (3) 12" wide cubbies
3. Height: (5) tier, 60"
4. Depth: 12"
5. 3" base
6. End panels: both ends

- G. N Robe Hook:

1. ASI model 0751 surface-mounted heavy-duty robe hook.

- H. P1 Hand Dryer:

1. ASI model 0199-1 ADA compliant high-speed hand dryer.
 2. Type: Electronic-sensor activated.
 3. Mounting: Surface.
 4. Material: Steel, with stainless steel finish.
- I. P2 Hair Dryer:
1. Excel model RH76-W ADA compliant high-speed hand dryer.
 2. Mounting: recessed.
 3. Material: Steel, with chrome plated finish.
- J. X2 Mop Holder rack:
1. ASI model 0796-4, 36" length.
 2. Material: Stainless Steel.
- K. DD1, DD2 Grab Bars (Toilet Stalls):
1. ASI model 3700 with snap-on flange, Type #s as noted on plans.
 2. Material: Stainless steel, 18 guage.
 3. Gripping Surfaces: Slip-resistant texture.
 4. Outside Diameter: 1-1/2 inches for heavy-duty applications.
- L. EE Toilet Tissue Dispenser:
1. Georgia Pacific model 59209.
 2. Mounting: Surface mounted with concealed anchorage.
- M. FF Seat Cover Dispenser:
1. Hospeco Health Gards model HG-1-2.
 2. Mounting: Surface mounted.
- N. GG Grab Bars (Showers):
1. ASI model 3700 with snap-on flange, Type # 50.
 2. Material: Stainless steel, 18 guage.
 3. Gripping Surfaces: Slip-resistant texture.
 4. Outside Diameter: 1-1/2 inches for heavy-duty applications.
- O. HH Shower Seat:
1. ASI model 8206-28 L-shaped phenolic fold-up shower seat.
- P. JJ Liquid-Soap Dispenser:
1. Deb Proline model "Curve" 1 liter.
 2. Mounting: Surface.
- Q. KK Grab Bars (Drinking Fountain):
1. ASI model 3700 with snap-on flange, Type # 75.

- 2. Material: Stainless steel, 18 guage.
- R. P3 Sanitary Napkin Disposal Unit:
 - 1. Hospeco Model # ND-1E.
- S. QQ Underlavatory Guard:
 - 1. Description: Insulating pipe coverings for supply and drain piping assemblies, which prevent direct contact with and burns from piping and allow service access without removing coverings.
 - 2. Material and Finish: Antimicrobial, molded plastic, white.

2.2 MATERIALS

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of four keys to Owner's representative.

PART 3 - EXECUTION

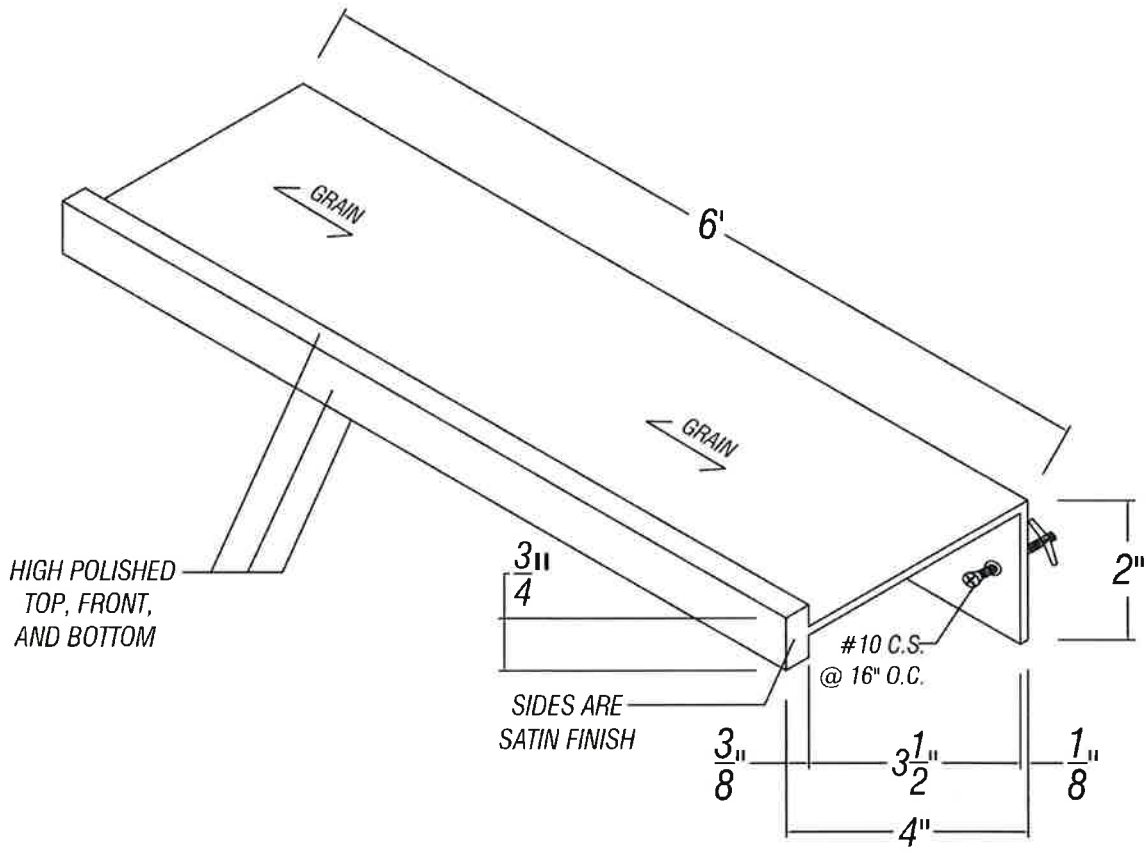
3.1 INSTALLATION

- A. Install accessories using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 - 1. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.
- B. Adjust accessories for unencumbered, smooth operation, and verify that mechanisms function properly. Replace damaged or defective items. Remove temporary labels and protective coatings.

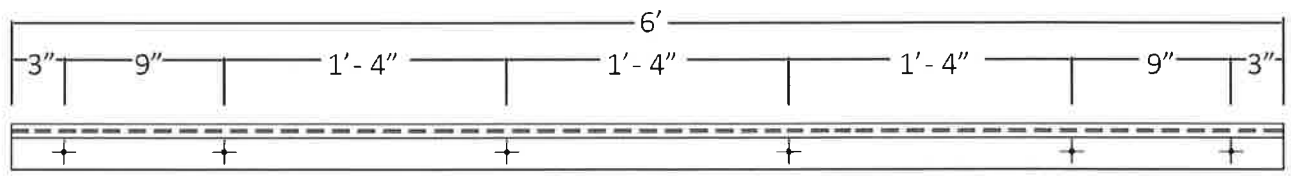
END OF SECTION 102800

E1


CHALK RAIL WITH RECTANGULAR PENCIL STOP - 6 FT



ISOMETRIC VIEW



HOLE PATTERN

PART #	FINISH SCHEDULE	DRAWN: JR	 ARCH HARDWARE, INC. "WHERE IDEAS MEET METAL"
CR 92-6	SATIN STAINLESS STEEL #304 ALLOY W/ POLISHED RECTANGULAR PENCIL STOP. *HARDWARE INCLUDED	CHECKED: RD REV. DATE: 02/26/2015	



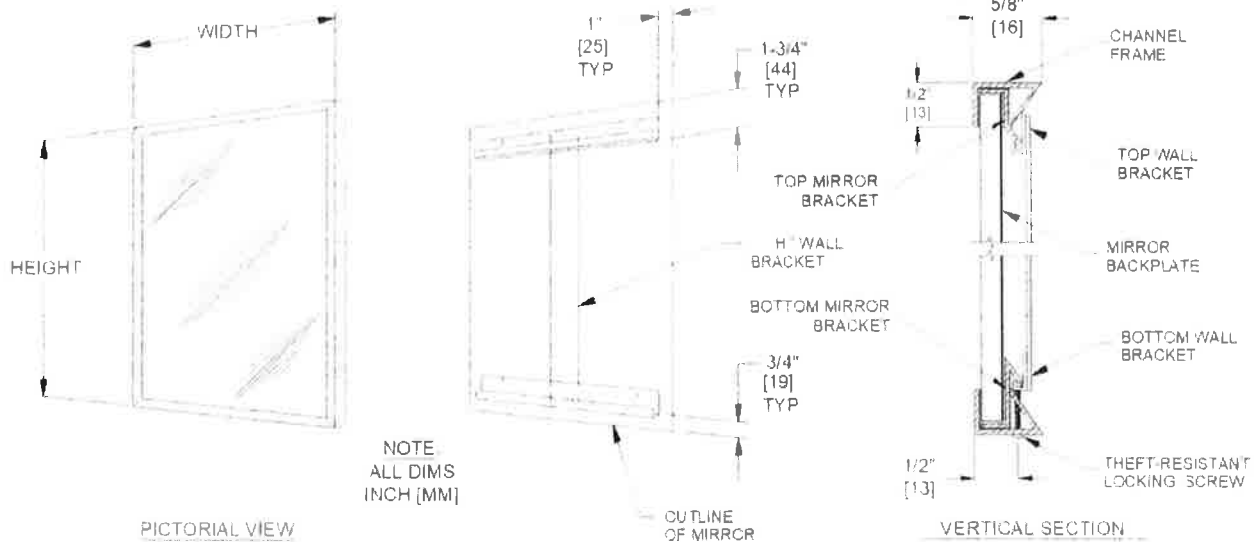
AMERICAN SPECIALTIES, INC
 441 Saw Mill River Road, Yonkers, NY 10701
 (914) 476.9000 • (914) 476.0688
 www.americanspecialties.com

MODEL No: 0620

ISSUED: 01/87

REVISED: 19 FEB 2018

CHANNEL FRAME MIRROR



SPECIFICATION

Channel Frame Mirror shall have frame fabricated of alloy 18-8 stainless steel, type 304, 20 gauge with mitered corners. Mirror glazing shall be B (insert glazing option) and shall be warranted for 15 years against silver spoilage. All edges of mirror shall be protected by friction and chafe absorbing fillers. Back of mirror shall be protected by full size shock-absorbing water-resistant filler and full size one piece 20 gauge corrosion protected steel. Top and bottom wall mounting brackets shall be fabricated of 20 gauge corrosion protected steel and shall be spot welded into "H" hanger. Mirror shall be secured to lower bracket with a Philips Pan Head locking screw.

Channel Frame Mirror shall be Model No 0620- B (insert glazing option) SEE PLANS (note size, W x H) as manufactured by American Specialties, Inc., 441 Saw Mill River Road, Yonkers, New York 10701-4913

MATERIALS

Frame: 18-8, type 304, 20 gauge (.036" <91mm> thick) stainless steel. Roll-formed one piece construction. Exposed surfaces have a N^o 4 satin finish. Edges and corners are burr free.

Glass: Standard glazing is N^o 1 quality, 1/4" (6.4mm) thick plate/float, silver coated and hermetically sealed with a uniform copper plating, and warranted against silver spoilage for 15 years. Mirrors meet Federal Spec DD-M-411C, ASTM C-1503, and ASTM C-1036-91.

Filler: Expanded polyethylene microcell foam sheet material, abrasion resistant and shock absorbing, water resistant, 1/8" inch (3.2mm) total layer thickness.

FABRICATION NOTE FOR SPECIFICATION

Mirrors larger than 21sq. Ft. (1.95m²) are fabricated in two (2) or more sections to provide installation and handling ease.

INSTALLATION

Install "H" wall brackets level and plumb per diagram location using ONLY N^o 8 or N^o 10 Pan Head screws (by others). Hang mirror on brackets and tighten locking screw (N^o 6-32F x 3/4" Philips Pan Head, supplied separately taped to mirror back) at bottom (note: this screw should be started prior to hanging mirror on wall bracket). For compliance with 2010 ADA Accessibility Standard, bottom edge of reflecting surface should be no higher than 40" (1016mm) above finished floor.

GLAZING OPTIONS

Units are supplied with 1/4" thick plate glass. Other glazing options are available. For a complete description of any other available glazing, see the **MIRROR GLAZING OPTIONS** chart.

E2 E3



AMERICAN SPECIALTIES, INC.
 441 Saw Mill River Road, Yonkers, NY 10701
 (914) 476.9000 • (914) 476.0688
 www.americanspecialties.com

MODEL No: GLAZINGS

ISSUED: 1-87

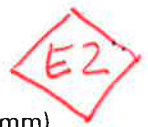
REVISED: 22 MAY 2014

MIRROR GLAZING OPTIONS

GLAZING SUFFIX	DESCRIPTION
A	Plate Glass - 1/4" (6.4mm) thick № 1 quality polished, silver coated and hermetically sealed with a uniform coating of electrolytic copper plating. Mirrors meet Federal Spec. № DD-M-411C, ASTM C-1503 and ASTM-C-1036-91. Image quality: Excellent
B (1,2,3)	Tempered Glass - 1/4" (6.4mm) thick polished tempered glass with two coats of silver applied. Electroplating with a heavy uniform coating of copper hermetically seals the silver. Back of mirror is finished and protected with a thick coat of heavy waterproof paint. Glazing meets Federal Specification № DD-G1403B, Amendment 1, ASTM C-1503 and ASTM-C-1048-92. Image quality: Good
C (1,2,3)	Metal Mirrors - Shall be Type 304 alloy 18-8 stainless steel, 20 gauge polished to a № 8 mirror finish. Image quality: Good
D (1)	Lexan Dura-Mirror - 1/4" (6.4mm) thick polycarbonate sheet, highly impact resistant. Mirror face is provided with a thick removable masking to prevent scratching during installation. Image quality: Very Good
E (1)	Plexiglas® - Shall be 1/4" (6.4mm) thick acrylic plastic, lightweight and highly shock resistant. Image quality: Very Good
L (1)	Mirror is fabricated with an interlayer of 1/32" (.8mm) thick vinyl bonded between two 1/8" (3mm) thick sheets of № 1 quality polished plate glass with back silver coated and hermetically sealed with a uniform coating of electrolytic copper plating. Back of mirror is finished and protected with a thick coat of heavy-duty waterproof paint. Laminated glass meets the performance criteria of Federal Spec. № DD-M-451 and ANSI Z87.1 specifications and complies with CPSC standards 16 CR 1201 (1) 11. Image quality: Excellent

NOTES

1. Glazing types indicated are particularly suited to applications where frequent breakage and/or security problems exist. These surfaces are best specified for use in prisons, schools, police stations, hospital wards, etc., where shards of broken glass might possibly be used as weapons.
2. The reflective quality of these mirror types is not as true as plate glass.
3. ASI will not accept returns of these mirror types based upon claims of distortion in reflective properties.



0620-2442 – 24" wide x 42" high (610 x 1067 mm)

0620-2448 – 24" wide x 48" high (610 x 1219 mm)

0620-2460 – 24" wide x 60" high (610 x 1524 mm)

0620-3036 – 30" wide x 36" high (610 x 914 mm)

0620-3048 – 30" wide x 48" high (610 x 1219 mm)

0620-3636 – 36" wide x 36" high (914 x 914 mm)

0620-3648 – 36" wide x 48" high (914 x 1219 mm)

0620-4830 – 48" wide x 30" high (1219 x 762 mm)

0620-4836 – 48" wide x 36" high (1219 x 914 mm)

0620-6024 – 60" wide x 24" high (1524 x 610 mm)



0620-6036 – 60" wide x 36" high (1524 x 914 mm)

0620-7236 – 72" wide x 36" high (1829 x 914 mm)

BIM OBJECTS
([HTTP://AMERICANSPECIALTIES.COM/WP-CONTENT/UPLOADS/TOILET-ACC_MIRRORS_ASI_0620.ZIP](http://americanspecialties.com/wp-content/uploads/TOILET-ACC_MIRRORS_ASI_0620.ZIP))

TECHNICAL DATA SHEET
([HTTP://AMERICANSPECIALTIES.COM/WP-CONTENT/UPLOADS/TDS-06202.PDF](http://americanspecialties.com/wp-content/uploads/TDS-06202.PDF))

Product Specifications

MIRROR SIZE OPTIONS CHART +

FINISHES
([HTTP://AMERICANSPECIALTIES.COM/WP-CONTENT/UPLOADS/GLAZINGS-4.PDF](http://americanspecialties.com/wp-content/uploads/GLAZINGS-4.PDF)) >

PRODUCT CARE & MAINTENANCE
([HTTP://AMERICANSPECIALTIES.COM/WP-CONTENT/UPLOADS/ASI-PRODUCT-CARE-MAINTENANCE.PDF](http://americanspecialties.com/wp-content/uploads/ASI-PRODUCT-CARE-MAINTENANCE.PDF)) >

MIRROR CARE & MAINTENANCE
([HTTP://AMERICANSPECIALTIES.COM/WP-CONTENT/UPLOADS/MIRRORS.ZIP](http://americanspecialties.com/wp-content/uploads/MIRRORS.ZIP)) >



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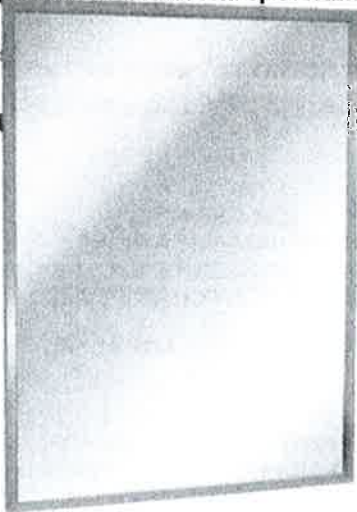
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0620 SERIES STAINLESS STEEL CHAN-LOK – PLATE GLASS MIRRORS, VARIABLE SIZES

1/2" x 1/2" (13 x 13 mm) 20 gauge type 304 satin finish stainless steel channel is a one-piece roll formed member that encases mirror and backing revealing a tight mitered corner. Mirror is installed on two wall brackets and held secure by theft-resistant screws.

See Price List for all sizes available.

Variable standard sizes available, choose appropriate suffix:

0620-1620 – 16" wide x 20" high (406 x 508 mm)

0620-1624 – 16" wide x 24" high (406 x 610 mm)

0620-1630 – 16" wide x 30" high (406 x 762 mm)

0620-1824 – 18" wide x 24" high (457 x 610 mm)


0620-1830 – 18" wide x 30" high (457 x 762 mm)

0620-1836 – 18" wide x 36" high (457 x 914 mm)

0620-2060 – 20" wide x 60" high (508 x 1524 mm)

0620-2424 – 24" wide x 24" high (610 x 610 mm)

0620-2430 – 24" wide x 30" high (610 x 762 mm)

 **0620-2436** – 24" wide x 36" high (610 x 914 mm)



Cabinets

Lockers

Modular Drawer Cabinets

Shelving & Rack

COMPARE

Home › Cabinets › Economical Storage Cabinets › Standard Cabinets › Economical Storage Cabinet 36" w x 24" d x 78" h



Economical Storage Cabinet 36" w x 24" d x 78" h

Model # PP1091

SHIPS IN 5-7 DAYS

A virtual storeroom of space! The 1091 Economical Standard Cabinet gives you space to hold 900 pounds of parts, stationery, or supplies. This cabinet has contemporary styling with rounded front corners. The double doors will also allow you full access to all areas of cabinet.

This economical cabinet includes a polished chrome handle. The doors are secured with a three-point locking system. In addition, you can lock the cabinet with the lock that is built into the door. This separate grooved key lock comes with two keys.

The doors also include pan type reinforcements to maintain door alignment. In addition the "Quiet Door" feature reduces noise when you are opening and closing doors.

The 1000 Series Storage Cabinets are made of durable heavy gauge construction. Each cabinet includes four shelves. Each shelf has also a weight capacity of 180 lbs. In addition you can adjust the shelves on 2" centers.

1091 Economical Standard Cabinet Features

- Double Doors for Full Access

Color

Putty



Assembly Option

Unassembled



Clear

Quantity

1



DETAILS

Overall Dimensions	36"w x 24"d x 78"h
Number Of Shelves	4
Capacity Per Shelf	180 lbs



- Tough, attractive, solid plastic never needs painting, resists dents and scratches
- Impervious to moisture — cubby will not rust or delaminate
- Durable, vandal resistant all-welded construction
- Wide range of sizes, colors and options
- 20 year warranty against rust, delamination or breakage under normal use*
- US Patent Numbers 6,685,285 – 6,792,661 – 6,793,299 – 7,029,078 – 7,223,317 – 7,278,695

Construction - Standard Features

Standard Sizes:

A =	12"	15"	18"	Wide
B =	12"	15"	18"	Deep
C =	8-1/4"	11-1/4"	14-1/4"	Opening Width
D =	24***, 36***, 48***, 60", 72"			Tall
Tiers	See Table.			

*** Nominal

Tiers	Actual Locker Height				
	24-11/16"	36-1/2"	48-11/32"	60"	72"
2	X	X	X	X	X
3		X	X	X	X
4			X	X	X
5				X	X
6					X

Frames

Constructed of 1/2" thick High Density Polyethylene (HDPE) with homogeneous color and a matte finish texture. Dirt or graffiti are easily removed with standard industrial cleaners. Frames are welded to cubby box to provide a secure, rigid assembly. Frame width is 1-7/8" on each side. Frame divider height is 1".

Sides, Tops, Bottoms and Dividers

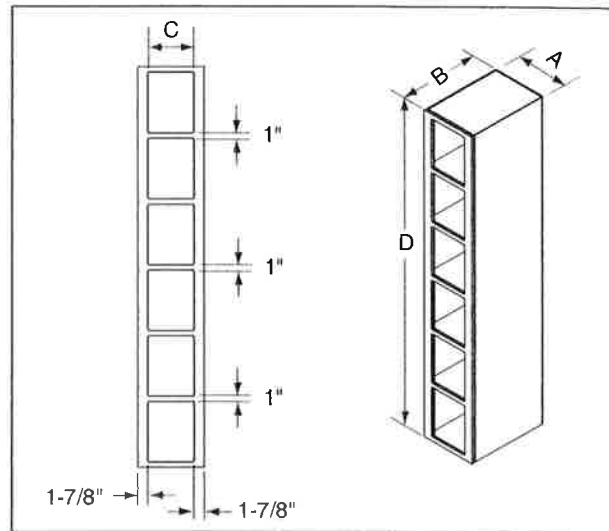
Constructed of 3/8" thick white HDPE with a smooth finish. Sides and back of box are formed from a single sheet of HDPE with fused corners. Tops, bottoms and dividers are welded to box to form a complete unit without metal fasteners or dovetail joints.

Construction - Optional Features

Slope Top – Model LENOXSLOPETOP

Constructed of a 1" thick HDPE backplate (color may vary) and a 1/2" thick colored HDPE slope top panel. Provides a finished look and prevents accumulation of dust and storage of items on top of cubby lockers. Back plate secures to wall first, then panel is secured through the cubby locker top from the inside — no exposed fasteners. Standard slope is 10°. Available in single cubby locker size or in 24", 30", 36", 45" and 72" lengths. All necessary hardware included.

* Normal use further defined as lockers installed in a climate-controlled environment, away from direct sunlight.



Base – Model LENOXBASE

Constructed of 1" thick HDPE with homogeneous color and a matte finish texture. Base is 3" tall and set back 3" from cubby locker front to provide toe clearance. Notched end caps provide ease of installation. Installation hardware, including screws, anchors, L-brackets and mending plates are included.

End Panels – Model LENOXENDPANEL

Constructed of 3/8" thick HDPE with homogeneous color and a matte finish texture. End panels cover white cubby sides on exposed ends and are available in flat or slope top styles and in single or double (back-to-back) configurations. All necessary hardware included.

Flat Top – Model LENOXFLATTOP

Constructed of 3/8" or 1/2" thick HDPE with homogeneous color and a matte finish texture. Provides a finished look on top of cubbies. Available in single cubby size or in 24", 30", 36", 45" and 72" lengths. Hardware not included.

Fillers - Model LENOXFILLER

Constructed of 1/2" thick HDPE secured to 3/8" thick HDPE angle bracket. Filler is attached through the inside of an end or corner cubby to fill gaps between cubbies and a wall or another cubby in a corner. Available in colors to match cubbies 24", 36", 48", 60" or 72" tall, 6", 12", 15" and 18" wide. All necessary hardware included.

Coat Hook

Double hook constructed of black polycarbonate. Furnished in 60" and 72" two-tier cubbies only. Hook hangs under cubby tops. Secured to tops with stainless steel screws.



Model	Description
<input type="checkbox"/> LENOXCUBBY	Solid Plastic Cubby Locker

Required Selections (Must select one from each category)

Locker Width (select one):

12-WIDTH 12" Wide Cubby

15-WIDTH 15" Wide Cubby

18-WIDTH 18" Wide Cubby

Locker Depth (select one):

12-DEPTH 12" Deep Cubby

15-DEPTH 15" Deep Cubby

18-DEPTH 18" Deep Cubby

Locker Height (select one):

24-HGT 24" High Cubby (Nom. Height)

36-HGT 36" High Cubby (Nom. Height)

48-HGT 48" High Cubby (Nom. Height)

60-HGT 60" High Cubby

72-HGT 72" High Cubby

Locker Tiers (select one):

2TIER Two-Tier Cubby

3TIER Three-Tier Cubby

4TIER Four-Tier Cubby

5TIER Five-Tier Cubby

6TIER Six-Tier Cubby

Locker Color (select one):

<input type="checkbox"/> Beige	<input type="checkbox"/> Sky Blue
<input type="checkbox"/> Black	<input type="checkbox"/> Spice
<input type="checkbox"/> Bronze	<input type="checkbox"/> Stardust Gray***
<input type="checkbox"/> Burgundy	<input type="checkbox"/> Starry Night
<input type="checkbox"/> Buttermilk	<input type="checkbox"/> Teal
<input type="checkbox"/> Canyon Granite	<input type="checkbox"/> Toffee
<input type="checkbox"/> Caribbean Sage***	<input type="checkbox"/> White
<input type="checkbox"/> Charcoal Gray	<input type="checkbox"/> Blue/White/Blue
<input type="checkbox"/> Deep Blue	<input type="checkbox"/> Brown/White/Brown
<input type="checkbox"/> Desert Stone	<input type="checkbox"/> Green/Beige/Green
<input type="checkbox"/> Dove Stone	<input type="checkbox"/> Red/White/Red
<input type="checkbox"/> Gray	<input type="checkbox"/> 100% Post-Consumer Beige**
<input type="checkbox"/> Hunter	<input type="checkbox"/> 100% Post-Consumer Charcoal Gray**
<input type="checkbox"/> Linen	<input type="checkbox"/> 100% Post-Consumer Moss**
<input type="checkbox"/> Moss	<input type="checkbox"/> 100% Post-Consumer Toffee**
<input type="checkbox"/> Plum	<input type="checkbox"/> 100% Post-Industrial Black
<input type="checkbox"/> Red	

Model	Description
<input type="checkbox"/> LENOXSLOPETOP	Optional Slope Top

Optional Selections

Slope Top Length (select one):

<input type="checkbox"/> 12"	<input type="checkbox"/> 30"
<input type="checkbox"/> 15"	<input type="checkbox"/> 36"
<input type="checkbox"/> 18"	<input type="checkbox"/> 45"
<input type="checkbox"/> 24"	<input type="checkbox"/> 72"

Locker Depth (select one):

<input type="checkbox"/> 12-DEPTH	12" Deep Slope Top
<input type="checkbox"/> 15-DEPTH	15" Deep Slope Top
<input type="checkbox"/> 18-DEPTH	18" Deep Slope Top

Slope Top Color (select one):

<input type="checkbox"/> Beige	<input type="checkbox"/> Sky Blue
<input type="checkbox"/> Black	<input type="checkbox"/> Spice
<input type="checkbox"/> Bronze	<input type="checkbox"/> Stardust Gray***
<input type="checkbox"/> Burgundy	<input type="checkbox"/> Starry Night
<input type="checkbox"/> Buttermilk	<input type="checkbox"/> Teal
<input type="checkbox"/> Canyon Granite	<input type="checkbox"/> Toffee
<input type="checkbox"/> Caribbean Sage***	<input type="checkbox"/> White
<input type="checkbox"/> Charcoal Gray	<input type="checkbox"/> Blue/White/Blue
<input type="checkbox"/> Deep Blue	<input type="checkbox"/> Brown/White/Brown
<input type="checkbox"/> Desert Stone	<input type="checkbox"/> Green/Beige/Green
<input type="checkbox"/> Dove Stone	<input type="checkbox"/> Red/White/Red
<input type="checkbox"/> Gray	<input type="checkbox"/> 100% Post-Consumer Beige**
<input type="checkbox"/> Hunter	<input type="checkbox"/> 100% Post-Consumer Charcoal Gray**
<input type="checkbox"/> Linen	<input type="checkbox"/> 100% Post-Consumer Moss**
<input type="checkbox"/> Moss	<input type="checkbox"/> 100% Post-Consumer Toffee**
<input type="checkbox"/> Plum	<input type="checkbox"/> 100% Post-Industrial Black
<input type="checkbox"/> Red	

Locker Top Type (select one):

<input type="checkbox"/> CONT-SLOPE	Optional Continuous Slope Top
<input type="checkbox"/> INDIV-SLOPE	Optional Individual Slope Top

Pre-cut Corners:

<input type="checkbox"/> RIGHT-CORNER	Corner on Right Side (facing cubby)
<input type="checkbox"/> LEFT-CORNER	Corner on Left Side (facing cubby)

** 100% Post-Consumer HDPE may have some minor flaws and the color may be inconsistent.

*** Translucent material is generally susceptible to color variations and inconsistencies.



Model	Description
<input type="checkbox"/> LENOXBASE	Optional Base

Optional Selections

Base Length (select one):

12" 30"
 15" 36"
 18" 45"
 24" 72"

Base Height (select one):

3" 3" High Base (standard)
 4" 4" High Base (custom)

Locker Depth (select one):

12-DEPTH 12" Deep Base
 15-DEPTH 15" Deep Base
 18-DEPTH 18" Deep Base

Base Color (select one):

Black Special Color

Model	Description
<input type="checkbox"/> LENOXPANEL	Optional End Panel

Optional Selections

End Panel Color (select one):

Beige Sky Blue
 Black Spice
 Bronze Stardust Gray***
 Burgundy Starry Night
 Buttermilk Teal
 Canyon Granite Toffee
 Caribbean Sage*** White
 Charcoal Gray Blue/White/Blue
 Deep Blue Brown/White/Brown
 Desert Stone Green/Beige/Green
 Dove Stone Red/White/Red
 Gray 100% Post-Consumer Beige**
 Hunter 100% Post-Consumer Charcoal Gray**
 Linen 100% Post-Consumer Moss**
 Moss 100% Post-Consumer Toffee**
 Plum 100% Post-Industrial Black
 Red

Locker End Type (select one):

SINGLE-ENDPANEL Single Type End Panel
 DOUBLE-ENDPANEL Double (Island) End Panel for Back-To-Back Lockers

Locker Height (select one):

24-HGT 24" High End Panel (Nom. Height)
 36-HGT 36" High End Panel (Nom. Height)
 48-HGT 48" High End Panel (Nom. Height)
 60-HGT 60" High End Panel
 72-HGT 72" High End Panel

Locker Depth (select one):

12-DEPTH 12" Deep End Panel (Nom. Height)
 15-DEPTH 15" Deep End Panel
 18-DEPTH 18" Deep End Panel

Locker Top Type:

SLOPE-TOP Optional - Select if End Panel is for lockers w/ Slope Top

** 100% Post-Consumer HDPE may have some minor flaws and the color may be inconsistent.

*** Translucent material is generally susceptible to color variations and inconsistencies.

Model	Description
<input type="checkbox"/> LENOXFLATTOP	Optional Top Panel

Model	Description
<input type="checkbox"/> LENOXFILLER	Optional Filler

Optional Selections	
Top Panel Color (select one):	
<input type="checkbox"/> Beige	<input type="checkbox"/> Sky Blue
<input type="checkbox"/> Black	<input type="checkbox"/> Spice
<input type="checkbox"/> Bronze	<input type="checkbox"/> Stardust Gray***
<input type="checkbox"/> Burgundy	<input type="checkbox"/> Starry Night
<input type="checkbox"/> Buttermilk	<input type="checkbox"/> Teal
<input type="checkbox"/> Canyon Granite	<input type="checkbox"/> Toffee
<input type="checkbox"/> Caribbean Sage***	<input type="checkbox"/> White
<input type="checkbox"/> Charcoal Gray	<input type="checkbox"/> Blue/White/Blue
<input type="checkbox"/> Deep Blue	<input type="checkbox"/> Brown/White/Brown
<input type="checkbox"/> Desert Stone	<input type="checkbox"/> Green/Beige/Green
<input type="checkbox"/> Dove Stone	<input type="checkbox"/> Red/White/Red
<input type="checkbox"/> Gray	<input type="checkbox"/> 100% Post-Consumer Beige**
<input type="checkbox"/> Hunter	<input type="checkbox"/> 100% Post-Consumer Charcoal Gray**
<input type="checkbox"/> Linen	<input type="checkbox"/> 100% Post-Consumer Moss**
<input type="checkbox"/> Moss	<input type="checkbox"/> 100% Post-Consumer Toffee**
<input type="checkbox"/> Plum	<input type="checkbox"/> 100% Post-Industrial Black
<input type="checkbox"/> Red	
Panel Length (select one):	
<input type="checkbox"/> 12-LENGTH	12" Long Flat Top
<input type="checkbox"/> 15-LENGTH	15" Long Flat Top
<input type="checkbox"/> 18-LENGTH	18" Long Flat Top
<input type="checkbox"/> 24-LENGTH	24" Long Flat Top
<input type="checkbox"/> 30-LENGTH	30" Long Flat Top
<input checked="" type="checkbox"/> 36-LENGTH	36" Long Flat Top
<input type="checkbox"/> 72-LENGTH	72" Long Flat Top
Panel Width (select one):	
<input checked="" type="checkbox"/> 12-WIDTH	12" Wide Flat Top
<input type="checkbox"/> 15-WIDTH	15" Wide Flat Top
<input type="checkbox"/> 18-WIDTH	18" Wide Flat Top
Panel Thickness:	
<input checked="" type="checkbox"/> 1/2-THICK	1/2" Thick Flat Top

Optional Selections	
Locker Height (select one):	
<input type="checkbox"/> 24-HGT	24" High Filler (Nom. Height)
<input type="checkbox"/> 36-HGT	36" High Filler (Nom. Height)
<input type="checkbox"/> 48-HGT	48" High Filler (Nom. Height)
<input type="checkbox"/> 60-HGT	60" High Filler
<input type="checkbox"/> 72-HGT	72" High Filler
Filler Width (select one):	
<input type="checkbox"/> 3-WIDTH	3" Wide Filler
<input type="checkbox"/> 6-WIDTH	6" Wide Filler
<input type="checkbox"/> 12-WIDTH	12" Wide Filler
<input type="checkbox"/> 15-WIDTH	15" Wide Filler
<input type="checkbox"/> 18-WIDTH	18" Wide Filler
Filler Color (select one):	
<input type="checkbox"/> Beige	<input type="checkbox"/> Sky Blue
<input type="checkbox"/> Black	<input type="checkbox"/> Spice
<input type="checkbox"/> Bronze	<input type="checkbox"/> Stardust Gray***
<input type="checkbox"/> Burgundy	<input type="checkbox"/> Starry Night
<input type="checkbox"/> Buttermilk	<input type="checkbox"/> Teal
<input type="checkbox"/> Canyon Granite	<input type="checkbox"/> Toffee
<input type="checkbox"/> Caribbean Sage***	<input type="checkbox"/> White
<input type="checkbox"/> Charcoal Gray	<input type="checkbox"/> Blue/White/Blue
<input type="checkbox"/> Deep Blue	<input type="checkbox"/> Brown/White/Brown
<input type="checkbox"/> Desert Stone	<input type="checkbox"/> Green/Beige/Green
<input type="checkbox"/> Dove Stone	<input type="checkbox"/> Red/White/Red
<input type="checkbox"/> Gray	<input type="checkbox"/> 100% Post-Consumer Beige**
<input type="checkbox"/> Hunter	<input type="checkbox"/> 100% Post-Consumer Charcoal Gray**
<input type="checkbox"/> Linen	<input type="checkbox"/> 100% Post-Consumer Moss**
<input type="checkbox"/> Moss	<input type="checkbox"/> 100% Post-Consumer Toffee**
<input type="checkbox"/> Plum	<input type="checkbox"/> 100% Post-Industrial Black
<input type="checkbox"/> Red	

** 100% Post-Consumer HDPE may have some minor flaws and the color may be inconsistent.

*** Translucent material is generally susceptible to color variations and inconsistencies.



AMERICAN SPECIALTIES, INC.

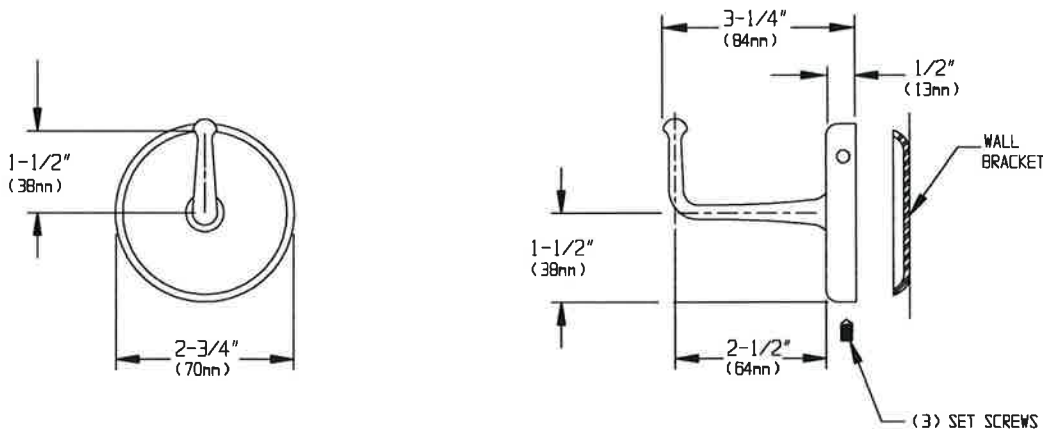
441 Saw Mill River Road, Yonkers, NY 10701 (914) 476-9000
www.americanspecialties.com

MODEL No: 0751

ISSUED: 1-87

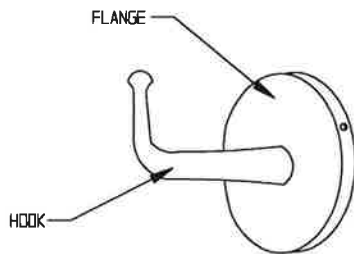
REVISED: 12-06

SURFACE MOUNTED HEAVY DUTY ROBE HOOK



FRONT VIEW

SIDE VIEW



PERSPECTIVE

SPECIFICATION

Surface Mounted Heavy-Duty Robe Hook shall be fabricated of brass with a chrome finish. Three (3) 1/4-28 cone point stainless steel hex socket set screws shall be provided evenly spaced around perimeter of flange for securing to wall bracket. Hook shall be capable of supporting over 300 lbs (136.1 kg) when properly attached to building element.

Heavy Duty Robe Hook shall be Model N^o 0751 of American Specialties, Inc. 441 Saw Mill River Road Yonkers, New York 10701-4913

INSTALLATION

Wall bracket is surface mounted using N^o 10 pan head self-tapping screws (provided by others to suit wall conditions) in a manner capable of supporting 300 lbs (136.1 kg) of downward force. Ensure that mounting configuration complies with local building codes. Secure hook to bracket by tightening three (3) hex socket set screws on perimeter of flange with a 1/8" hex wrench. For compliance with ADA Accessibility Guidelines install the hook center-line 54" (1372) maximum above the finished floor (MAX AFF) when clear floor side reach access is provided or 48" (1219) MAX AFF with clear floor forward reach access only provided.

Accessory Specialties

AMERICAN DISPENSER

Desert Ray Products

WATROUS, INC.



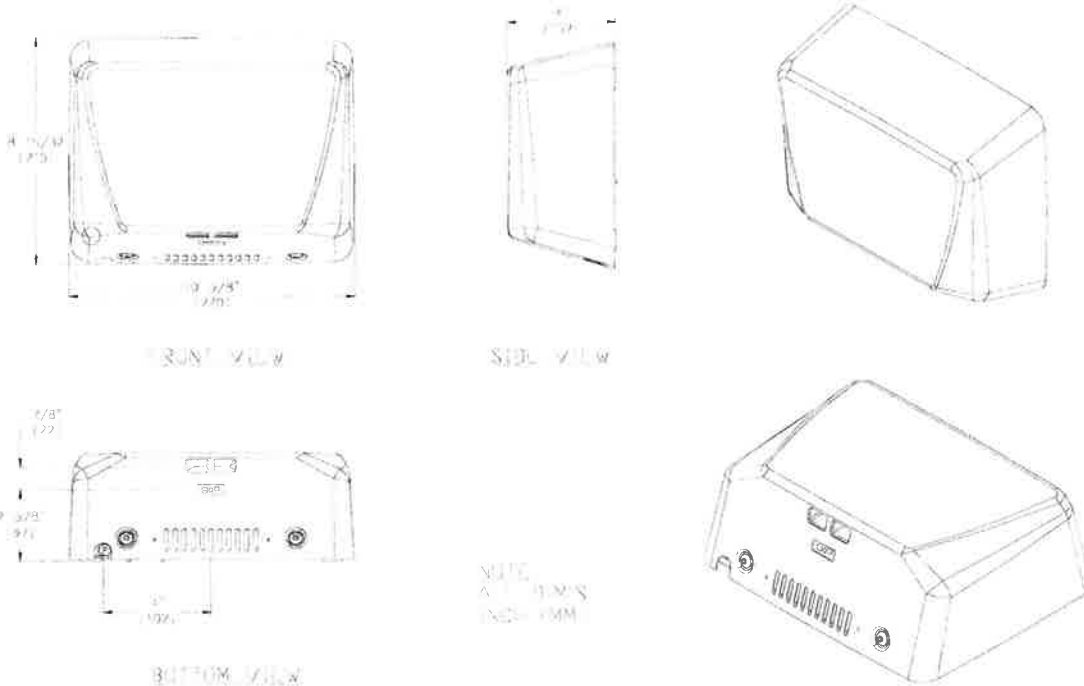
AMERICAN SPECIALTIES, INC.
441 Saw Mill River Road, NY 10701
(914) 476.9000 • (914) 476.0688
www.americanspecialties.com

MODEL №: 0199

ISSUED: 10/12

REVISED: 03 Oct 2013

ADA COMPLIANT SURFACE MOUNTED HIGH-SPEED DRYER (1 OF 2)



SPECIFICATION

ADA Compliant Surface Mounted High-Speed Hand Dryer shall operate automatically from IR sensor activated by beam reflection from objects placed in sensing zone. Motor and heating element shall have internal resetting automatic thermal protection. Unit shall develop 60 CFM (102 m³/h) of heated air and shall provide drying time of less than 15 seconds. Cover shall be heavy-duty, one piece formed 18 gage stainless steel bright or satin finished on all exposed surfaces (by option specified) or heavy-duty, one piece formed 18 gage steel finished on all exposed surfaces with white porcelain enamel. Fixed directional air nozzle shall be heavy-duty, rust proof and highly tamper resistant. Air intake slots shall not allow access to internal parts. Circuitry shall have self-adjusting time-out and fail-safe off protection controlled by a microprocessor that shall detect and reject false signals and shall automatically self-calibrate to provide uniform sensitivity over its entire life span. Entire unit shall be internally electrically grounded. Dryer unit shall have C-UL-US[®] and CE approval and be listed under the re-examination services of Underwriters Laboratories, Inc. Unit shall be warranted against defects in materials or workmanship for five (5) years. Complete Owner's Manual (OM) and Installation Guide (IG) shall be provided with unit.

ADA Compliant Surface Mounted High-Speed Hand Dryer shall be Model № 0199 of American Specialties, Inc., 441 Saw Mill River Road, Yonkers, NY 10701-4913

INSTALLATION

Surface mount unit on wall with four (4) 1/4" washers and screws or bolts (supplied) through holes (provided) in a corrosion protected steel back plate into suitable prepared mountings (by others) or other suitable mounting hardware (by others) to suit wall conditions. Electrical service is supplied and connected (by others) prior to installing cover. Cover is secured to back plate with recessed, pin-hex pan head cap screws (supplied) opened with security wrench (supplied). For compliance with ICC/ANSI A-117.1-2003 and 2010 ADA Accessibility Standards for adults install unit with bottom of sensor lens 48" (1219) maximum above finished floor (MAX AFF) if unobstructed reach access is provided or 44" (1118) MAX AFF if forward reach over an obstruction (e.g. vanity or commode) with reach depth greater than 20" (508) and less than 25" (635) is only provided. For general utility install unit so that sensor lens is 44" to 54" (1118 to 1372) AFF. Mounting Template and Installation Guide (MT & IG) is supplied with unit.

P1



AMERICAN SPECIALTIES, INC.
 441 Saw Mill River Road, NY 10701
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 www.americanspecialties.com

MODEL No: 0199

ISSUED: 10/12

REVISED: 03 Oct 2013

ADA COMPLIANT SURFACE MOUNTED HIGH-SPEED DRYER (2 OF 2)

OPERATION

Activate dryer by placing hands under sensor. Dryer automatically shuts off after user removes hands from sensor zone. Complete OM and MT-IG are supplied with unit for future reference of Installation Requirements, Operating Conditions and Service.

COLOR OPTION*

Unit is supplied with white finish unless color option is specified. Specify optional cover Bright or Satin Stainless Steel by adding appropriate code number suffix to standard model number (e.g. 0199-1-92 or 0199-1-93).

RATINGS							
MODEL	TYPE	AIR Velocity	TIMING SAFETY	VOLTS AC FREQUENCY Hertz	AMPS	WATTS x1000	* COLOR
0199-1	Hand	150 ~ 230 ft/S 45.5 ~ 70 m/s	Automatic 60 second Shut-Off	110 – 120 • 50/60	10.4 Max	0.84-1.0	Standard White Optional SS Bright SS Satin
0199-2				208 – 240 • 50/60	5.2 Max	0.75-1.0	
0199-3				277 • 50/60	5.2 Max	1.0	

MOTOR	H/P	RPM x1000	FAN TYPE	HEATING ELEMENT	CFM m ³ /h	AIR OUTPUT TEMPERATURE
Brush Type Dual Ball Bearings	0.67	16-29 (ADJ)	Multi-Inlet Centrifugal	325-450Watt with auto reset circuit breaker Range Adjustable by Owner	42-60 (71-102)	131° F ± 5@ 77° F (55° C ± 2.8 @ 25° C) Ambient room temp

Net Wt	Ship Wt	DRYING TIME	SENSING RANGE	SAFETY	Water Protection
8.4 Lbs 3.8 kg	9.2 Lbs 4.2 kg	Less Than 15 seconds	Standard = 6" ± 25/32" (152 ± 20)	C-UL-US®, CE	Drip Proof IP23

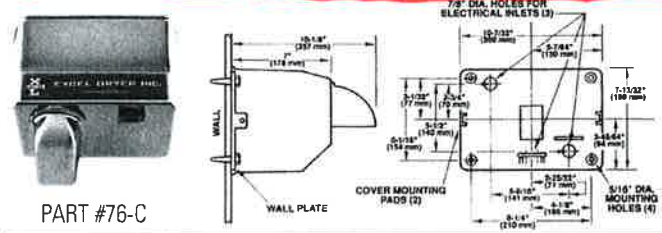
SENSOR TYPE	DRYING PERSISTENCE	MOTOR THERMAL PROTECTION	HEATER THERMAL PROTECTION	SOUND PRESSURE
IR 780 nm Self-adjusting	Automatic 2 second Hold-On Shut-Off delay	120v Shut off @ > 275 °F {> 135 °C} 240v Shut off @ > 203 °F {> 95 °C}	Shut off @ > 185 °F {> 85 °C} Reset on @ < 167 °F {< 75 °C}	dB-A @ 2M 68.9 Minimum 74.3 Maximum

P2



HANDS ON® CAST COVER SERIES PUSH BUTTON ACTIVATED HAND AND HAIR DRYERS

Part ID	Description	Finish	Time Cycle
HAND DRYERS			
76-W	Hands On, Surface-Mounted, Cast Cover	White Epoxy Paint	30 Seconds
76-C	Hands On, Surface-Mounted, Cast Cover	Chrome Plated	30 Seconds
R76-W	Hands On, Semi-Recessed, Cast Cover	White Epoxy Paint	30 Seconds
R76-C	Hands On, Semi-Recessed, Cast Cover	Chrome Plated	30 Seconds
HAIR DRYERS			
H76-W	Hands On, Surface-Mounted, Cast Cover	White Epoxy Paint	3 Minutes
H76-C	Hands On, Surface-Mounted, Cast Cover	Chrome Plated	3 Minutes
RH76-W	Hands On, Semi-Recessed, Cast Cover	White Epoxy Paint	3 Minutes
RH76-C	Hands On, Semi-Recessed, Cast Cover	Chrome Plated	3 Minutes



PART #76-C

SURFACE MOUNTED SPECIFICATIONS

Width: 10 3/4" (273 mm) **Height:** 8" (203 mm)
Depth: 7" (178 mm) **Weight:** 17 lbs. (7.7 kgs.)

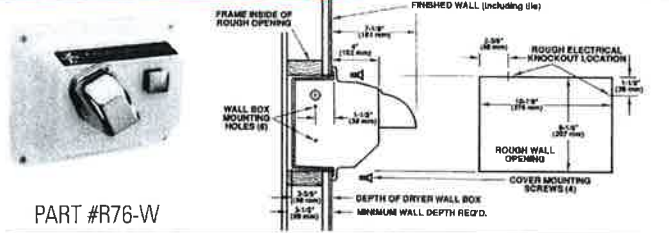
SUGGESTED MOUNTING HEIGHTS

From floor to bottom of dryer:

	HAND DRYER	HAIR DRYER
Men	40" (102 cm)	64" (163 cm)
Women	38" (97 cm)	58" (147 cm)
Teenagers	36" (91 cm)	56" (142 cm)
Small Children	30" (76 cm)	43" (109 cm)
Handicapped	32" (81 cm)	45" (114 cm)

CONSTRUCTION

- Dryer cover shall be one-piece, heavy-duty, rib-reinforced die-cast zinc alloy. It shall be lightweight, unbreakable, rust-proof, fitted with a chrome plated die-cast zinc alloy push button, a fixed or 360° revolving die-cast, chrome plated, zinc alloy nozzle.
- All exposed surfaces shall be bright chrome plated or finished with chip-proof, electrostatically applied epoxy paint.
- Surface-mounted covers shall be fastened by two flat head, recessed tamper-proof bolts to a cast zinc alloy wall pallet and shall be equipped with three (3) 7/8" (22mm) diameter holes, one of which shall be suitable for use with surface conduit. Recessed covers shall be fastened by four flat-head recessed, tamper-proof bolts to wall box and shall be equipped with two (2) 7/8" (22mm) diameter holes for ease of wiring. Wall plate shall be fastened to wall box by four concealed 1/4" (6mm) mounting bolts.
- Cover shall be equipped with an air inlet opening on the bottom of the casting and covered with a vandal resistant metal protective grill to prevent the entry of foreign objects. A chrome plated air outlet nozzle on the front of the cover shall permit a full flow of warm air when in operation, and shall be protected by a cast alloy grating fixed into the blower housing.
- All internal parts shall be coated according to Underwriters' Laboratories, Inc. requirements.
- Entire mechanism shall be internally grounded.



PART #R76-W

RECESSED MOUNTED SPECIFICATIONS

Width: 12 1/2" (318 mm) **Height:** 9 3/4" (248 mm)
Depth: 4" (102 mm) **Weight:** 18 lbs. (8.1 kgs.)

ELECTRICAL

Units are available as specified in:

110-120V	15A or 20A	60 Hz
208-230V	10A	60 Hz
277V	8A	60 Hz
220-240V	10A	50 Hz



MECHANISM

- Motor shall be capacitor-initiated, brushless type (for longer life and quiet operation) 1/10 hp, 3450 rpm with self-lubricated bearings. It shall be insulated by a resilient mounting and shall be protected by a self-resetting thermal protector. For 50 hz applications, motor shall be a universal 1/10 hp, 4200 rpm at rated load, with sealed lubricated ball bearings. Motor shall be insulated by resilient mounting and is thermally protected.
- Fan shall be a large, single inlet centrifugal type for maximum capacity, and shall deliver 150 cfm. Fan shall be mounted directly on the motor shaft, and fan and motor unit shall be insulated from dryer with a resilient rubber mounting to obtain maximum dampening effect.
- The heating element is constructed of Nichrome wire and side mounted on the blower housing, thereby being vandal proof. It shall be protected by an automatic resetting thermostat which shall open whenever air flow is cut off and shall close when flow of air is resumed. The element shall produce an air temperature of 145°F/63°C at a 72°F/22°C ambient room temperature at the outlet.
- The timer is a state of the art electronic device with an adjustable time cycle. For hand dryers, timers are set at 30 seconds and at 3 minutes for hair drying.

UNLIMITED WARRANTY

All parts on Hand and Hair Dryers shall be warranted against defective material and/or workmanship for a period of ten years. Warranty shall include labor performed at factory as well as the repair or exchange of defective parts at manufacturer's option, and shall include damage due to accidents, misuse or vandalism.



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JUNE 2016

Products



Stainless Steel Feminine Hygiene Waste Receptacle

Product Description

- Stainless Steel waste receptacle
- Dimensions: 11.625" x 8.25" x 4.5"

PRODUCT #

ND-1E

[TO SEE PRICE \(/LOGIN.ASPX?RETURNURL=%2FPRODUCT%2FND-1E&SM=FALSE\)](/LOGIN.ASPX?RETURNURL=%2FPRODUCT%2FND-1E&SM=FALSE)

↓ [SPECS](#)

SKU	ND-1E
Case Depth	8.20
Case Gross Weight	3.35
Case Height	11.60
Case Width	4.50
Cases Per Pallet	180
Color	Stainless Steel
Cube	.25
Hi Layers Per Pallet	9.00
Inner Packing	1 Each
Quantity	1



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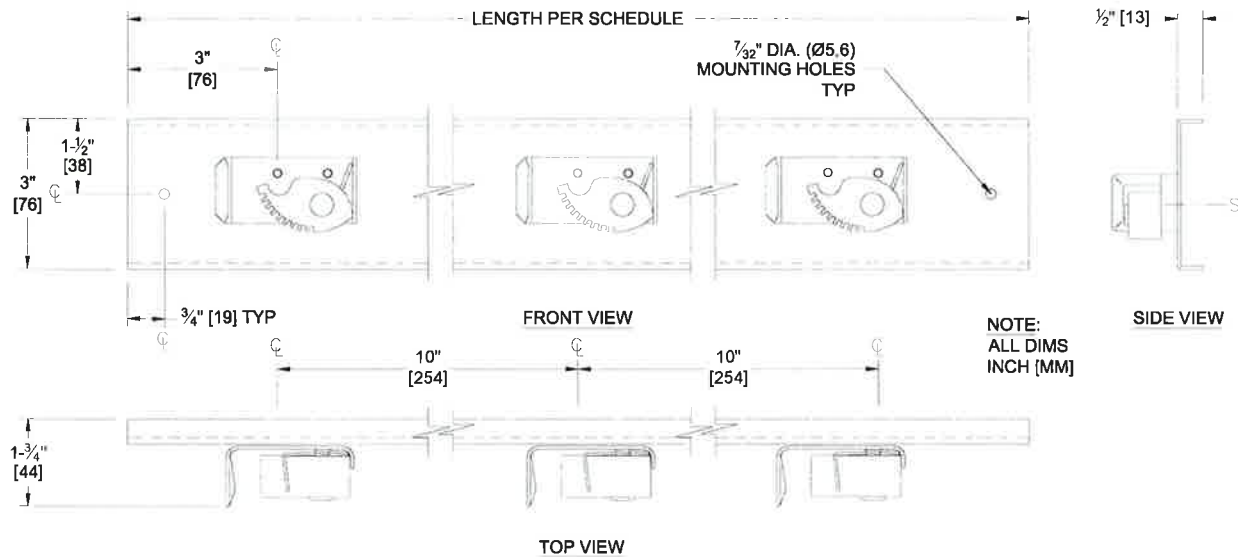
MODEL №: 0796

ISSUED: 01/87

REVISED: 07/09

X2

MOP HOLDER RACK



SCHEDULE OF AVAILABILITY

Model №:	Length	Mop Holder Qty	Qty
0796-3	26" [660]	3	
* → 0796-4	36" [914]	4	

SPECIFICATION

Mop Holder Rack shall be fabricated of one-piece channel alloy 18-8 stainless steel, type 304, 20 gauge with satin finish. Horizontal edges of channel shall return 1/2" (13) to wall. Mop holder brackets shall be fabricated of cadmium plated steel and shall be ribbed for rigidity. Each mop holder shall have a pivoting spring loaded serrated rubber cam that shall hold round handles of 7/8" to 1-1/4" diameter (Ø22 to Ø32) wedged against ribbed clamp plate. Number of mop holders and length of unit shall be as specified in standard schedule.

Mop Holder Rack shall be Model № 0796-3 (or 0796-4) as manufactured by American Specialties, Inc., 441 Saw Mill River Road, Yonkers, New York 10701-4913

INSTALLATION

For general utility mount rack 70" (1778) above finished floor (AFF) from bottom of rack with № 10 self-tapping screws (by others) through holes provided in channel. For compliance with ADA Accessibility Guidelines, install unit so that top of rack is 48" (1219) maximum AFF if clear floor access is provided.

OPERATION

Mop or broom handle is pushed into grip-jaw of pivoting serrated rubber cam with upward motion until it seats behind rib on clamp plate. Spring holds cam against handle. Gravity holds mop clamped in position.

Accessory Specialties

AMERICAN DISPENSER

Desert Ray Products

MITROLIS inc.



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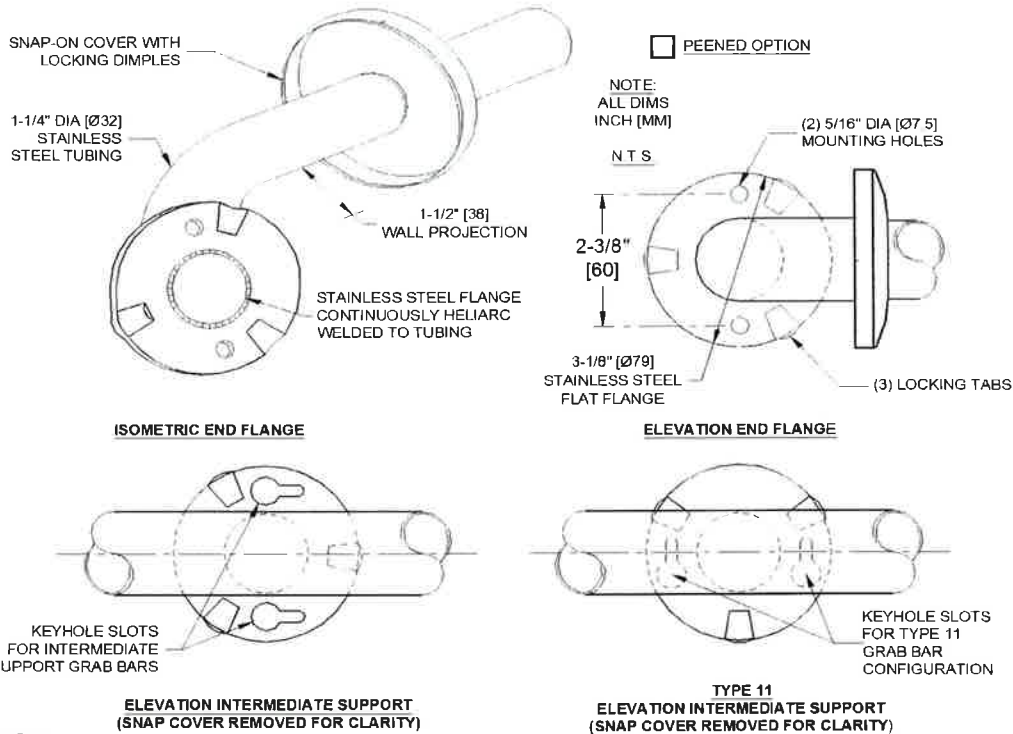
MODEL №: 3700

ISSUED: 01/87

REVISED: 3 MAR 2017

D01 D02

1-1/4" DIA. [Ø32] GRAB BAR SERIES WITH SNAP-ON FLANGE COVERS



SPECIFICATION

1-1/4" Diameter [Ø32] Grab Bar with Snap-On Flange Covers for concealed mounting shall be type 304 stainless steel alloy 18-8. Tubing shall be 1-1/4" diameter [Ø32] x 18 gauge (0.048") [1.2]. Snap-on cover shall be 22 gauge (0.03") [0.8]. Flange shall be 1/8" [3] thick and shall be heliarc welded to tubing with a continuous concealed bead. End flanges shall have two (2) 5/16" diameter [Ø7.5] mounting holes. Center posts (if any) shall have (2) keyhole slots to ease installation access. All exposed surfaces shall have a satin finish and shall be protected during shipment with a plastic bag. For optional non-slip surface, add suffix -P (peened).

1-1/4" Diameter [Ø32] Grab Bar with Snap-On Flange Covers shall be Series № 3700 of American Specialties, Inc., 441 Saw Mill River Road, Yonkers, New York 10701- 4913

STRENGTH

ASI Grab Bars are designed to meet and exceed ADA requirements as published in CABO/ANSI A117.1 and 2010 ADA Accessibility Standards. Mounting to the wall is a critical part of the system to meet this requirement. To withstand the shear, tension or pullout, and torsion loads generated by the maximum loading, the fastener system must be adequately sized.

INSTALLATION

Use grab bar as template to mark mounting holes locations and pre-drill holes. Install bar using two (2) № 10 self-tapping pan head screws and flat washers (by others) or other fastener system (by others) to suit conditions for each flange. Appropriate anchoring and backing must be provided in accordance with local building codes or as specified on Architects Plans prior to wall finishing. For compliance with 2010 ADA Accessibility Standards, install unit so that the top of the grab bar is 33" [840] minimum above finished floor (AFF) to 36" [915] maximum AFF. Anchors are available from ASI and must be specified separately for each grab bar style scheduled (see 3900 series).

Accessory Specialties

AMERICAN DISPENSER

Desert Ray Products

MITROUS

DD1 DD2



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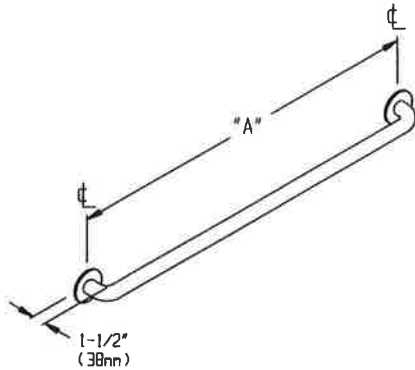
PAGE 1 of 3

ISSUED: 09-96

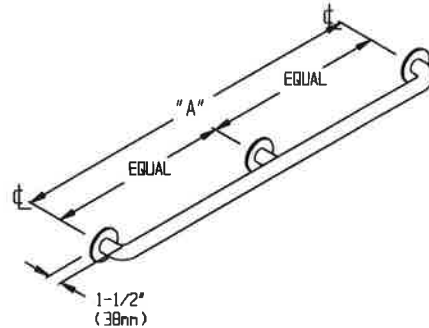
REVISED: 09-08

GRAB BAR CONFIGURATIONS

Type 01



Type 02



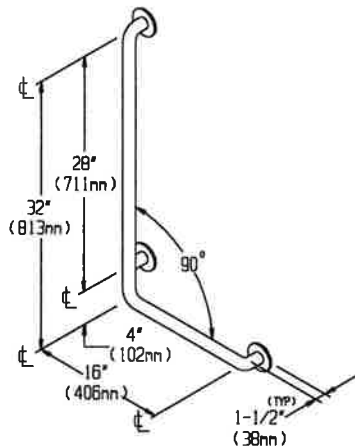
SCHEDULE

QTY.	DIM. A	QTY.	DIM. A
			30" (762mm)
	12" (305mm)		36" (914mm)
	18" (457mm)		42" (1067mm)
	24" (610mm)		48" (1219mm)

SCHEDULE

QTY.	DIM. A
	52" (1321mm)
	54" (1372mm)
	60" (1524mm)
	72" (1829mm)

Type 04

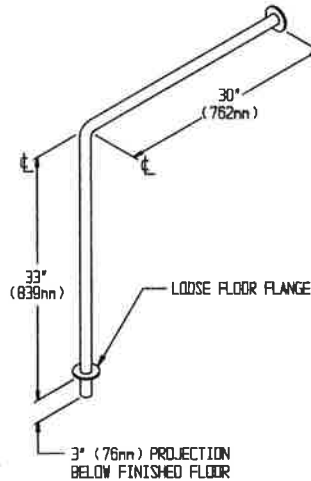


LEFT HAND SHOWN,
RIGHT HAND OPPOSITE

HAND	QTY. REQ'D.
L.H.	
R.H.	

MODEL N° MUST SPECIFY -LH OR -RH

Type 15



Contractor to provide proper sleeve in floor x 3" long to accept bar O.D. specified.

Accessory Specialties

AMERICAN DISPENSER

Desert Ray Products

WATROUS, INC.

EE



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GP Pro

1-866-HELLO GP (435-5647)

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Dispns Tissue 9" Jumbo, 2-RL, Smoke

Two roll or twin jumbo jr. dispensing system for dependable, high capacity performance.



Description:

This durable, high-capacity 9" jumbo bath tissue dispenser holds two rolls up to 9" in diameter each- the equivalent of 11.5 rolls of standard 2-ply tissue. The design reduces waste by restricting access to the second roll before the main roll is completely used up. Attractive see-through grey color complements any decor. This covered, key-lock design protects against waste as well as pilferage while making refilling rolls quick and easy.

Features & Benefits:

- » High-Impact plastic construction is durable, washable, and stands up to most cleaning agents, ensuring years of cost-saving performance
- » High-Capacity - holds two roll up to 9" in diameter (the equivalent of 11.5 rolls of standard 2-ply tissue) for continuous service
- » Stub-roll feature reduces waste by restricting access to the second roll before the main roll is used up

Product Details

Brand Owner	GP
Brand	Georgia-Pacific®
MFG Part#	59209
Color	Translucent Smoke
UP - UPC	073310592091
Each Per Ship Unit	1 Each
Items Per Each	0 Each
Case Total	1 Each
Dispenser (WxDxH)	20.020" x 5.670" x 12.260"
UNSPSC	47131710
Replaces Item	58150, 58250
Buy Multiple	1 EA

Case Shipping Info

Case GTIN	10073310592098
Case Gross Wgt	4.240 LBS
Case Net Wgt	4.150 LBS
Case Dimensions (LxWxH)	20.270" x 5.950" x 12.760"
Case Volume	0.891 CFT

Each Shipping Info

Each Gross Weight	4.24 lbs
Each Net Wgt	4.15 lbs
Each Dimensions	20.270" x 5.950" x 12.760"
Each Volume	0.891 CFT

Unit Shipping Info

TI-Qty/Layer	7
HI-Layers/Unit	8
Unit Qty	56
Unit Dimensions (LxWxH)	45.840" x 40.640" x 48.000"



0 73310 59209 1

printed 8/23/2018



Products



Health Gards® Half-Fold Toilet Seat Cover Dispenser

Product Description

- Holds two sleeves of 250 half-fold seat covers
- White, plastic
- Wall mounted
- Styrene Plastic
- Self Adhesive Tape

PRODUCT #

HG-1-2

[TO SEE PRICE \(/LOGIN.ASPX?RETURNURL=%2FPRODUCT%2FHG-1-2&SM=FALSE\)](/LOGIN.ASPX?RETURNURL=%2FPRODUCT%2FHG-1-2&SM=FALSE)

↓ [SPECS](#)

SKU	HG-1-2
Case Depth	17.40
Case Gross Weight	2.25
Case Height	5.20
Case Net Weight	0.00
Case Width	12.10
Cases Per Pallet	150
Color	White
Hi Layers Per Pallet	5.00

99



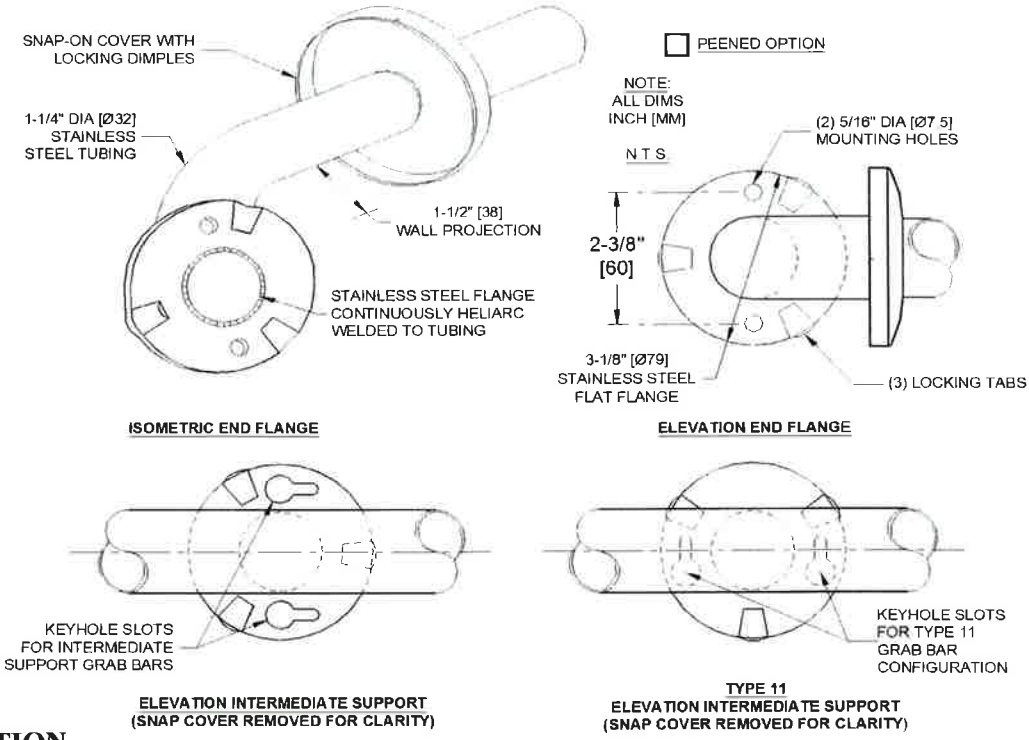
AMERICAN SPECIALTIES, INC.
 441 Saw Mill River Road, Yonkers, NY 10701
 (914) 476.9000 • (914) 476.0688
 www.americanspecialties.com

MODEL №: 3700

ISSUED: 01/87

REVISED: 3 MAR 2017

1-1/4" DIA. [Ø32] GRAB BAR SERIES WITH SNAP-ON FLANGE COVERS



SPECIFICATION

1-1/4" Diameter [Ø32] Grab Bar with Snap-On Flange Covers for concealed mounting shall be type 304 stainless steel alloy 18-8. Tubing shall be 1-1/4" diameter [Ø32] x 18 gauge (0.048") [1.2]. Snap-on cover shall be 22 gauge (0.03") [0.8]. Flange shall be 1/8" [3] thick and shall be heliarc welded to tubing with a continuous concealed bead. End flanges shall have two (2) 5/16" diameter [Ø7.5] mounting holes. Center posts (if any) shall have (2) keyhole slots to ease installation access. All exposed surfaces shall have a satin finish and shall be protected during shipment with a plastic bag. For optional non-slip surface, add suffix -P (peened).

1-1/4" Diameter [Ø32] Grab Bar with Snap-On Flange Covers shall be Series № 3700 of American Specialties, Inc., 441 Saw Mill River Road, Yonkers, New York 10701- 4913

STRENGTH

ASI Grab Bars are designed to meet and exceed ADA requirements as published in CABO/ANSI A117.1 and 2010 ADA Accessibility Standards. Mounting to the wall is a critical part of the system to meet this requirement. To withstand the shear, tension or pullout, and torsion loads generated by the maximum loading, the fastener system must be adequately sized.

INSTALLATION

Use grab bar as template to mark mounting holes locations and pre-drill holes. Install bar using two (2) № 10 self-tapping pan head screws and flat washers (by others) or other fastener system (by others) to suit conditions for each flange. Appropriate anchoring and backing must be provided in accordance with local building codes or as specified on Architects Plans prior to wall finishing. For compliance with 2010 ADA Accessibility Standards, install unit so that the top of the grab bar is 33" [840] minimum above finished floor (AFF) to 36" [915] maximum AFF. Anchors are available from ASI and must be specified separately for each grab bar style scheduled (see 3900 series).

Accessory Specialties

AMERICAN DISPENSER

Desert Ray Products

MITROUS...

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AMERICAN SPECIALTIES, INC.

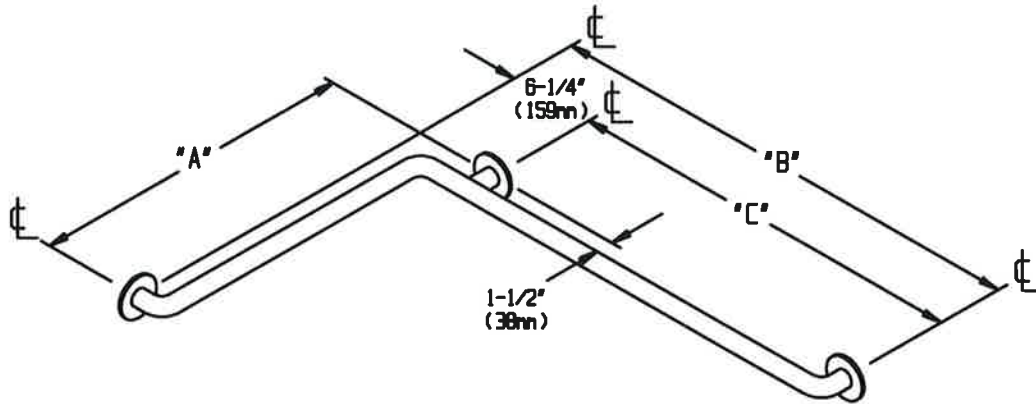
441 Saw Mill River Road, Yonkers, NY 10701 (914) 476-9000

PAGE 3 of 3

ISSUED: 9-96

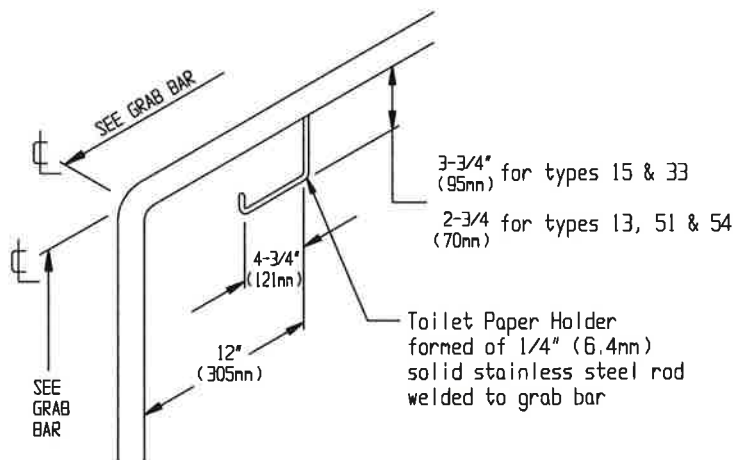
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GRAB BAR CONFIGURATIONS



TYPE	A	B	C
50	24" (610mm)	36" (914mm)	29-3/4" (756mm)
56	36" (914mm)	54" (1372mm)	47-3/4" (1213mm)
57	42" (1069mm)	54" (1372mm)	47-3/4" (1213mm)
60	18" (457mm)	30" (762mm)	23-3/4" (603mm)
74	18-1/8" (460mm)	33-1/8" (841mm)	26-7/8" (683mm)

Option 25



Option 25 Toilet Paper Holder is welded on to Grab Bars of the Swing Up or Swing Away configurations 3413, 3451, 3454 and Fixed Types 15, 33



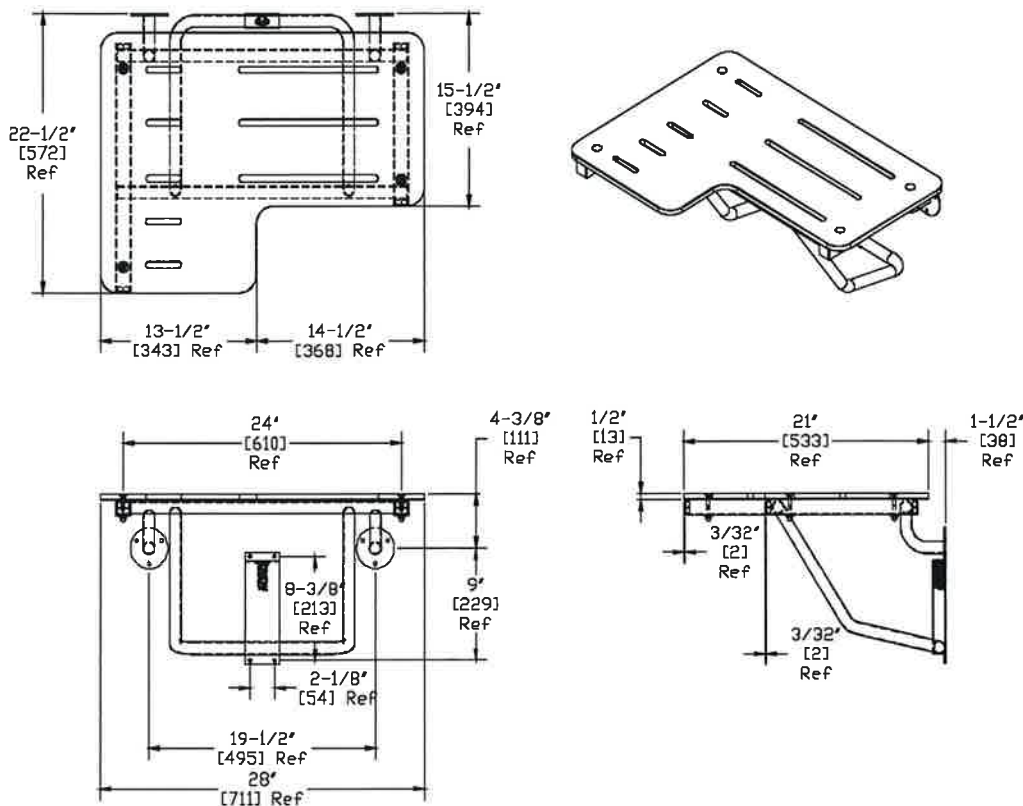
AMERICAN SPECIALTIES, INC.
 441 Saw Mill River Road, Yonkers, NY 10701
 (914) 476.9000 • (914) 476.0688
 www.americanspecialties.com

MODEL No: 8206-28

ISSUED: 07/2014

REVISED: 11 July 2014

L-SHAPED PHENOLIC FOLD-UP SHOWER SEAT (pg 1 of 2)



SPECIFICATION

Phenolic Fold-Up Shower Seat shall have all metal parts fabricated from alloy 18-8 stainless steel, type 304; seat frame and support legs shall be 1" diameter (Ø25) and 1-1/4" (32) square x 18 gauge (1.2) with 3/16" (4.8) mounting flanges and 16 gauge (1.5) guide bracket/arm support. All exposed surfaces shall have satin finish. Seat shall be 5/16" (8) thick phenolic with white color top and bottom surfaces and shall have black edges. Structural assembly shall be of welded construction and all exposed edges and corners shall be radiused and/or deburred. Support arm shall fold up when in retracted position to provide low profile against wall. No extra fittings shall be required to retain seat in storage position. Guide bracket shall control seat lowering into operating position. Unit shall satisfy 2010 Accessibility Standards when mounted properly.

Phenolic Fold-up Shower Seat shall be Model N^o 8206-28 as manufactured by American Specialties, Inc., 441 Saw Mill River Road, Yonkers, NY 10701-4913

INSTALLATION

This unit is surface mounted. Installer/construction contractor must provide concealed anchor plate or blocking as specified in construction documents or as required by local building codes prior to wall finishing. Fasten unit flanges and guide bracket to concealed anchor or blocking plate with appropriate hardware. See "STRENGTH" section below. Note that concealed mounting plates or anchors and hardware are not supplied with this product and must be specified separately. Ensure that mounting configuration complies with local building codes.



AMERICAN SPECIALTIES, INC.
 441 Saw Mill River Road, Yonkers, NY 10701
 (914) 476.9000 • (914) 476.0688
 www.americanspecialties.com

MODEL No: 8206-28

ISSUED: 07/2014

REVISED: 11 July 2014

L-SHAPED PHENOLIC FOLD-UP SHOWER SEAT (pg 2 of 2)

STRENGTH

ASI Shower Seats are designed to meet and exceed **2010 ADA Accessibility Standards** and ANSI A117.1 that fabricated product shall be of adequate strength to support a load of 250 pounds (113.4 kg) and unit shall conform to size and edge clearances as diagrammed. Mounting to the wall is a critical part of the system to meet this requirement. To withstand the shear, tension or pullout, and torsion loads generated by the maximum loading, the fastener system must be adequately sized. Unit will carry a load of 500 lbs if properly installed. The supporting wall must be adequately reinforced to carry the rated load for the products lifetime.

MATERIALS

Tube: 18 gauge (.048" <1.22> thick) type 304 stainless steel, 1" (Ø25) dia. and 1-1/4" (32) square. Unitized all welded construction. Exposed surfaces are satin finish. Edges and corners are radiused and burr free.

Flange: 3/16" (4.8) type 304 stainless steel. Exposed surfaces have satin finish. Edges and corners are radiused and burr free.

Bracket: 16 gauge (.06" <1.52> thick) type 304 stainless steel. Exposed surfaces are satin finish. Edges and corners are radiused and burr free.

Seat: Solid Phenolic ("L" shape) 1/2" x 28" x 21" (13 x 711 x 533). Exposed surfaces have semi-gloss laminate white colored top and bottom surfaces and shall have black edges. Corners are radiused and burr free. Seat top shall have eight (8) total slots 1/2" (13) wide with three (3) slots 12" (305) long and five (5) slots 3" (76) long for water drainage and user slip resistance. Mounting hardware is stainless steel flat head AN-SI B-18.5-1971 carriage bolts with acorn nuts on bottom.

Spring: Stainless steel wire type 304 OD 27/32" (Ø21,6) coils x 2-1/4" body length (57,2) x .085" (Ø2,2) wire diameter.

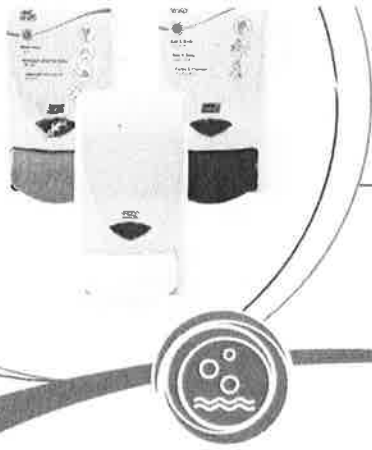
OPERATION

Fold-up Shower Seat requires only one hand operation to manually lower to horizontal position for use or raise for departure and arrival. Guide bracket with spring detent prevents seat from dropping and provides positive support in usage position as well as spring locked storage position.



Product Information Sheet

Deb Washroom & Shower Manual Dispensers



Unique range of 1 liter, 2 liter and 4 liter closed, sealed cartridge dispensers that meet the distinct needs of any office or public facility environment.




USAGE

For exclusive use with Deb Cleanse Washroom foam soaps and shower products.

METHOD OF USE

Large, 'easy-push' buttons dispense a controlled dose of product appropriate for the application required and empty cartridges are easily replaced in seconds.

Feature	Benefit
Guaranteed for life	<ul style="list-style-type: none"> All Deb dispensers are manufactured from durable plastic components and rigorously tested for high usage environments, providing assurance of quality and long-term cost efficiency
BioCote® protected	 <ul style="list-style-type: none"> Deb dispensers are exclusively protected by BioCote®, a silver-based antimicrobial agent that is incorporated into the plastic components at the time of manufacture and inhibits the growth of a broad spectrum of bacteria and molds BioCote® will not wear-out or rub-off and is effective for the lifetime of the dispenser
Large push buttons	<ul style="list-style-type: none"> Minimize the operation force required to allow easy use by hand or elbow; suitable in hygiene sensitive areas
Fixed product dose	<ul style="list-style-type: none"> Delivers the exact amount required, controlling usage and reducing waste
Unique locking mechanism	<ul style="list-style-type: none"> Helps prevent unauthorized access, pilferage and product contamination
Sight Glass	<ul style="list-style-type: none"> Indicates the level of product in the cartridge which helps identify when product needs replacing
Simple cartridge replacement	<ul style="list-style-type: none"> Designed for exclusive use with Deb skin care system products to enable cartridges to be replaced in seconds, reducing maintenance time and costs
Hygienic, airless cartridges	<ul style="list-style-type: none"> The ultrasonically sealed cartridge and pump mechanisms prevent the ingress of air into the cartridge during use to help prevent product contamination and ensure 'fresh' product is dispensed every time
No wastage	<ul style="list-style-type: none"> The air-tight cartridges are designed to collapse during use ensuring full evacuation of product with no wastage

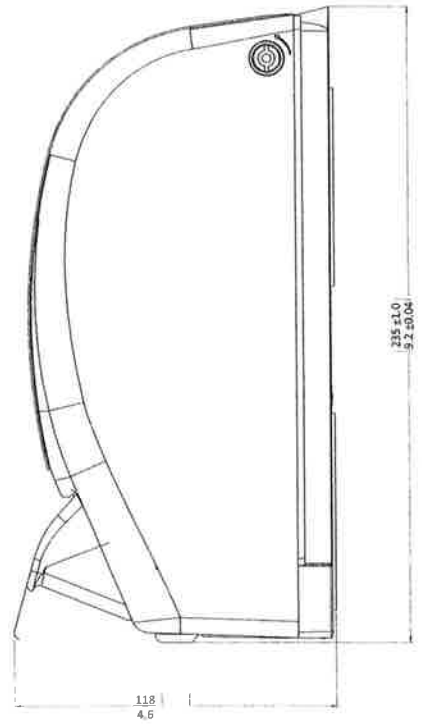
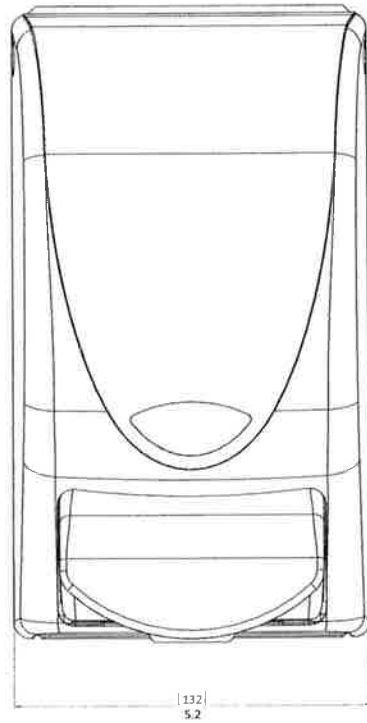


Code	Dispenser	Color	Size	Dimensions H x W x D	For use with Deb Stoko cartridges
WHB1LDS	Proline Curve 1000	white	1 Liter	9.252 x 4.921 x 4.606	universal for all 1 liter Deb Stoko cartridges
TWH1LDS	Proline Curve 1000	translucent white & chrome	1 Liter	9.252 x 4.921 x 4.606	universal for all 1 liter Deb Stoko cartridges
91128	Proline Curve 1000	black	1 Liter	9.252 x 4.921 x 4.606	universal for all 1 liter Deb Stoko cartridges
TBK1LDS	Proline Curve	translucent black & chrome	1 Liter	9.252 x 4.921 x 4.606	universal for all 1 liter Deb Stoko cartridges
TPW1LDS	Transparent White	transparent white & chrome	1 Liter	9.252 x 4.921 x 4.606	universal for all 1 liter Deb Stoko cartridges
TPB1LDS	Transparent Black	transparent black & chrome	1 Liter	9.252 x 4.921 x 4.606	universal for all 1 liter Deb Stoko cartridges
MSS1LDS	Mr Soapy Soap Dispenser	red	1 Liter	9.252 x 4.921 x 4.606	universal for all 1 liter Deb Stoko cartridges
WYH1LDS	Kid's Wash Dispenser	green	1 Liter	9.252 x 4.921 x 4.606	universal for all 1 liter Deb Stoko cartridges
BLK2LDP	Proline Curve 2000 Foam	black	2 Liter	11.378 x 6.378 x 5.472	for all 2 liter foam Deb Stoko cartridges
WHB2LDP	Proline Curve 2000 Foam	white	2 Liter	11.378 x 6.378 x 5.472	for all 2 liter foam Deb Stoko cartridges
WTS2LDP	Proline Curve 2000 Lotion	white	2 Liter	11.378 x 6.378 x 5.472	for all 2 liter non-foam Deb Stoko cartridges
BKS2LDP	Proline Curve 2000 Lotion	black	2 Liter	11.378 x 6.378 x 5.472	for all 2 liter non-foam Deb Stoko cartridges
WHB4LDR	Proline Curve 4000	white	4 Liter	13.74 x 7.008 x 6.22	universal for all 4 liter Deb Stoko cartridges
BLK4LDR	Proline Curve 4000	black	4 Liter	13.74 x 7.008 x 6.22	universal for all 4 liter Deb Stoko cartridges
WRM1LDS	Deb Stoko Cleanse Washroom	white	1 Liter	9.252 x 4.921 x 4.606	CLR1L, AZU1L, RFW1L, ENG1L, GPGR1L, GPUP1L
WRM2LDP	Deb Stoko Cleanse Washroom	white	2 Liter	11.378 x 6.378 x 5.472	CLR2LT, AZU2LT, RFW2LT, ENG2LT
RSH1LDS	Deb Stoko Refresh Luxury Shower	white	1 Liter	9.252 x 4.921 x 4.606	CMW1L
RSH2LDP	Deb Stoko Refresh Luxury Shower	white	2 Liter	11.378 x 6.378 x 5.472	CMW2LT
SHW1LDS	Deb Stoko Cleanse Shower	white	1 Liter	11.378 x 6.378 x 5.472	HBG1L
SHW2LDP	Deb Stoko Cleanse Shower	white	2 Liter	11.378 x 6.378 x 5.472	HBG2LT



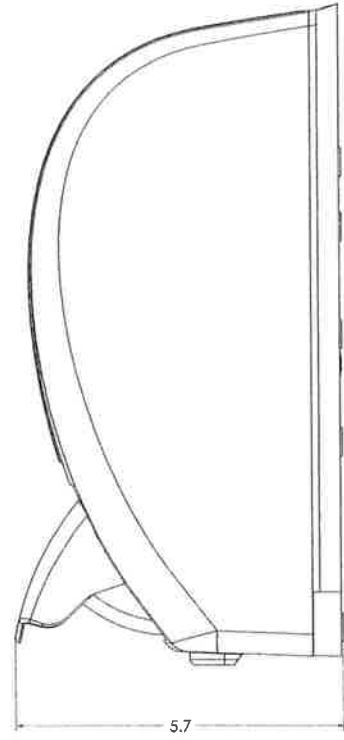
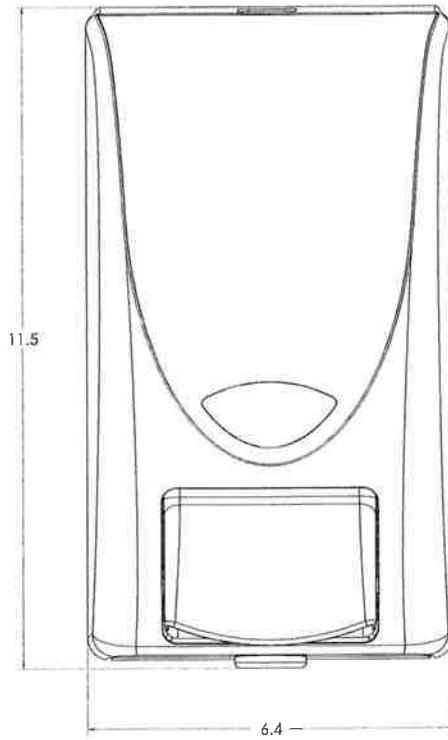
1 LITER DISPENSER

- WHB1LDS
- TWH1LDS
- 91128
- TBK1LDS
- TPW1LDS
- TPB1LDS
- MSS1LDS
- WHY1LDS
- WRM1LDS
- RSH1LDS
- SHW1LDS



2 LITER DISPENSER

- BLK2LDP
- WHB2LDP
- WTS2LDP
- BKS2LDP
- WRM2LDP
- RSH2LDP
- SHW2LDP



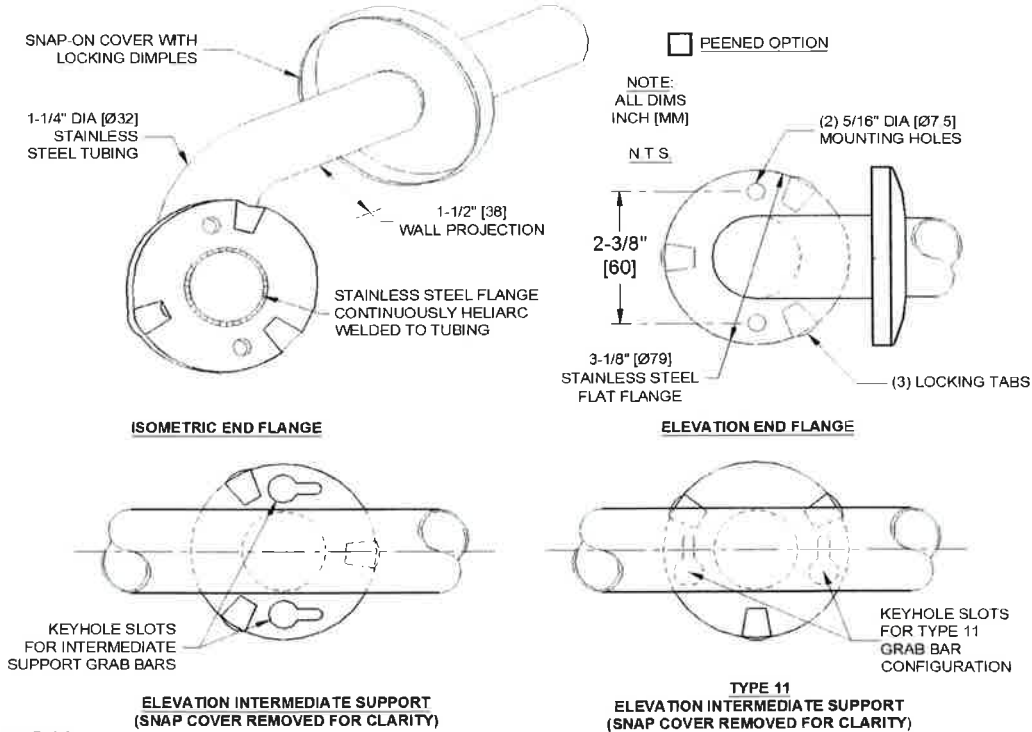


AMERICAN SPECIALTIES, INC.
 441 Saw Mill River Road, Yonkers, NY 10701
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 www.americanspecialties.com

MODEL No:	3700
ISSUED:	01/87
REVISED:	3 MAR 2017



1-1/4" DIA. [Ø32] GRAB BAR SERIES WITH SNAP-ON FLANGE COVERS



SPECIFICATION

1-1/4" Diameter [Ø32] Grab Bar with Snap-On Flange Covers for concealed mounting shall be type 304 stainless steel alloy 18-8. Tubing shall be 1-1/4" diameter [Ø32] x 18 gauge (0.048") [1.2]. Snap-on cover shall be 22 gauge (0.03") [0.8]. Flange shall be 1/8" [3] thick and shall be heliarc welded to tubing with a continuous concealed bead. End flanges shall have two (2) 5/16" diameter [Ø7.5] mounting holes. Center posts (if any) shall have (2) keyhole slots to ease installation access. All exposed surfaces shall have a satin finish and shall be protected during shipment with a plastic bag. For optional non-slip surface, add suffix -P (peened).

1-1/4" Diameter [Ø32] Grab Bar with Snap-On Flange Covers shall be Series № 3700 of American Specialties, Inc., 441 Saw Mill River Road, Yonkers, New York 10701- 4913

STRENGTH

ASI Grab Bars are designed to meet and exceed ADA requirements as published in CABO/ANSI A117.1 and 2010 ADA Accessibility Standards. Mounting to the wall is a critical part of the system to meet this requirement. To withstand the shear, tension or pullout, and torsion loads generated by the maximum loading, the fastener system must be adequately sized.

INSTALLATION

Use grab bar as template to mark mounting holes locations and pre-drill holes. Install bar using two (2) № 10 self-tapping pan head screws and flat washers (by others) or other fastener system (by others) to suit conditions for each flange. Appropriate anchoring and backing must be provided in accordance with local building codes or as specified on Architects Plans prior to wall finishing. For compliance with 2010 ADA Accessibility Standards, install unit so that the top of the grab bar is 33" [840] minimum above finished floor (AFF) to 36" [915] maximum AFF. Anchors are available from ASI and must be specified separately for each grab bar style scheduled (see 3900 series).

Accessory Specialties

AMERICAN DISPENSER

Desert Ray Products

MITTROSS inc.

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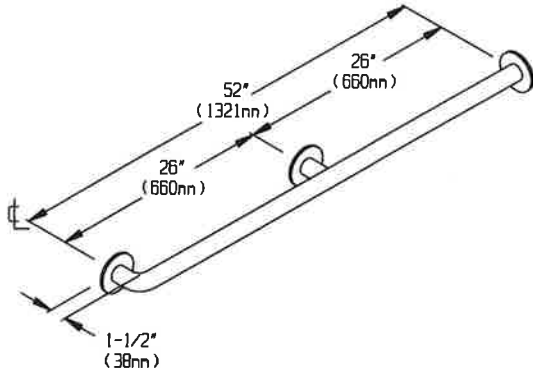


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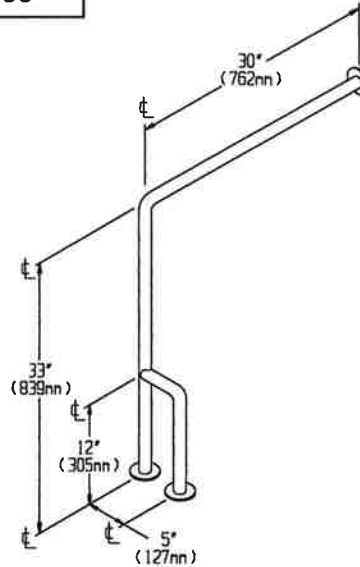
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REVISED: 5-05

GRAB BAR CONFIGURATIONS

Type 24



Type 33

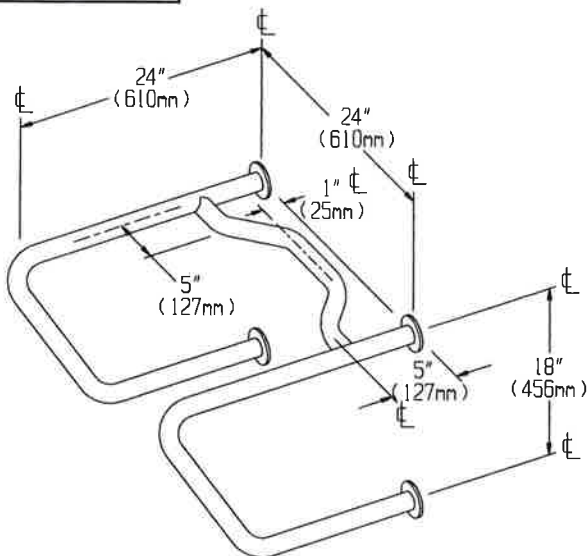


RIGHT HAND SHOWN,
LEFT HAND OPPOSITE

HAND	QTY. REQ'D.
L.H.	
R.H.	

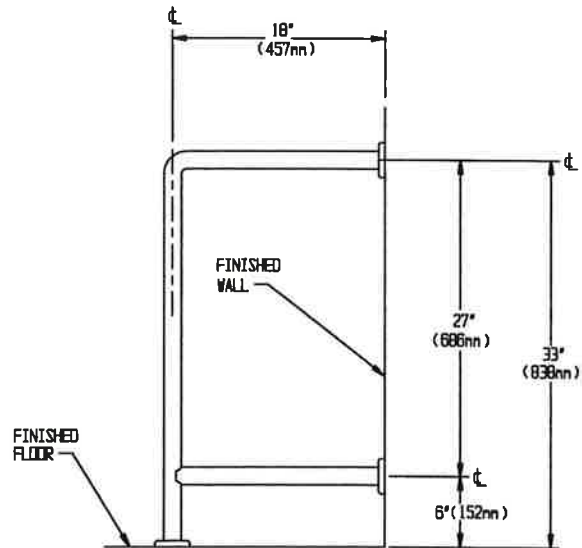
MODEL N^o MUST SPECIFY -LH OR -RH

Type 34



FOR BEDPAN FLUSH VALVE USE

Type 75



Accessory Specialties

AMERICAN DISPENSER

Desert Ray Products

WATROUS, INC.

SECTION 104400 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 FIRE-PROTECTION CABINETS

- A. Fire-Protection Cabinets: Enameled-steel, semirecessed cabinet for fire extinguisher.
 - 1. Manufacturer: Kidde model 468047 or equal.
- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Steel sheet.
 - 1. Trim Style: Rolled trim.
 - 2. Trim Material: Steel.
- D. Door Material: Steel.
 - 1. Door Style: Fully glazed with frame.
 - 2. Door Glazing: Tempered safety glass.
- E. Accessories: Mounting brackets.
- F. Finishes:
 - 1. Manufacturer's standard baked-enamel paint for the following:
 - a. Exterior of cabinet door, and trim except for those surfaces indicated to receive another finish.
 - b. Interior of cabinet and door.

2.2 FIRE EXTINGUISHERS AND BRACKETS

- A. Portable Fire Extinguishers: NFPA 10, listed and labeled for the type, rating, and classification of extinguisher.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:

- a. Kidde Residential and Commercial Division model Pro Plus 10 MP or equal.
2. Multipurpose Dry-Chemical Type: UL-rated 4-A:80-B:C, 10-lb nominal capacity, in enameled-steel container.
 - B. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for fire extinguishers indicated, with plated or baked-enamel finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cabinets and mounting brackets at heights acceptable to authorities having jurisdiction.
- B. Install fire extinguishers in mounting brackets in Mechanical Room, in cabinet inside Check Room.

END OF SECTION 104400

SECTION 10 50 80 - METAL LOCKERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS, WORK INCLUDED

- A. Lockers, hinged door type.
- B. Hardware, base, top, and filler panels.
- C. Benches.
- D. Submit shop drawings, product data, color samples. Include locker types, sizes, configurations, layout of groups of lockers, accessories, manufacturer's installation instructions, and numbering plan. Verify locker lay-out with actual conditions, including base alignment, clearance dimensions, and related criteria.
- E. Protect locker finishes and adjacent surfaces from damage during installation.

PART 2 - PRODUCTS

A. MANUFACTURERS

Basis of Design: Characteristics of specific products, where named in this Section, are indicated to establish required level of quality, appearance, and performance. The Architect will consider comparable products by alternate manufacturers where listed, and requests for substitutions, under the provisions of the Project Manual.

- B. Manufacturer: Penco Invincible II Defiant SPL. Type: Steel Lockers, fully enclosed, fully assembled.
- C. Sheet Steel: ASTM A 653 commercial quality, G60 coating; mill phosphatized; suitable for exposed applications, and stretcher or roller leveled to stretcher leveled flatness, in the following minimum thicknesses:
- D. Tops, Bottoms, Shelves, Tier Dividers, end panels: 16 gauge, solid sheet steel.
- E. Backs: 18 gauge, solid. Mesh not permitted.
- F. Frames: 16 gauge channel frames, with continuous vertical door strike and cross member between each door.
- G. Doors: 14 gauge, style as specified, welded door reinforcement.
- H. Hinges: Manufacturer's standard piano hinge, welded to door panel and frame.
- I. Locking mechanism: Recessed stainless steel pan, operating latch free, with single point latch.

2.2 PERFORMANCE REQUIREMENTS

- A. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.

2.3 CHARACTERISTICS

- A. Style: Two Tier, Diamond Perforated Door, with stainless steel Defiant recessed pan and single point latch (no moving parts).
- B. Place pull/latch mechanism maximum 36 inches above finished floor at lower tier, centered in door panel at accessible lockers.
- C. Locker Size: 12 inches wide x 18 inches deep x 36 inches high (two tier).
- D. Top: Sloped Top.
- E. Base: Concrete base.

2.4 HARDWARE AND ACCESSORIES

- A. Lock: Padlocks provided by Owner.
- B. Coat hook: Provide one double prong coat hook at locker top and one single prong coat hook on each side and back of locker.
- C. Provide shelf at 15 inches above finished floor at accessible locker.
- D. Numerals: Provide polished aluminum numeral plates at each locker.

2.5 FINISH AND COLOR

- A. Finish: Manufacturer" standard baked-enamel finish (thermosetting topcoat), applied after phosphatized steel preparation. Provide minimum dry film thickness of 1.4 mils on doors, frames, and legs, and 1.1 mils elsewhere.
- B. Colors: #822 "Regal Blue".

2.6 BENCH

- A. Type: Heavy duty plank style hardwood bench seat with heavy duty steel pedestals.
- B. Manufacturer: Penco # 9602, or equal.
- C. Size: 1-1/4 x 9-1/2 inch seat by length as shown on Drawings.
- A. Pedestal, Penco # 60822H or equal.

- B. Metal Finish: Manufacturer's standard factory powder coat finish, color as selected by Architect.
- C. Wood Finish: WI System # 3, Polyurethane

2.7 ACCESSIBLE BENCH

- A. Type: Heavy duty plank style hardwood bench seat with heavy duty steel pedestals.
- B. Manufacturer: Penco # 9632, or equal.
- C. Size: 1-1/4 x 20 inch seat by length as shown on Drawings.
- D. Pedestal, Penco # 60822H or equal.
- E. Include backrest and mounting brackets and hardware.
- F. Metal Finish: Manufacturer's standard factory powder coat finish, color as selected by Architect.
- G. Wood Finish: WIC System # 3, Polyurethane.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Prior to work of this section, carefully inspect previously installed work. Verify all such work is complete to the point where this installation may properly commence.
- B. Verify that work of this section may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.
- C. Verify bases and recesses are properly sized and located, and that all required blocking is in place.

3.2 INSTALLATION

- A. Install lockers secure, plumb, square, and in line. Set on prepared base provided.
- B. Anchor lockers with appropriate anchor devices to suit materials encountered.
- C. Install end panels, filler panels, sloped tops, and bases to completely close off openings.

END OF SECTION 10 50 80

SECTION 122200 - CURTAIN

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and Samples.

PART 2 - PRODUCTS

2.1 TRACK

- A. Diamond Drapery “5000 Series” Cubicle Track, contact tel #: (714) 761-4623.
- B. Finish: Clear anodized.
- C. Support Capability: Weight of drapery indicated.
- D. Mounting: Layout as indicated on Drawings, including ceiling brackets, suspension tubing, track brackets, end wall brackets.
- E. Draw: Center opening.
- F. Carriers: Rollers with hooks.

2.2 CURTAIN

- A. Healthcare Curtains “Reef / Heron” curtains, no mesh, contact tel #: 855-563-3364
- B. Provide curtains and drapes passing flame-resistance testing according to NFPA 701.

2.3 FABRICATION

- A. If less than a full width of fabric is required to produce panel of specified fullness, use equal widths of not less than one-half width of fabric located at ends of panel.
- B. Seams: Join widths so that patterns match and vertical seams lay flat and straight without puckering. Horizontal seams are not acceptable.
- C. Side Hems: Double-turned, 1-1/2-inch- wide, blindstitched hems.
- D. Bottom Hems: Double-turned, 4-inch- wide, weighted and blindstitched hems.

PART 3 - EXECUTION

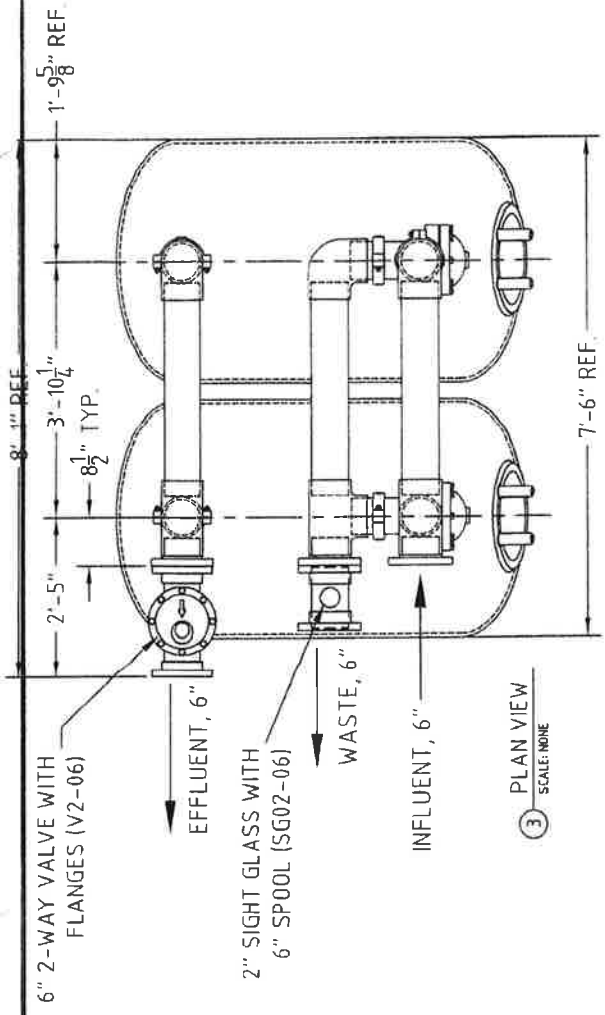
3.1 INSTALLATION

- A. Install track systems level and plumb, and at height and location in relation to adjoining openings as indicated on Drawings.
- B. Where curtains abut overhead construction, hang with 1/4-inch clearance.
- C. Where curtains extend to floor, install with not more than 1-inch and not less than 1/2-inch clearance.

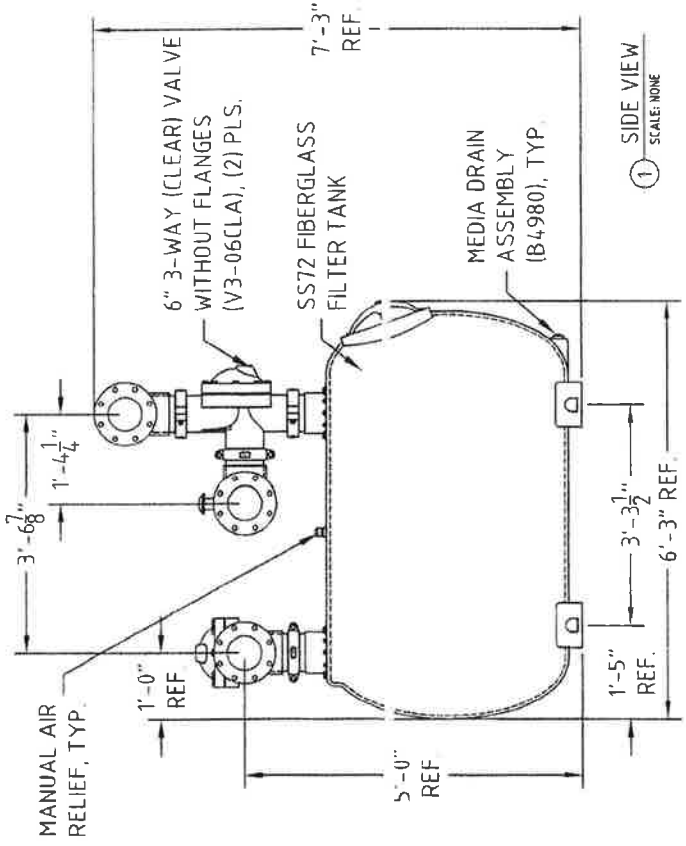
END OF SECTION 122200

NOTES:

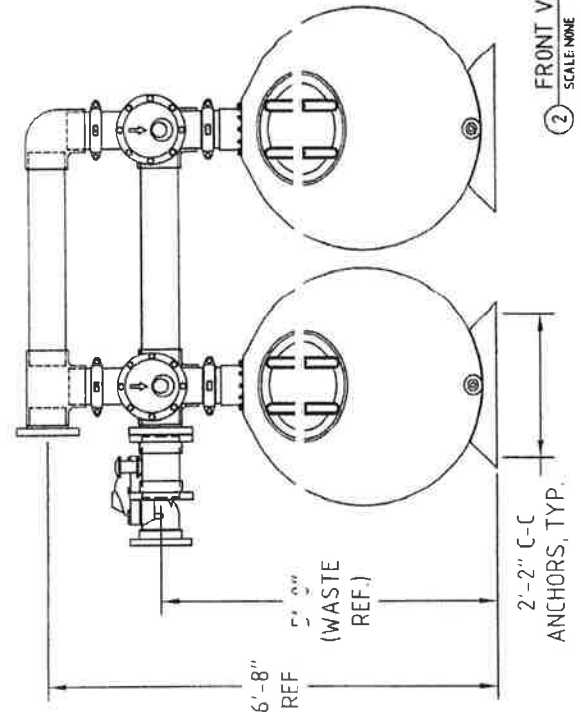
1. TOTAL FILTRATION AREA: 40 SQ. FT.
2. STANDARD SYSTEM INCLUDES SEMI-AUTOMATIC CONTROLLER (CM200, NOT SHOWN) AND FACE-PIPING KIT NUMBER FP-SS2-0606 (SHOWN, INCLUDES FLANGE GASKETS AND ISOPLAST HARDWARE).
3. AUTOMATIC CONTROLLER (CA100) IS AVAILABLE AS AN UPGRADE
4. DIMENSIONS ARE APPROXIMATE. DO NOT PRESET ANCHORS.
5. ALL PIPING SHOULD BE SUPPORTED WITH ADEQUATE BRACING AND HANGERS (BY OTHERS) TO PREVENT DAMAGE FROM WEIGHT AND VIBRATION.



3 PLAN VIEW
SCALE: NONE



1 SIDE VIEW
SCALE: NONE



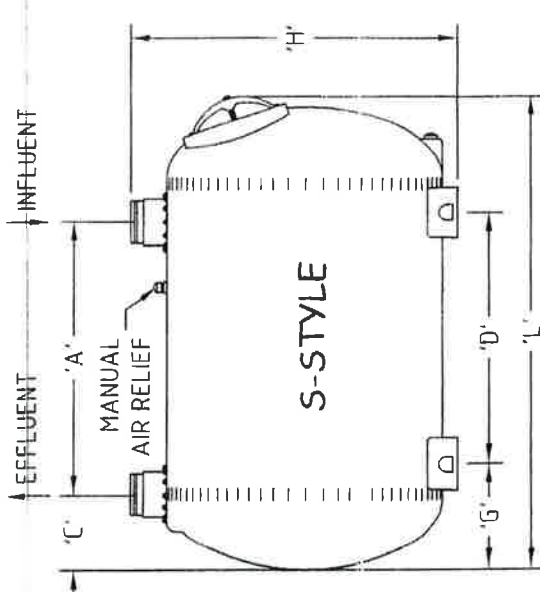
2 FRONT VIEW
SCALE: NONE

This data represents the latest knowledge available to us at time of presentation. However Paragon Aquatics and others involved in gathering and presenting this drawing assume no liability for its use.

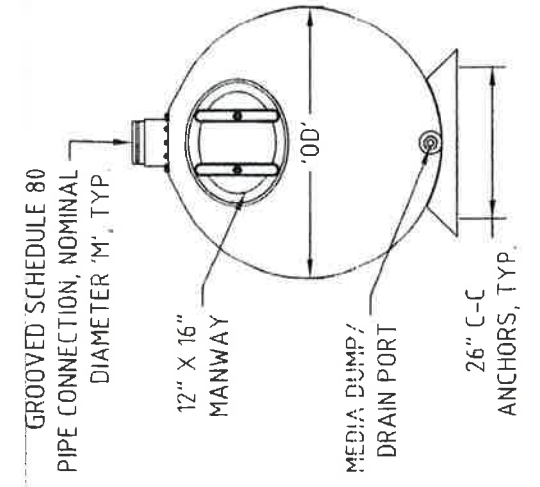


1351 Route 55
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Drawn by:	Date:	Title:
BDG	12/17/98	SIARK
Approved by:	Date:	Drawing Number:
JP	12/2/02	SS2-72-06
Rev Ltr:	C	Sheet:
		1 of 1



(2) SIDE VIEW
SCALE: NONE



(1) FRONT VIEW
SCALE: NONE

TANK NUMBERING SYSTEM

SS72

NOMINAL DIAMETER 'R' = 36" 'S' = 42"

TANK STYLE 'S' (END MANWAY)

NOMINAL LENGTH (INCHES)

TANK PART NUMBER	FILTER AREA (SQ.FT.)	FLOW RATE @10GPM PER SQ.FT.(GPM)	FLOW RATE @15GPM PER SQ.FT.(GPM)	FLOW RATE @20GPM PER SQ.FT.(GPM)	MEDIA REQUIRED (FT ³)	SAND (FT ³)	GRAVEL (FT ³)	FREEBORD HEIGHT (in)	SAND BED DEPTH (in)	GRAVEL DEPTH (in)	OPERATING WEIGHT (lbs.)	SHIPPING WEIGHT (lbs.)	'A' (in)	'C' (in)	'D' (in)	'G' (in)	'H' (in)	'L' (in)	'OD' (in)	'M' NOM. DIA.
RS60	13.5	135	203	270	15.5 (1550 lbs.)	12.5 (1250 lbs.)	3 (300 lbs.)	10	12-1/2		4100	580	36	12	33	15	42	63	37-1/2	4"
RS72	17.2	172	258	344	19 (1900 lbs.)	15.5 (1550 lbs.)	3.5 (350 lbs.)				4900	650	4.8		4.5		75			
SS48	13.5	135	203	270	16.5 (1650 lbs.)	14 (1400 lbs.)	2.5 (250 lbs.)		6		4400	560	19	13	21	14	48	51		
SS72	20	200	300	400	26 (2600 lbs.)	22 (2200 lbs.)	4 (400 lbs.)	12-1/2	16		6600	740	42-7/8	12	39-1/2	17	51	75	43-1/2	6"
SS96	27	270	405	540	36 (3600 lbs.)	31 (3100 lbs.)	5 (500 lbs.)				8800	900	67-1/4	12	60	19		99		

NOTE: DIMENSIONS ARE APPROXIMATE - NOT FOR CONSTRUCTION.

This data represents the latest knowledge available to us at time of presentation. However Paragon Aquatics and others involved in gathering and presenting this drawing assume no liability for its use.

PARAGON AQUATICS
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Drawn by: JD
 Date: 3/14/03
 Title: STARK TANK SPECIFICATIONS - 42" & 36" DIA. 'S'-STYLE

Approved by: [Signature]
 Date: [Blank]
 Drawing Number: SS/RS-SPECS
 Rev Ltr: C
 Sheet: 1 of 1





STARK™ FILTRATION

Engineering Specifications: Fiberglass Pressure Filters

Effective: November 24, 2015

Revision: K

Part 1: Quality Standards

- 1.1 Acceptable Manufacturers – Paragon Aquatics.
- 1.2 All horizontal filters shall be NSF listed and manufactured in accordance with ANSI/NSF International Standard 50.
- 1.3 For the LSS Applications (e.g. aquariums and zoos): Each vessel built shall undergo a hydrostatic pressure test at maximum operating pressure for a minimum of 15 minutes.
- 1.4 The filter vessel shall carry a fifteen-year limited warranty covering defects in material and workmanship, the first three years of which shall not be pro-rated.

Part 2: Performance Standards

- 2.1 Maximum operating pressure of the filter shall be 75 psi. The vessels shall be designed with a minimum burst pressure factor of safety of 4 to 1.
- 2.2 The operating temperature range of the vessel shall be above freezing to 120 °F.
- 2.3 The filter shall be capable of withstanding negative pressure up to 5 in.- Hg.
- 2.4 The filter shall be post cured such that the glass transition temperature (T_g) shall be no less than 150 °F.

Part 3: Vessel Construction

- 3.1 The vessel(s) shall be constructed using a dual-containment construction method consisting of a multiple-layer fiberglass liner filament wound with continuous fiber strand. The fiberglass liner shall be a structural member capable of withstanding 50 psig internal pressure before winding. Winding shall include both helical and circumferential winds and shall be applied to the entire vessel, including domes. The entire dome shall be covered except where the vessel connects to the winder. The winding shall be performed on a computer controlled multi-axis machine. Alternate construction methods shall not be accepted.
- 3.2 The wetted surface shall be either a standard gel coat (GC), or an oxidant corrosion barrier (OR). The oxidant corrosion barrier (OR) wetted surface shall be used in applications where there is the potential for contact with gaseous ozone, or high concentrations of ozone in solution. The gel coat (GC) surface shall be used in all other applications.
- 3.3 For the standard gel coat (GC), the gel coat shall be a modified polyester gel coat equivalent to a Cook gel coat 943-AN-023 with a thickness no less than 10 mils.
- 3.4 For the oxidant corrosion barrier (OR), the surface will consist of two 10 mil minimum layers of vinyl ester resin on surfacing veil for a total of no less than 20 mil resin rich surface, followed by a minimum 100 mil layer of vinyl ester resin reinforced with chopped strand mat fibers. The glass fiber veil

shall be C-glass equivalent to Owens Corning M524-C64. The vinyl ester resin shall be Dow Derkane Momentum 411-350 epoxy-vinyl ester. The vinyl ester shall be hardened with Lubrozol OHD 50% active MEKP or equivalent.

- 3.5 The structural layer shall consist of combinations of chopped glass and woven roving in an isophthalic - polyester matrix. This structure will be followed by continuous - glass roving in an isophthalic - polyester or epoxy matrix.
- 3.6 The chopped glass shall be made from Certainteed 292-207 gun roving or PPG Hybon 6313 gun roving. The chop length shall be greater than 1.5 inch and less than 2.5 inches.
- 3.7 The woven roving shall be Certainteed or PPG - 24 ounces per sq. yd., 5 stands in the running direction and 4 strands perpendicular to the running direction
- 3.8 The chopped glass and woven-roving matrix shall be Reichold 334100-00, or 33409-00, or Deon 6631T.
- 3.9 Continuous glass roving shall be Certainteed or Owens – OCFI1A, 2400 tex, sized for either epoxy or polyester depending on which one is used as the matrix.
- 3.10 The vessel(s) shall be wound on a computer controlled multi-axis winder, and programmed for duplication among like vessels. Manual winding methods or machines with less than 4 axis - control shall not be permitted.
- 3.11 For vessels larger than 4ft. in diameter, winding fish eyes around openings shall be closed using random mats, resin, and thixotropic additives. The exterior of the vessel at these fish-eye areas shall be covered with c-glass veil wetted with either epoxy or polyester resin.
- 3.12 Vessels shall be post cured in an oven at a minimum temperature of 150 F for no less than 3 hours to drive out volatiles and enhance cure. The minimum glass transition temperature of the matrix shall be 140 F.
- 3.13 All vessels shall be supplied with an exterior, all-weather coating. Coating shall be urethane based with UV inhibitors.

Part 4: Vessel Openings

- 4.1 At least one manway opening shall be provided on all vessels. The manway openings shall be independent of any pipe connections. The manway openings shall be above the sand line of the filter. 8ft. diameter - horizontal vessels shall be equipped with 2 manways.
- 4.2 The manway opening shall be no less than 12 X 16 inches. The manway cover shall have an integrally molded **viewing window** at its center and shall seal on the inside of the vessel. The manway cover shall be positioned so the internal pressure from the filter will augment the seal. No additional hardware or through bolts, with the exception of yokes or clamps shall be allowed.



STARK™ FILTRATION

- 4.3 External face piping shall be schedule 80 PVC pipe. All fittings shall be solvent cemented. An air relief shall be provided at the top of the vessel.
- 4.4 A kinetic air relief/vacuum relief valve shall be provided at the customer's request. If provided, this valve shall be located, along with the manual air relief valve, at the air relief port(s). Vacuum relief shall be sized for maximum customer flow rates to prevent vacuum in the vessel from exceeding 5 inch Hg.
- 4.5 For those filters with lengths not exceeding 50 inches and/or for those filters with a manway opening on a dome end, influent and effluent pipes shall be terminated with victaulic-type connections. All other filters shall be terminated with VanStone-style PVC flanges.

Part 5: Internal Piping

- 5.1 Total pressure drop for top and bottom piping at maximum backwash flow rate shall not exceed 5 psi. (Measurement of this pressure drop is performed in a clean, non-sand-filled filter.)
- 5.2 The influent header shall be outfitted with either "showerhead" style or open style diffusers. There shall be one diffuser per two sq. ft. of filter bed area.
- 5.3 The effluent piping header shall be outfitted with a lateral system. Slot opening shall be between .010 and .012 inches. Lateral slots shall be a self-cleaning "V" style. Machined straight slots are not acceptable. Laterals shall be a full 2" NPT (2-3/8" outside diameter), specifically molded for use in commercial filtration. There shall be a total of a minimum of 1 sq. in. equivalent slot area per sq. ft. of filter area.
- 5.4 The diffusers and laterals shall be made from plastic materials.

Part 6: Vessel Supports

- 6.1 Horizontal filter vessels shall be supported on saddle style bases.
- 6.2 Horizontal vessels 5 ft in diameter and below shall be supplied with bases. Each base is to be secured to the vessel with a minimum of two stainless steel bolts. The use of adhesives to hold the saddle to the vessel is not acceptable.
- 6.3 Two bases shall be provided for tank support. Stacked vessels shall be erected on "mirror image" bases mounted on the top of the bottom filter vessel.
- 6.4 The top horizontal vessel of a stacked 2-vessel pair shall be supported on saddles mounted directly on the lower-vessel – cylindrical surface.
- 6.5 A means of rotating the vessel within the saddle for leveling purposes shall be provided.
- 6.6 Vertical vessels 60 inches in diameter and below shall be supplied on FRP tripod-style bases. Vertical vessels 72 inches in diameter and greater shall be supplied on FRP cylindrical bases. The bases shall allow full access to vessel connections without the use of support piers.

- 6.7 Base and base connections shall be designed to meet all seismic conditions noted in the 2005 California Building Code regarding tanks with supported bottoms and shall withstand wind loads of up to 120mph.

Part 7: External Piping

- 7.1 For all vessels below 8 ft. in diameter, valves to initiate the backwash cycle shall be diaphragm-operated valves. The valves shall be operated either hydraulically or pneumatically.
- 7.2 Valves shall be constructed of non-corrosive materials such as ABS plastic. All metal components (shaft and fasteners) shall be Type 316 Stainless Steel. Diaphragm contact materials shall be EPDM or nitrile with polyurethane sideport seals. Cast iron and other metal valves are not acceptable.
- 7.3 The influent, effluent and waste external manifolds shall be constructed of schedule 80 PVC piping and fittings and class 150 flanges.
- 7.4 For multiple-tank systems, each tank in the system shall be backwashed individually using filtered water from the remaining tanks. The common method of backwashing by using raw source water in a reverse flow through the filter or filters will not be acceptable.

Part 8: Backwash Controller

- 8.1 An electrically operated, programmable controller shall be used to provide automatic activation of backwash filter cycles on a preset time basis and/or pressure variations.
- 8.2 Programmer Controls and ancillary components shall be step-down customer's line voltage to the 20 to 28 VAC.
- 8.3 The controller shall be capable of controlling backwash of up to 11 filters based on the following criteria:
 - Time interval
 - Pressure differential
 - Flow rate
 - Volume
 - Time or pressure
 - Time and pressure
 - Volume or pressure
 - Volume and pressure
 - Time of day
 - Time of day and pressure
- 8.4 The backwash controller shall be separate and distinct from other controllers such as chemical feed controllers.
- 8.5 For manually controlled systems, valve actuation to initiate the backwash cycle shall be a single-knob control using a multiport control valve to distribute pressure to the diaphragm valves. Multiport control valve, and influent, effluent, and multiport pressure gages shall be mounted on a common panel.



Model 45 Specifications

Chlorinator height 31" [78.7cm]
Chlorinator weight (full) 55 lbs [24.9kg]
Chlorinator weight (empty)..... 30 lbs [13.6kg]

Capacity:

25 lbs [11.3kg] Pulsar® Plus Dry Chlorinator
Briquettes (equivalent to 17 lbs [7.7kg]
available chlorine)

Feed Rate:

Pulsar® Plus Briquettes: 2-50 lbs
[1.5-22.7kg] of Available Chlorine per day (Pool)
[3-66kg] of Available Chlorine per day (Spa)

Recommended Pool Size:

5,000-100,000 gallon [18,927-378,541 liter]
un-stabilized¹

50,000-150,000 gallon [189,271-567,812 liter]
stabilized¹

¹Subject to local health codes

Model 140 Specifications

Chlorinator height 35" [88.9cm]
Chlorinator weight (full) 150 lbs [68.0kg]
Chlorinator weight (empty)..... 50 lbs [22.7kg]

Capacity:

100 lbs [45.4kg] Pulsar® Plus Dry Chlorinator
Briquettes (equivalent to 68 lbs [30.8kg]
available chlorine)

Feed Rate:

Pulsar® Plus Briquettes: 5-140 lbs
[2.3-63.5kg] of Available Chlorine per day

Recommended Pool Size:

15,000-200,000 gallon [56,781-757,182 liter]
un-stabilized¹

50,000-600,000 gallon [189,271-2,271,247 liter]
stabilized¹

¹Subject to local health codes

Model 500 Specifications

Chlorinator height40" [101.6cm]
Chlorinator weight (full) 465 lbs [210.9kg]
Chlorinator weight (empty)..... 165 lbs [74.8kg]

Capacity:

300 lbs [136.1kg] Pulsar® Plus Dry Chlorinator
Briquettes (equivalent to 204 lbs [92.5kg]
available chlorine)

Feed Rate:

Pulsar® Plus Briquettes: 25-500 lbs
[11.4-266.8kg] of Available Chlorine per day

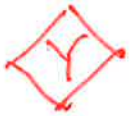
Recommended Pool Size:

50,000-600,000 gallon [189,250-2,271,000 liter]
un-stabilized¹

100,000-1,600,000 gallon [378,500-6,056,000 liter]
stabilized¹

¹Subject to local health codes





Chemtrol® PC2100

PROGRAMMABLE CONTROLLER

ORP / pH CONTROL
with 8-line LCD display
and Chlorine Sensor Option

* U.S. Patent 5,895,565

Chemical Automation is now recognized as a must for many applications such as swimming pools, spas, cooling towers and industrial water treatment. With its advanced microprocessor-based technology, the CHEMTROL® PC2100 Programmable Controller introduces a new standard of sophistication in automated control of sanitizers (chlorine or bromine), oxidizers and pH.

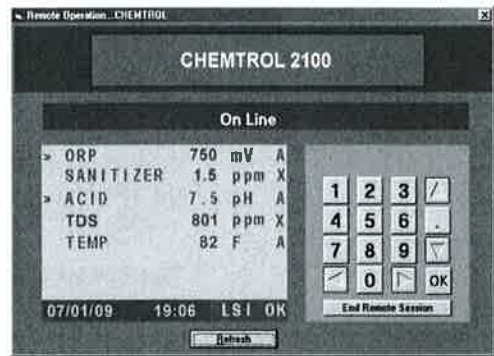
STANDARD FEATURES

- ✓ Large 8-line LCD DISPLAY for easy operation,
- ✓ **ORP CONTROL** of sanitizer and/or oxidizer activity,
- ✓ **pH CONTROL** with choice of acid or base feed,
- ✓ Programmable **SHOCK TREATMENT** and **CHEMICAL SAVINGS** cycles,
- ✓ **LANGELIER SATURATION INDEX** for water balance,
- ✓ **AUTOMATIC DATA LOGGING** for up to 999 tests,
- ✓ **USB** and **Micro SD** ports for program updates and data logging,
- ✓ Safety **FLOW SWITCH**,
- ✓ **FULL SCREEN MENUS** in English, French or Spanish,
- ✓ Screen displays in **US** or **METRIC UNITS**,
- ✓ COMPATIBLE with all **COMMON SANITIZERS AND OXIDIZERS**.



OPTIONS

- ✓ **FREE CHLORINE SENSOR** with direct readings in PPM or mg/l,
- ✓ **FLOW CELL** assembly with clear cover and 3 valves,
- ✓ Programmable **HEATER** control,
- ✓ **CONDUCTIVITY** or **TOTAL DISSOLVED SOLIDS (TDS)** control,
- ✓ **4-20 mA Outputs** for BMS or PLC control,
- ✓ **REMOTE COMPUTER OPERATION** and **GRAPHIC DATA DISPLAY** under *Windows™*.



REMOTE COMPUTER OPERATION
under *Windows™*

SIMPLE AND RELIABLE

The CHEMTROL® PC2100 is a user-friendly and reliable controller that is easy to install and operate. All menus are displayed in clear language in English, French or Spanish with choice of US or metric units. Every unit is supplied with a comprehensive operation manual plus on-site start-up and training by a Qualified Dealer and a **FIVE-YEAR electronics warranty**.

EXTENDED TECHNICAL SUPPORT

The cost and frustration of service calls and downtimes are greatly reduced with two proprietary features of the CHEMTROL® PC2100:

- the patented **Probe Alert Safeguard*** constantly monitors the response of the ORP and pH probes and alerts the operator in case of probe failure,
- the **CHEMCOM™** Program for *Windows™* allows **immediate technical support** from our Service Department or from a Qualified Dealer by remote computer with true duplex operation.

Technical support from CHEMTROL® is based on our experience with over 30,000 installations worldwide. It is also available by toll-free phone, by fax or by e-mail.

Visit our Web Site at www.sbcontrol.com or call today for a free demo CD.

**Optional
FREE CHLORINE
Sensor and
Flow Cell**



SANTA BARBARA CONTROL SYSTEMS

5375 Overpass Road
Santa Barbara, CA 93111 - USA

TOLL-FREE
PHONE
FAX
INTERNET

800-621-2279
805-683-8833
805-683-1893
www.sbcontrol.com

Leading in Automated Water Treatment Since 1976



SECTION -SWIMMING POOL WATER CHEMISTRY CONTROL

1.01 SUMMARY

A. **A PROGRAMMABLE CHEMICAL AUTOMATION SYSTEM** shall be supplied for continuous monitoring of water chemistry (ORP, PPM, pH and Temperature), Langelier Saturation Index and temperature and for automatic control of the chemical feeders and heater. The controller shall include a programmable microprocessor with an eight (8)-line display screen and a sixteen (16)-key keyboard for operator access.

B. The system shall be a **CHEMTROL® PC2100 PROGRAMMABLE CONTROLLER** of current design and model manufactured by **SANTA BARBARA CONTROL SYSTEMS** of Santa Barbara, California or a technically equal system certified by the specifying agent as capable of providing equal performance for all operating functions.

C. Exceptions to the specifications shall be described in detail together with a list of ten (10) similar operating systems of same model and manufacture, with the name, address and telephone number of operating personnel.

1.02 SPECIFICATIONS

A. WATER CHEMISTRY CONTROL

1. The controller shall automatically activate the appropriate chemical feeders in order to maintain the sanitizer level within +/-0.1 parts per million (PPM) or +/- 10 mV (millivolts) of Oxidation-Reduction Potential (ORP) and the pH within +/- 0.1 pH unit of the setpoints selected by the operator. ORP and Sanitizer functions shall include seven-day, level-based chemical saver programs. All setpoint and calibration levels shall be adjustable with a numeric keypad mounted on the front panel of the unit. Controllers with internal switches or calibration adjustments will not be considered equal.
2. The controller shall be capable of actuating all outputs in the following operator-selectable modes: off, manual, automatic and timer cycle. In the automatic mode, the operator shall be able to choose between on/off control with adjustable deadband or proportional feed control with adjustable deadband and progressive control zones.
3. The controller shall include a programmable seven-day shock program with operator selectable ON and OFF times for each day of the week and optional separate chemical feeder relay control.
4. The controller shall include automatic control of a chemical feeder for Automated Chloramine Treatment (A.C.T.).
5. The controller shall have the capability to operate an Ozone generator utilizing an internal spare relay with high ORP lockout.
6. The controller shall continuously calculate and display the Langelier Saturation Index using either sensor data and/or manual input for pH, temperature, total alkalinity and calcium hardness. The resulting calculated water condition shall be displayed on the main screen as either "Scaling", "Corrosive" or "OK".
7. The controller shall be contained in a NEMA Type 4X (rain and splash proof) lockable fiberglass cabinet with an LCD graphic display screen of eight (8) lines of twenty-two (22) alphanumeric characters. The main screen shall display current readings, control modes and operational status for ORP, pH, (PPM, temperature, TDS and flow rate available.) A 16-key touch pad shall be provided for direct access to all the menus and submenus and for entering numerical data. Controllers with smaller displays or displays that require scrolling through menus will not be considered equal. All screens shall have the capability of being displayed at any time in unabbreviated English, French or Spanish and in US / metric units.
8. The controller shall include a safety flow switch to de-energize relay outputs in case of a loss of flow.
9. The controller shall be factory set to water treatment industry standards. The operator shall be able at any time to adjust all programmable functions to preferred settings. The controller shall have a reset mode to reset all or selected functions to the original factory standards.
10. The controller shall have the capability to calibrate all sensor inputs, depending on the accuracy needed, using 1-, 2-, or 3-point calibration to determine respectively the origin, slope and curvature of the calibration curve.
11. The controller shall include programmable high and low alarm levels for all control functions with operator-selectable feed lockout and alarm buzzer options. A Remote Alarm relay shall be included in parallel with alarm buzzer for operator-selectable voltage or dry contact output

12. The controller shall record and display the elapsed run time for each activation event and a cumulative run time resettable at any time by the operator. The controller shall provide for operator-adjustable event run time limits and total run time alarms for all control functions.
13. The controller shall include a memory storage battery with minimum reserve power for six (6) months.
14. The controller shall include an on-board memory chip for storing of test data on operator-selectable schedules. USB communications port shall be included for on-site downloading of the test data. Test data storage must consist of the following sensor inputs: ORP, pH (PPM, TDS, Temperature and Main flow rate available with optional sensors). The controller shall insert a test data every time power is turned on to indicate power failures. Controllers failing to data log all listed parameters will not be considered equal.
15. The controller shall include an on-screen visual display of all test data logged in memory. Controllers that require the use of external accessories or equipment, such as portable computers or remote access computers, to retrieve or display test data shall not be considered equal.

B. OPTIONS

1. OPTION PPM010: A solid-state PPM SENSOR with a selective membrane shall monitor and display the Free Chlorine concentration in water in ppm or mg/l and shall be used to control the chlorine feed device. The sensor readings must be accurate to 0.01 PPM and be compatible with CYA levels in excess of 20 PPM. PPM values derived from ORP sensor readings shall not be acceptable. The PPM sensor shall not require the use of chemical reagents and/or of a special flow cell for water flow and pressure regulation.
1. OPTION TEMP2: The controller shall include an electronic temperature sensor to monitor and display the water temperature in degrees Fahrenheit or Celsius with adjustable high and low alarms. The controller shall include automatic control of the heater with a seven-day energy saver program.
2. OPTION TDS2: The controller shall include a conductivity/temperature sensor for display of TDS in parts per millions or conductivity in microSiemens/cm. It shall automatically control a water dump valve for automatic purging of saturated water, or injection of a saline solution in for use with salt chlorine generator. The controller shall also monitor and display the water temperature in degrees Fahrenheit or Celsius with adjustable high and low alarms.
3. OPTION FLOW2: The controller shall include an electronic water flow meter for monitoring and displaying the main line water flow and cumulative flow. The operator shall be able to calibrate the flow sensor by entering its K-factor. The controller shall also include a programmable low flow alarm with operator selectable pump lockout and alarm buzzer options.
4. OPTION FCA: The ORP and pH shall be mounted in a see-through flow cell with a clear cover, pre-assembled with a water spigot and (2) ball valves [Sch 80 PVC]. Optional Temperature and TDS sensors will be mounted on corner Tee inline with see-through flow cell.
5. OPTION SCA: The ORP and pH sensors shall be mounted in a see-through flow cell with a clear cover located inside a lockable fiberglass enclosure with a window. Optional Temperature and TDS sensors will be mounted on corner Tee inline with flow cell.
6. OPTION REM2: The controller shall include a modem for remote operation by PC-compatible computer. A Windows software program shall be supplied with true duplex operation capability representing the actual controller screen display with automatic downloading and visual graphics representation of test data. Controllers using simulation or virtual representation of the display screen shall not be considered equal.
7. OPTION ETHCOM2: The controller shall include an Ethernet / Internet modem for remote operation by PC-compatible computer using Ethernet / Internet network communication. A Windows-based software program shall be supplied with true duplex operation capability representing the actual controller screen display with automatic downloading and visual graphics representation of test data. Controllers using simulation or virtual representation of the display screen shall not be considered equal.
8. OPTION RS485: The controller shall include a communication converter and RS485-based multiplex communication for remote operation by PC-compatible computer linked directly to the controller. A Windows-based software program shall be supplied with true duplex operation capability representing the actual controller screen display with automatic downloading and visual graphics representation of test data. Controllers using simulation or virtual representation of the display screen shall not be considered equal.
9. OPTION MULTI2: The controller shall include RS485-based multiplex communication for networking with up to thirty (30) controllers and remote operation through a host controller using options REM, ETHCOM or RS485.

10. OPTION MODBUS2: The controller shall include software-based conversion of sensor signals, setpoint, high & low alarms, cumulative run time and total feed time for ORP, pH, PPM, Temperature, TDS, and Flow available with optional sensors, into MODBUS protocol for monitoring on Building Management Systems. The controller shall also allow MODBUS writing for changing control modes and setpoints from Building Management Systems. (Other Protocol options are Lonworks, Bacnet /MSTP, Bacnet/IP, TCP/IP, N2 Bus.)
11. OPTION 420M: A four (4)-channel converter board shall be provided to convert the sensor digital signals for ORP, pH, PPM, Temperature or (TDS) into analog 4-20 mA signals for monitoring on Building Management Systems.

C. WARRANTY

1. The controller shall be covered by a standard manufacturer warranty of five (5) years. Special extensions of more limited warranties shall not be considered acceptable. All sensors will be covered by a standard one (1) year warranty. Other parts shall be covered by their own manufacturer's warranty. The controller shall not require a service technician for annual calibration, seasonal start up, or whenever chemicals supplier or type are changed.
2. The manufacturer shall supply a complete instruction, operating and maintenance manual. Check-out of installation, start up, and instruction of operating personnel shall be performed by an authorized and properly trained manufacturer representative.

CHEMTROL_PC2100_spec - 12/2010

SECTION 21 1313 – WET- PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 Related Documents

Drawings and the general provisions of the Contract, including General and Supplementary Conditions and other Division One Specifications Sections, apply to this Section.

1.2 Description

Provide a complete wet pipe automatic fire sprinkler system throughout the building, as required by code, and the authorities having jurisdiction.

1.3 Work Included

Furnish all design, labor, materials, equipment, and services required for and/or reasonably incidental to the completion of the following work. Include all such work shown on the drawings and/or listed below.

- A. Provide a complete wet-pipe automatic fire sprinkler system. System design shall be in accordance with NFPA 13 2016 and comply with the requirements of the authority having jurisdiction.
- B. Provide all sprinkler heads and piping. All sprinklers shall be quick response unless noted otherwise on the contract drawings.
- C. All main, test, and auxiliary drains, as necessary.
- D. All painting of portions of the fire protection system required to be painted by the authority having jurisdiction.
- E. Compliance to all design requirements of the authority having jurisdiction.
- F. Arranging for all required inspections by the authority having jurisdiction. Cost of all testing and special inspection required.
- G. Shop drawings of the fire protection systems showing location and type of heads, piping, hangers, bracing, drains, test valves, and all related items.
- H. Testing and flushing of complete installation as required by NFPA 13, 2016 and the authority having jurisdiction.
- I. All permit and inspection fees for the work under this section.
- J. A paddle type flow switch is to be installed at each system riser.

- K. Coordination of the fire sprinkler system with the other trades on this project.

1.4 Referenced Standards

The 2016 edition of NFPA 13 shall be followed. Where these specifications or the authority having jurisdiction requirements vary from this standard, the more rigid requirements shall apply.

1.5 Related Work Under Other Sections

The following is not in the work under this Section, but is covered under other Sections.

- A. Installation of the underground fire protection system with exception of 5'-0" stub.
- B. Fire Alarm Systems and the electrical wiring for the fire sprinkler supervisory system.

1.6 Code Requirements

All work shall conform to the requirements of applicable Federal, State and local building and safety codes, ordinances and regulations.

- A. Nothing in this specification or on the plans shall be construed as permitting a departure from any applicable Federal, State and local building and safety codes, ordinances and regulations, or from any requirement by the authority having jurisdiction.
- B. Special attention shall be given to local fire and building regulations.
- C. All work shall be done in accordance with NFPA 13, 2016.

1.7 Sub-Contractor Qualifications

All work must be performed by a State licensed automatic fire sprinkler contractor regularly and currently engaged in the installation of fire protection systems.

1.8 Shop Drawings and Submittals

Before commencing any work or providing any materials at the job site for this project, this contractor shall submit to the Owner's Representative, for approval, Shop Drawings and Material Data Sheets. Shop drawings shall be in compliance with NFPA 13, 2016 and include any local requirements. Material Data Sheets should contain the manufacturer's data regarding all material and equipment intended for use on this project.

- A. Within thirty (30) days submit shop drawings to the Owner's Representative for review. These drawings shall include layout of all piping and valves.
- B. Within thirty (30) days submit 6 copies of all materials to be used. Submittal shall

include valves, pipe, fittings, etc., for review prior to any fabrication or installation.

- C. After making corrections as indicated by the Owner's Representative, submit shop drawings to all authorities for approval.
- D. This contractor must submit detailed shop drawings and inspection certificates to the authority having jurisdiction, so as to cause no delay to construction schedule.
- E. Upon completion of the project, submit final "as built" record drawings and calculations detailing installed supply piping, system control valves, main and branchline piping, and sprinkler head locations.
- F. Upon completion of the job, furnish the Owner's Representative with a copy of the "Contractors Material and Test Certificate" signed by the authority having jurisdiction.

1.10 Design of Systems

All work shall be designed and installed by the contractor in accordance with the requirements the authority having jurisdiction, NFPA 13, and the appropriate edition of the California Building Code and the California Fire Code.

- A. The building shall be hydraulically designed per NFPA 13, 2016.
- B. Fire protection system lines shall be designed so as to avoid all utility lines, conduit, structural components etc.
- C. All main and test drains shall be piped to approved locations.

PART 2 - PRODUCTS

2.1 Materials

Overhead piping, fittings and certain hanger material shall conform to the requirements outlined in NFPA 13, all other material shall be listed in the Underwriters Laboratories, Inc., Fire Protection Equipment List, and the Factory Mutual Approval Guide, for use as intended in overhead automatic fire sprinkler system installations, and shall be acceptable to the authority having jurisdiction. Material that is pending approval shall not be acceptable.

- A. Fittings and couplings that are designed to be installed on plain end pipe or which incorporate set screws shall not be used. Fittings shall be designed to withstand earthquake forces and local vibration, which may be present in the building.
- B. All sprinklers below ceilings are to be pendent style as noted on the fire protection drawings.
- C. All sprinklers above ceilings to be upright or pendent style as noted on the fire protection drawings.

- D. Any pipe and fittings installed outside of the building and exposed to the elements shall be galvanized or painted to protect against corrosion.
- E. Bushings shall not be used unless specifically approved.
- F. All threaded pipe shall be Allied Tube Schedule 40 black steel or equal. UL Listed and FM Approved.
- G. All grooved pipe shall be Allied Tube Schedule 10 black steel or equal. UL Listed and FM Approved.
- H. All grooved fittings to be Victaulic or approved equal.

PART 3 - EXECUTION

3.1 Installation

It is the intent of these specifications that this contractor design and install the fire protection system to meet the specifications contained herein, including the various design and performance criteria delineated and to be responsible for the actual performance of the system according to these criteria.

- A. Prior to bid, visit the job site; take measurements and other such information. Compare this with the drawings and specifications as to the conditions under which the work is to be performed. No allowance shall be subsequently made for extra expenses due to failure or neglect to make such an examination.
- B. All piping shall be installed as required by NFPA 13 and in a manner acceptable to the authority having jurisdiction.
- C. All piping shall be pressure tested and flushed according to the procedures set forth in NFPA 13.
- D. Sprinkler heads installed where they may be exposed or subjected to mechanical damage shall be furnished with head guards.
- E. All piping shall be concealed where shown on the contract drawings.
- F. Installation of the sprinkler system shall not be started until complete plans and hydraulic calculations have been approved by the authority having jurisdiction.
- G. All equipment installed under this contract shall be protected from external damage, including, but not limited to corrosion and settlement.
- H. This contractor shall be responsible for any damage to other work caused by his installation or by leaks in the fire protection lines.

- I. All work shall be done in a neat and workman like manner.

3.2 As Built Drawings

- A. Keep a current set of "as-built" drawings on the job site at all times. These drawings should be up-dated as changes are made.
- B. Keep a current set of Material Data Sheets, with catalog cuts, on the job site at all times.

3.3 Clean Up

Perform the work under this section so as to keep affected portions of the site neat, clean and orderly at all times. Upon completion of the work under this section, remove immediately all surplus materials, rubbish and equipment associated with or used in the performance of this work. Failure to perform such cleanup operations within 24 hours of notice by the Owner's Representative shall be considered adequate grounds for having the work done by others at contractor's expense.

END OF SECTION

SECTION 22 1113 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes water-distribution piping and related components outside the building for water service, fire-service mains and combined water service and fire-service mains.
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.
- C. Construct in accordance with Organization and Trade Standards of the authority having jurisdiction and in the presence of a representative of that agency.

1.3 REFERENCES

- A. Organization and Trade Standards
 - 1. State of California, Department of Transportation (CalTrans), Standard Specifications as adopted by local jurisdictional authority, latest edition, including amendments.
 - 2. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones" current edition.
 - 3. Local jurisdictional and agency engineering and public works regulations and standards.
 - 4. Conform to applicable regulations of the California Plumbing Code for installation of water, sanitary sewer and gas systems.

1.4 DEFINITIONS

- A. EPDM: Ethylene propylene diene terpolymer rubber.
- B. LLDPE: Linear, low-density polyethylene plastic.
- C. PA: Polyamide (nylon) plastic.
- D. PE: Polyethylene plastic.
- E. PP: Polypropylene plastic.

- F. PVC: Polyvinyl chloride plastic.
- G. RTRF: Reinforced thermosetting resin (fiberglass) fittings.
- H. RTRP: Reinforced thermosetting resin (fiberglass) pipe.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
 - 1. Wiring Diagrams: Power, signal, and control wiring for alarms.
- C. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
 - 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
 - 3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
- E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
- G. NSF Compliance:

1. Comply with NSF 14 for plastic potable-water-service piping.
2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
1. Ensure that valves are dry and internally protected against rust and corrosion.
 2. Protect valves against damage to threaded ends and flange faces.
 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
1. Notify Construction Manager and Owner no fewer than two days in advance of proposed interruption of service.
 2. Do not proceed with interruption of water-distribution service without Construction Manager's and Owner's written permission.

1.9 COORDINATION

- A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON PIPE AND FITTINGS

- A. Ductile-Iron Pipe: AWWA C151, with push-on-joint or mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 2. Fittings shall have a pressure class of 250 psi.
 3. Pipe and Fittings shall be mortar lined per AWWA C104 and asphalt coated (1 mil thick), or epoxy coated in accordance with AWWA C550.
 4. Glands and Gaskets and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
 5. Flanged Ductile-Iron Pipe with Ductile: AWWA C115, ductile- or gray-iron threaded flanges.
 6. Bolts and Studs: ASTM A307, 60,000 PSI Tensile Strength.

2.2 PE PIPE AND FITTINGS

- A. PE, AWWA Pipe: AWWA C901 and be made from compounds having the standard code designation PE 3408 and shall have a pressure rating not less than **200 psig**.
1. PE, tubing shall be Eagle 3408, Inerstate PE3408, Performance Pipe 5100 Ultra-Line, Westflex Gold Label 3408, or approved equal.
 2. PE, Fittings shall be brass compression type fittings with a pressure rating not less than 200 psig. Stainless steel insert stiffeners from the same manufacturer shall be used at all compression joints.

2.3 PVC PIPE AND FITTINGS

- A. PVC, AWWA Pipe: AWWA C900, Class 200, with bell end with gasket, and with spigot end.
1. Comply with UL 1285 for fire-service mains if indicated.
 2. PVC Fabricated Fittings: AWWA C900, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket, ASTM F477 in each bell.
 3. Joint Restraint Devices: Unibell B-13, Standard Performance Specification for use with PVC Pipe.

2.4 SPECIAL PIPE FITTINGS

A. Restrained Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. EBAA Iron, Inc. Series 1100HD and Series 1700
 - b. U.S. Pipe and Foundry Company, "Field-Lok" gaskets or MF Field Lok restraints.
 - c. Wedge-type restrainer glands – Sigma "One-Lok", EBAA "Megalug" or EBAA "Megaflange"

2.5 JOINING MATERIALS

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for commonly used joining materials.
- B. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer as approved by jurisdictional authority, unless otherwise indicated.

2.6 PIPING ACCESSORIES AND SPECIALTIES

- A. Refer to project drawings and Utility District Standards for all piping accessories and specialties, including:
 - a. Curb ball valves
 - b. Corporation ball valves
 - c. Couplings
 - d. Meters
 - e. Meter Boxes
 - f. Pipe Supports
 - g. Service Saddles
 - h. Dielectric Fittings

2.7 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Mueller 2360 Series
 - b. Mueller 2361 Series
 - c. American Flow Control 500 Series
 - d. American Flow Control 2500 Series
 - e. No equals or substitutes will be allowed.
2. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:
 - a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.
 - 1) Standard: AWWA C509.
 - 2) Minimum Pressure Rating: 250 psig.

- 3) End Connections: Push on or mechanical joint.
- 4) Interior Coating: Complying with AWWA C550.
- 5) Exterior Coating: Exterior surfaces and wet interior surface shall be coated with polyimide-cured epoxy per NSF Standard 61 and AWWA C550
- 6) Disk or body shall be rubber coated.
- 7) Stem, stem nuts, glands, and bushings shall be of bronze, with O-ring seals.
- 8) Actuators shall be 2-inch square operating nuts, turning counter-clockwise to open.

2.8 VALVE AND WATER SYSTEM ACCESSORIES AND SPECIALTIES

- A. Refer to project drawings and Utility District Standards for all valve accessories and specialties, including:
 - a. Valve boxes
 - b. Valve marking stakes
 - c. Stem Extensions
 - d. Blowoff Assemblies
 - e. Air Valve Assemblies
 - f. Detector Check Valves
 - g. Corporation Valves
 - h. Reduced-Pressure-Principle Backflow Preventers
 - i. Double-Check, Backflow-Prevention Assemblies

2.9 WATER METERS

- A. Water meters will be furnished and installed by utility company. The contractor shall be responsible for performing all other work required.

2.10 WATER METER BOXES AND VAULTS

- A. Refer to project drawings and Utility District Standards for all water meter box and vault requirements. All meter boxes and vaults shall have metal lids with H-20 loading, marked "WATER", with bolting mechanisms and shall be furnished with bolts to secure the lid.

2.11 FIRE HYDRANTS

- A. Refer to project drawings and Utility District Standards for all specifications for fire hydrants.
- B. Dry-Barrel Fire Hydrants:
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Waterous Pacer Model No. WB67DDP. No equals or substitutes will be accepted.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping.
- D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping 3" and smaller shall be the following:
 - 1. PE, AWWA C901 pipe; with brass compression type fittings.
- F. Underground Fire-Service-Main Piping and Water-Main Piping 4 inch to 12 inch shall be any of the following:
 - 1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
 - 2. PVC, AWWA Class 200 pipe listed for fire-protection service; PVC Class 200 fabricated fittings; and gasketed joints.

3.3 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.
- B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- C. All Hot tapping of existing mains shall be performed by the Public Utility District.
- D. Direct tapping of water mains shall not be permitted. Double strap service saddles shall be used for all service connections.
- E. Comply with NFPA 24 for fire-service-main piping materials and installation.
 - 1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.
 - 2. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
- F. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.
- G. Install PE pipe according to ASTM D 2774 and ASTM F 645.
- H. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.
- I. Bury piping with depth of cover over top at least 48 inches.
- J. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- K. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
 1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.
- L. Sleeves are specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- M. Mechanical sleeve seals are specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- N. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
- O. See Division 21 Section "Water-Based Fire-Suppression Systems" for fire-suppression-water piping inside the building.
- P. See Division 22 Section "Domestic Water Piping" for potable-water piping inside the building.

3.4 JOINT CONSTRUCTION

- A. See Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.

3.5 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.
- C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
- D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.
- E. MSS Valves: Install as component of connected piping system.

- F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.6 DETECTOR-CHECK VALVE INSTALLATION

- A. Install in heated enclosure aboveground.
- B. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.
- C. Support detector check valves, meters, shutoff valves, and piping as required by Water District.

3.7 WATER METER BOX INSTALLATION

- A. Install water meter boxes in paved areas flush with surface.
- B. Install water meter boxes in grass or earth areas with top **2 inches** above surface.

3.8 CONCRETE VAULT INSTALLATION

- A. Install precast concrete vaults according to ASTM C 891.

3.9 FIRE HYDRANT INSTALLATION

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
- B. AWWA Fire Hydrants: Comply with AWWA M17.
- C. UL/FMG Fire Hydrants: Comply with NFPA 24.

3.10 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. See Division 22 Section "Common Work Results for Plumbing" for piping connections to valves and equipment.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.11 FIELD QUALITY CONTROL

- A. Contractor shall submit to the Water District a written Testing and Disinfection plan that addressed the proposed steps and procedures to be utilized. The plan shall be submitted a minimum of five working days prior to commencement of the procedures. The plan shall comply with appropriate jurisdictional requirements.
- B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- C. Pressure Testing: Refer Public Utility District Standards.
- D. Flushing and Disinfection: Refer to Public Utility District Standards.
- E. Hydrostatic Tests: Refer to Public Utility District Standards.
- F. Prepare reports of testing activities.

3.12 IDENTIFICATION

- A. Install continuous underground, detectable warning tape during backfilling of trench for underground water-distribution piping. Locate as shown on the drawings.

END OF SECTION 22 11 13

SECTION 22 1313 - FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Construct in accordance with Organization and Trade Standards of the authority having jurisdiction and in the presence of a representative of that agency.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe and fittings.
 - 2. Nonpressure and pressure couplings.
 - 3. Expansion joints and deflection fittings.
 - 4. Backwater valves.
 - 5. Cleanouts.
 - 6. Encasement for piping.
 - 7. Manholes.

1.3 DEFINITIONS

- A. FRP: Fiberglass-reinforced plastic.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Expansion joints and deflection fittings.
 - 2. Backwater valves.
- B. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.
- D. Field quality-control reports.

1.5 REFERENCES

- A. Organization and Trade Standards

1. State of California, Department of Transportation (CalTrans), Standard Specifications as adopted by local jurisdictional authority, latest edition, including amendments.
2. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones" current edition.
3. Local jurisdictional and agency engineering and public works regulations and standards.
4. Conform to applicable regulations of the California Plumbing Code, Part for installation of water, sanitary sewer and gas systems.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of service.
 2. Do not proceed with interruption of service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 GRAVITY SEWER PIPE AND FITTINGS

- A. PVC Gravity Sewer Piping:
 1. Pipe and Fittings: PVC SDR-35 shall conform to ASTM D 3034 for diameters from 4" to 15" and ASTM F 679 for 18" to 24", with integral-bell gasket joints. Rubber gaskets shall be factory installed and conform to ASTM F 477. Pipe joints shall conform to ASTM D 3212.
- B. PVC Pressure Piping (used for deep pipe):
 1. Pipe and Fittings: PVC C900 and C905 shall conform to AWWA C900 and C905. Pipe shall be supplied with integral-bell gasket joints. Rubber gaskets shall be factory installed and conform to ASTM F 477. Pipe joints shall conform to ASTM D 3139.
- C. Ductile Iron Pipe

1. Ductile Iron Pipe shall conform to and meet the requirements of ANSI/AWWA C151/A21.51. It shall be the thickness class required for supporting the imposed loads and shall be CL 51 or greater. Joints shall conform to ANSI/AWWA C111/ A21.11.

2.2 NONPRESSURE-TYPE TRANSITION COUPLINGS

- A. Push-on gasket joints and fittings may be used except where otherwise required by THE PUBLIC UTILITY DISTRICT
- B. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.
- C. Sleeve Material shall be approved by TDD prior to installation, and as follows:
 1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 2. For Concrete Pipes: ASTM C 443, rubber.
 3. For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 4. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 5. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- D. Unshielded, Flexible Couplings:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Bond Seal
 - b. Fernco Inc.
 - c. Indiana Seal
 - d. or approved equal.
 3. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
- E. Shielded, Flexible Couplings:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Bond Seal
 - b. Fernco Inc.
 - c. Indiana Seal
 - d. or approved equal.

3. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

F. Ring-Type, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Bond Seal
 - b. Fernco Inc.
 - c. Indiana Seal
 - d. or approved equal.
3. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

G. Nonpressure-Type, Rigid Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Romac
 - b. Bond Seal Anti Shear
 - c. Fernoc Anti Shear
 - d. Indiana Seal Anti Shear
 - e. Or approved equal
3. Description: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling, molded from ASTM C 1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.3 PRESSURE-TYPE PIPE COUPLINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Cascade Waterworks Mfg.
 2. Dresser, Inc.
 3. Ford Meter Box Company, Inc. (The); Pipe Products Div.
 4. JCM Industries, Inc.
 5. Romac Industries, Inc.
 6. Smith-Blair, Inc.; a Sensus company.
 7. Victaulic Depend-O-Lok, Inc.
 8. Viking Johnson..

- C. Tubular-Sleeve Couplings: AWWA C219, with center sleeve, gaskets, end rings, and bolt fasteners.
- D. Metal, bolted, sleeve-type, reducing or transition coupling, for joining underground pressure piping. Include 350-psig minimum pressure rating and ends of same sizes as piping to be joined.
- E. Center-Sleeve Material: Manufacturer's standard.
- F. Gasket Material: Natural or synthetic rubber.
- G. Metal Component Finish: Corrosion-resistant coating or material.

2.4 EXPANSION JOINTS AND DEFLECTION FITTINGS

- A. Ductile-Iron, Flexible Expansion Joints:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. EBAA Iron, Inc.
 - b. Romac Industries, Inc.
 - c. Star Pipe Products..
 - 3. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 350-psig minimum working pressure and for offset and expansion indicated.
- B. Ductile-Iron Expansion Joints:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Dresser, Inc.
 - b. EBAA Iron, Inc.
 - c. JCM Industries, Inc.
 - d. Smith-Blair, Inc.; a Sensus company.
 - 3. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 350-psig minimum working pressure and for expansion indicated.
- C. Ductile-Iron Deflection Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. EBAA Iron, Inc.
3. Description: Compound coupling fitting with ball joint, flexing section, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include rating for 350-psig minimum working pressure and for up to 15 degrees of deflection.

2.5 BACKWATER VALVES

A. Cast-Iron Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Josam Company.
 - b. Smith, Jay R. Mfg. Co.
 - c. Tyler Pipe.
 - d. Watts Water Technologies, Inc.
 - e. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
3. Description: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.
4. Horizontal type; with swing check valve and hub-and-spigot ends.
5. Combination horizontal and manual gate-valve type; with swing check valve, integral gate valve, and hub-and-spigot ends.
6. Terminal type; with bronze seat, swing check valve, and hub inlet.

B. PVC Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Canplas LLC.
 - b. IPS Corporation.
 - c. NDS.
 - d. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
 - e. Sioux Chief Manufacturing Company, Inc.
 - f. Zurn Light Commercial Products Operation; Zurn Plumbing Products Group.
3. Description: Horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

2.6 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. J.R. Smith or equal, 4240/37 series with cast iron lid, tractor type, set flush with final surface in landscape areas, 1/2" below finish surface in asphalt areas. "SEWER" shall be stamped on the lid.
 - b. Boxes shall be constructed of steel reinforced concrete.
2. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

B. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: Internal rubber seal shall be installed as specified by THE PUBLIC UTILITY DISTRICT. The internal rubber seal and seal extensions shall be as manufactured by Cretex Specialty Products, or approved equal. The seals and extensions shall have a minimum thickness of 3/16 inches and shall be extruded from a high grade rubber compound conforming to the applicable requirements of ASTM C923. The bands used form compressing the seal and extension against the manhole shall be fabricated from 16 gauge stainless steel conforming to ASTM A240 type 304, any screws or bolts or nuts used on this band shall be stainless steel conforming to ASTM F593, Type 304.
8. External Manhole/Vault Seals: Exterior manhole walls shall be sealed with a liquid cold-applied waterproofing membrane system such as Sonneborn HLM 5000®, or equivalent. Exterior joints shall be sealed with an elastomeric based external joint wrap such as Henry RUB'R-NEK®, or equivalent.
9. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
10. Steps: Individual FRP steps, FRP ladder, or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
11. Adjusting Rings: Interlocking HDPE rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.

12. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

C. Designed Precast Concrete Manholes:

1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
3. Joint Sealant: Internal rubber seal shall be installed as specified by THE PUBLIC UTILITY DISTRICT. The internal rubber seal and seal extensions shall be as manufactured by Cretex Specialty Products, or approved equal. The seals and extensions shall have a minimum thickness of 3/16 inches and shall be extruded from a high grade rubber compound conforming to the applicable requirements of ASTM C923. The bands used for compressing the seal and extension against the manhole shall be fabricated from 16 gauge stainless steel conforming to ASTM A240 type 304, any screws or bolts or nuts used on this band shall be stainless steel conforming to ASTM F593, Type 304.
4. External Manhole/Vault Seals: Exterior manhole walls shall be sealed with a liquid cold-applied waterproofing membrane system such as Sonneborn HLM 5000®, or equivalent. Exterior joints shall be sealed with an elastomeric based external joint wrap such as Henry RUB'R-NEK®, or equivalent.
5. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
6. Steps: Individual FRP steps, FRP ladder, or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
7. Adjusting Rings: Interlocking HDPE rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
8. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

D. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser, with 4-inch- minimum-width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

E. Manhole-Cover Inserts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

- a. FRW Industries; a Syneco Systems, Inc. company.
 - b. Knutson Enterprises.
 - c. L. F. Manufacturing, Inc.
 - d. Parson Environmental Products, Inc.
3. Description; Manufactured, plastic form, of size to fit between manhole frame and cover and designed to prevent stormwater inflow. Include handle for removal and gasket for gastight sealing.
 4. Type: Solid.

2.7 CONCRETE

- A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R, and the following:
 1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
 1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.
- C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
 1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: 2 percent through manhole.
 2. Benches: Concrete, sloped to drain into channel.
 - a. Slope: 8 percent.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
 1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, nonpressure, drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope of 2 percent unless otherwise indicated.
 - 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
 - 3. Install piping with 30" minimum cover.
 - 4. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 - 5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 - 6. Install ductile-iron, gravity sewer piping according to ASTM A 746.
 - 7. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 8. Install PVC cellular-core sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 9. Install PVC corrugated sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 10. Install PVC profile sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 11. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 12. Install PVC gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 13. Install fiberglass sewer piping according to ASTM D 3839 and ASTM F 1668.
 - 14. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
 - 15. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
- G. Install force-main, pressure piping according to the following:
 - 1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
 - 2. Install piping with 30" minimum cover.
 - 3. Install ductile-iron pressure piping according to AWWA C600 or AWWA M41.
 - 4. Install ductile-iron special fittings according to AWWA C600.

5. Install PVC pressure piping according to AWWA M23 or to ASTM D 2774 and ASTM F 1668.
 6. Install PVC water-service piping according to ASTM D 2774 and ASTM F 1668.
- H. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
1. Hub-and-spigot, cast-iron soil pipe.
 2. Hubless cast-iron soil pipe and fittings.
 3. Ductile-iron pipe and fittings.
 4. Expansion joints and deflection fittings.
- I. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure, drainage piping according to the following:
1. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
 3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
 4. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
 5. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
 6. Join PVC cellular-core sewer piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
 7. Join PVC corrugated sewer piping according to ASTM D 2321.
 8. Join PVC profile sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
 9. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
 10. Join PVC gravity sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
 11. Join fiberglass sewer piping according to ASTM D 4161 for elastomeric-seal joints.
 12. Join nonreinforced-concrete sewer piping according to ASTM C 14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
 13. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
 14. Join dissimilar pipe materials with nonpressure-type, flexible or rigid couplings.
- B. Join force-main, pressure piping according to the following:
1. Join ductile-iron pressure piping according to AWWA C600 or AWWA M41 for push-on joints.
 2. Join ductile-iron special fittings according to AWWA C600 or AWWA M41 for push-on joints.
 3. Join PVC pressure piping according to AWWA M23 for gasketed joints.
 4. Join PVC water-service piping according to ASTM D 2855.

5. Join dissimilar pipe materials with pressure-type couplings.
- C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 - a. Unshielded flexible or rigid couplings for pipes of same or slightly different OD.
 - b. Unshielded, increaser/reducer-pattern, flexible or rigid couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 2. Use pressure pipe couplings for force-main joints.

3.4 MANHOLE INSTALLATION

- A. General: Install manholes complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Install FRP manholes according to manufacturer's written instructions.
- D. Form continuous concrete channels and benches between inlets and outlet.
- E. Set tops of frames and covers $\frac{1}{2}$ " below finished surface of manholes that occur in pavements. Set tops 6" above finished surface elsewhere unless otherwise indicated.

3.5 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

3.6 BACKWATER VALVE INSTALLATION

- A. Install horizontal-type backwater valves in piping manholes or pits.
- B. Install combination horizontal and manual gate valves in piping and in manholes.
- C. Install terminal-type backwater valves on end of piping and in manholes. Secure units to sidewalls.

3.7 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.

2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
 3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
 4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.8 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 22 Section "Sanitary Waste and Vent Piping."
- B. Connect force-main piping to building's sanitary force mains specified in Division 22 Section "Sanitary Waste and Vent Piping." Terminate piping where indicated.
- C. Make connections to existing piping and underground manholes.
1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 - c. Connection to existing manholes walls shall be made per THE PUBLIC UTILITY DISTRICT requirements.
 4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- D. Connect to grease oil and sand interceptors specified in Division 22 Section "Sanitary Waste Interceptors."

3.9 CLOSING ABANDONED SANITARY SEWER SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8-inch- thick, brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes: Excavate around manhole as required and use either procedure below:
 - 1. Remove manhole and close open ends of remaining piping.
 - 2. Remove top of manhole down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
- C. Backfill to grade according to Division 31 Section "Earth Moving."

3.10 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
 - 1. Use detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.11 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate report for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.

2. Test completed piping systems according to requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate report for each test.
 5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
 - a. Fill sewer piping with water. Test with pressure of at least 8-foot head of water, and maintain such pressure without leakage for at least 15 minutes.
 - b. Close openings in system and fill with water.
 - c. Purge air and refill with water.
 - d. Disconnect water supply.
 - e. Test and inspect joints for leaks.
 - f. Allowable leakage for mainline shall not exceed 350 gallons per mile per day per inch diameter of pipe. (see THE PUBLIC UTILITY DISTRICT requirements for laterals)
 6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Test plastic gravity sewer piping according to THE PUBLIC UTILITY DISTRICT requirements.
 7. Mandrel Testing: Test sanitary sewerage according to requirements of authorities having jurisdiction, and the following:
 - a. Test plastic gravity sewer piping according to THE PUBLIC UTILITY DISTRICT requirements.
 8. Television Tests: Provide Television Testing of each section of sewer pipeline in accordance with THE PUBLIC UTILITY DISTRICT and the requirements of authorities having jurisdiction.
 9. Manholes and Grease Interceptors: Test all manholes and grease interceptors for leakage according to requirements of authorities having jurisdiction, and the following:
 - a. Water test per THE PUBLIC UTILITY DISTRICT requirements.
 - b. Vacuum test per THE PUBLIC UTILITY DISTRICT requirements.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.
- 3.12 CLEANING
- A. Clean dirt and superfluous material from interior of piping.

END OF SECTION 22 13 13

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data for each type of plumbing fixture, including trim, fittings, accessories, appliances, appurtenances, equipment, and supports.
2. Documentation indicating flow and water consumption requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" for plumbing fixtures for people with disabilities.
- B. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- C. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for fixture materials that will be in contact with potable water.

2.2 *FOR PLUMBING FIXTURES REFER TO PLUMBING FIXTURE SCHEDULE ON PLANS*

2.3 FITTINGS

A. Supply Fittings:

1. Standards: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water. ASME A112.18.1/CSA B125.1.
2. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
3. Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
4. Risers: ASME A112.18.6, braided- or corrugated-stainless-steel flexible hose riser.

B. WASTE FITTINGS

1. Standard: ASME A112.18.2/CSA B125.2.

2. Trap Sizes: NPS 1-1/2 by NPS 1-1/4.

2.4 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
 1. Characteristics: Nonshrink; recommended for interior and exterior applications.
 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fitting insulation kits on fixtures for people with disabilities.
- B. Install fixtures with flanges and gasket seals.
- C. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- D. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified and to building wall construction where no support is indicated.
- E. Fasten wall-mounted fittings to reinforcement built into walls.
- F. Fasten counter-mounting plumbing fixtures to casework.
- G. Secure supplies to supports or substrate within pipe space behind fixture.
- H. Set shower receptors and mop basins in leveling bed of cement grout.
- I. Install individual supply inlets, supply stops, supply risers, and tubular brass traps with cleanouts at fixture.
- J. Install water-supply stop valves in accessible locations.
- K. Install traps on fixture outlets. Omit traps on fixtures having integral traps. Omit traps on indirect wastes unless otherwise indicated.
- L. Install hot-water dispensers in back top surface of sink or in counter with spout over sink.
- M. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.

- N. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.
- O. Install piping connections between plumbing fixtures and piping systems and plumbing equipment. Install insulation on supplies and drains of fixtures for people with disabilities.
- P. Ground equipment.

END OF SECTION 224000

SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of valve indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. ASME Compliance:
 1. ASME B1.20.1 for threads for threaded end valves.
 2. ASME B16.1 for flanges on iron valves.
 3. ASME B16.5 for flanges on steel valves.
 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 5. ASME B16.18 for solder-joint connections.
 6. ASME B31.1 for power piping valves.
 7. ASME B31.9 for building services piping valves.

2.2 GENERAL-DUTY VALVES

A. One-Piece, Brass Ball Valves:

1. Description: Standard: MSS SP-110.
2. CWP Rating: 400 psig.
3. Seats: PTFE.

B. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Standard: MSS SP-80, Type 3.
2. CWP Rating: 200 psig (1380 kPa).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Valve Sizes: Same as upstream piping unless otherwise indicated.
- B. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions.
- C. Use gate and ball valves for shutoff duty; globe and ball for throttling duty.
- D. Locate valves for easy access and provide separate support where necessary.
- E. Install valves for each fixture and item of equipment.
- F. Install three-valve bypass around each pressure-reducing valve using throttling-type valves.
- G. Install valves in horizontal piping with stem at or above center of pipe.
- H. Install valves in a position to allow full stem movement.
- I. Install check valves for proper direction of flow in horizontal position with hinge pin level.

END OF SECTION 230523

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.
2. Hangers and Supports:
 - a. Shop Drawings: Signed and sealed by a qualified contractor.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hangers and Supports for Plumbing Piping Equipment:

1. Structural Performance: Hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - a. Design supports for multiple pipes capable of supporting combined weight of supported systems and system contents.
 - b. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - c. Design seismic-restraint hangers and supports for piping and equipment, and obtain approval from authorities having jurisdiction.

2.2 HANGERS AND SUPPORTS FOR HVAC

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of steel.

C. Fastener Systems:

1. Verify suitability of fasteners in this article for use in lightweight concrete or concrete slabs less than 4 inches thick.
2. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pullout, tension, and shear capacities appropriate for supported loads and building materials where used.
3. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel anchors, for use in hardened portland cement concrete; with pullout, tension, and shear capacities appropriate for supported loads and building materials where used.

PART 3 - EXECUTION

3.1 GENERAL PIPING INSTALLATIONS

- A. Install piping free of sags and bends.
- B. Install fittings for changes in direction and branch connections.

3.2 HANGERS AND SUPPORTS

- A. Comply with MSS SP-69 and MSS SP-89. Install building attachments within concrete or to structural steel.
- B. Install hangers and supports to allow controlled thermal and seismic movement of piping systems.
- C. Install powder-actuated fasteners and mechanical-expansion anchors in concrete after concrete is cured. Do not use in lightweight concrete or in slabs less than 4 inches thick.
- D. Load Distribution: Install hangers and supports so piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - 1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes.
 - 2. Pipe Hangers (MSS Type 5): For suspension of pipes to allow off-center closure for hanger installation before pipe erection.
 - 3. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes
 - 4. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes.
- F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers.

END OF SECTION 230529

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals:
 - 1. Certified TAB reports.
 - 2. Documentation of work performed per ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
 - 3. Documentation of work performed per ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."
- B. TAB Firm Qualifications: AABC, NEBB, or TABB certified.
- C. TAB Report Forms: Standard TAB contractor's forms approved by Architect.
- D. Perform TAB after leakage and pressure tests on water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine the approved submittals for HVAC systems and equipment.
- C. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- D. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- E. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- F. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- G. Examine automatic temperature system components to verify the following:

1. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
2. Sequence of operation for control modes is according to the Contract Documents.
3. Controller set points are set at indicated values.
4. Interlocked systems are operating.
5. Changeover from heating to cooling mode occurs according to indicated values.

H. Report deficiencies discovered before and during performance of test and balance procedures.

3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.3 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Provide independent test and balance agency services for testing, and balancing of air distribution for heating-cooling systems, with work done under supervision of a qualified engineer, by qualified engineering technicians and trained personnel, using instruments certified accurate to limits used in standard practice for testing and balancing of air distribution for heating-cooling systems. Independent test and balance agency shall be certified members of Associated Air Balance Council.
- B. Installation Phase:
 - 1) Study design specifications and drawings and prepare schedule to physically inspect mechanical equipment for air distribution systems to be tested and balanced. Provide Air Balance Agency with one (1) copy of contract plans and specifications, mechanical equipment submittals and approved change orders necessary for proper balancing of air distribution system.

- 2) Prepare tests and balancing schedule, test record forms and necessary technical information about the air distribution systems for installed heating-cooling equipment and fan systems, for complete total air balance.
 - 3) Recommend adjustments and/or corrections to mechanical equipment and air distribution systems that are necessary for proper balancing of the air distribution systems.
- C. Upon completion of the air handling system, the Air Balance Agency shall complete tests, analysis, and balance of air handling systems for heating-cooling-ventilating equipment. The Air Balance Agency then shall submit five (5) copies of balance report to the Mechanical Contractor for forwarding to the Architect for evaluation and approval.
- D. Air Balance Report shall at a minimum include the following data:
- 1) Title Page:
 - a) Company name/address/telephone number.
 - b) Project name/location.
 - c) Project Architect/Engineer.
 - d) Project contractor.
 - 1) Instrument List/Manufacturer/Model.
 - 2) Abbreviations Used.
 - 3) Air Conditioning Units existing unit designations including split systems.
 - a) Installed Equipment Data:
 1. Location
 2. Identification Number
 3. Manufacturer/Model Number
 - b) Design Data:
 1. Air flow (CFM) supply/return/outside
 2. Static Pressure
 3. Fan Motor BHP
 4. Fan Motor HP
 5. Fan Speed (RPM)
 6. Filter Data: Type, quantity, size and air pressure drop.
 - c) Balancing Test Data:
 7. Air Flow (CFM) supply/return/outside and totals
 8. Static Pressure (total) external.
 9. Fan Speed (RPM)
 10. Fan Operating Amperes

11. Fan Operating BHP
 12. Inlet and Discharge Pressure
 13. Air Velocity (Average)
- 5) Air Distribution Device (diffusers, registers and grilles)
- a) Installed Design Data:
 14. Location: Area served/room number/location
 15. Corresponding Air Conditioning Unit
 16. Device Identification: Type/Size
 17. Area Factor
 18. Velocity (FPM)
 19. Air Flow (CFM)
 - b) Balancing Test Data:
 20. Velocity (FPM) - Test, Final
 21. Air Flow (CFM) - Test, Final
- E. All outlet: Set for specified air pattern.
- F. Supply, return, exhaust, outside air and relief dampers and variable volume boxes; set for design CFM.
- G. Under normal operating conditions record temperatures at each thermostat and indicated thermostat set point.
- H. Air Balance Agency shall conduct tests listed above in the presence of the Owner's Representative, if requested to do so.
- I. Review with and instruct Owner's Representative on procedure for minimum permissible air adjustments for local variations to suit occupants.
- J. After the building is occupied, recheck balancing and adjust to suit needs of occupancy.

END OF SECTION 230593

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.
2. For adhesives and sealants, documentation including printed statement of VOC content.

- ##### B. Quality Assurance: Labeled with maximum flame-spread index of 25 and maximum smoke-developed index of 50 according to ASTM E 84.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics:

1. Indoor Insulation and Related Materials: To be factory-labeled designating maximum flame-spread index of 25 or less and smoke-developed index of 50 or less according to ASTM E 84.

2.2 INSULATION MATERIALS

- ##### A. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- ##### B. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
- ##### C. Mineral-Fiber Blanket Insulation: Comply with ASTM C 553, Type II and ASTM C 1290, Type I.
- ##### D. Polyolefin Insulation: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.
- ##### E. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- ##### F. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 2. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
- G. Factory-Applied Jackets: When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
- H. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
- I. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

PART 3 - EXECUTION

3.1 INSULATION INSTALLATION

- A. Comply with requirements of the Midwest Insulation Contractors Association's "National Commercial & Industrial Insulation Standards" for insulation installation on pipes and equipment.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall, Partition, and Floor Penetrations: Install insulation continuously through penetrations. Seal penetrations. Comply with requirements in Section 078413 "Penetration Firestopping."
- D. Flexible Elastomeric Insulation Installation:
1. Seal longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
 2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- E. Mineral-Fiber Insulation Installation:
1. Insulation Installation on Straight Pipes and Tubes: Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 2. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.

3. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
4. Blanket and Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
5. For ducts and plenums with surface temperatures below ambient, install a continuous, unbroken vapor barrier.

F. Polyolefin Insulation Installation:

1. Seal split-tube longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of polyolefin pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

G. Plenums and Ducts Requiring Insulation:

1. Concealed and exposed supply and outdoor air.
2. Concealed and exposed return air located in nonconditioned space.

H. Plenums and Ducts Not Insulated:

1. Metal ducts with duct liner.
2. Factory-insulated plenums and casings.
3. Flexible connectors.
4. Vibration-control devices.
5. Factory-insulated access panels and doors.

I. Piping Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawlspaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.2 DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed duct insulation shall be[one of] the following:

1. Flexible Elastomeric: 1 inch thick.
2. Mineral-Fiber Blanket: 2 inches, 1.5-lb/cu. ft. nominal density.
3. Polyolefin: 1 inch thick.

3.3 HVAC PIPING INSULATION SCHEDULE

A. Refrigerant Suction (larger than 3/4") and Liquid(Larger than 3/8") Piping: Insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

3. Polyolefin: 1 inch thick.

END OF SECTION 230700

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.
2. Shop Drawings: For facility natural-gas piping layout.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: [100 psig (690 kPa)] minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Building: One distribution pressure. [0.5 psig (3.45 kPa) or less]

2.2 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and polyethylene (PE).

2.3 SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Corrugated stainless-steel tubing with polymer coating.

B. Strainers: ASTM A 126, Class B, cast-iron body, Y-pattern, full size of connecting piping, CWP rating of 125 psig (860 kPa). Include mesh startup strainer and perforated stainless-steel basket.

- C. Detectable Warning Tape: PE-film warning tape 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection; colored yellow.

2.4 MANUAL GAS-SHUTOFF VALVES

- A. General Requirements for Metallic, Manual Gas-Shutoff Valves: Comply with ASME B16.33.

- 1. CWP Rating: [125 psig (860 kPa)].

- B. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

- 1. Body: Bronze, complying with ASTM B 584.
 - 2. Ball: Chrome-plated brass.
 - 3. Stem: Bronze; blowout proof.
 - 4. Seats: Reinforced TFE; blowout proof.
 - 5. Packing: Separate packnut with adjustable stem-packing threaded ends.
 - 6. CWP Rating: 600 psig (4140 kPa).
 - 7. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 - 8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

- C. Bronze Plug Valves: MSS SP-78.

- 1. Body: Bronze, complying with ASTM B 584.
 - 2. Plug: Bronze.
 - 3. Operator: Square head or lug type with tamperproof feature where indicated.
 - 4. Pressure Class: 125 psig (862 kPa).
 - 5. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 - 6. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 EARTHQUAKE VALVES

- A. Earthquake Valves: ASCE 25: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.

2.6 ESCUTCHEONS AND FLOOR PLATES

- A. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- B. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- C. One-Piece Floor Plates: Cast-iron flange[**with holes for fasteners**].

PART 3 - EXECUTION

3.1 INDOOR PIPING INSTALLATION

- A. Install piping free of sags and bends.
- B. Install fittings for changes in direction and branch connections.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Piping Installed under Buildings: Install piping under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with a weatherproof vent cap.
- E. Install escutcheons at penetrations of interior walls, ceilings, and floors.
- F. Install gas stops for shutoff to appliances with low-pressure gas supply.
- G. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- H. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- I. Connect branch piping from top or side of horizontal piping.
- J. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- K. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- L. Connect gas piping to equipment and appliances with shutoff valves and unions. Install gas valve upstream from and within 72 inches (1800 mm) of each appliance using gas. Install union or flanged connections downstream from valves.
- M. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to the outdoors and terminate with weatherproof vent cap.
- N. Do not use natural-gas piping as grounding electrode.

3.2 PIPING JOINT CONSTRUCTION

- A. Threaded Joints: Thread pipe with tapered pipe threads complying with ASME B1.20.1.
- B. Joints in Steel Piping with Protective Coating: Apply joint-cover kits to pipe after joining to cover, seal, and protect joints.

3.3 VALVE INSTALLATION

- A. Install manual gas-shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

3.4 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG (3.45 kPa)

- A. Aboveground, distribution piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Drawn-temper copper tube with wrought-copper fittings and brazed joints.

3.5 ABOVEGROUND, MANUAL GAS-SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes NPS 2 (DN 50) and smaller shall be one of the following:
 - 1. One-piece, bronze ball valve with bronze trim.
- B. Valves in branch piping for single appliance shall be one of the following:
 - 1. One-piece, bronze ball valve with bronze trim.

END OF SECTION 231123

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.
2. For solvent cements and adhesive primers, documentation including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Hot-Water Heating Piping: 100 psi at 180 F.
2. Makeup-Water Piping: 80 psi at 150 F.
3. Condensate-Drain Piping: 150 F.
4. Air-Vent Piping: 200 F.
5. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 PIPES, TUBES, AND FITTINGS

A. Hard Copper Tubing: ASTM B 88, Type L with ASME B16.22 wrought-copper solder fittings and ASTM B 32, 95-5 tin antimony solder.

B. CPVC Pipe: ASTM F 441/F 441M, Schedule 40, plain ends with ASTM F 438, socket-type solvent welding fittings.

1. CPVC solvent cement shall have a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. PVC Pipe: ASTM D 1785, Schedule 40, plain ends with ASTM F 438, socket-type solvent welding fittings.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- D. Steel Pipe: ASTM A 53, Schedule 40, plain ends.
- E. Unions: ASME B16.39, malleable-iron, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.
- F. Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150 psi minimum working pressure, 250 deg F maximum operating temperature.
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded ends.

2.3 SPECIAL-DUTY VALVES

- A. Bronze, Calibrated-Orifice, Balancing Valves:
 - 1. Body: Bronze, ball or plug type with calibrated orifice or venturi.
 - 2. Pressure-Gage Connections: Integral seals for portable differential pressure meter.
 - 3. CWP Rating: Minimum 125 psi.
 - 4. Maximum Operating Temperature: 250 psi.
 - 5. Valve shall have integral pointer and calibrated scale to register degree of valve opening.
- B. Diaphragm-Operated, Pressure-Reducing Valves: ASME labeled.
 - 1. Body: Bronze or brass.
 - 2. Low inlet-pressure check valve.
 - 3. Inlet Strainer: Removable without system shutdown.
 - 4. Valve Seat and Stem: Noncorrosive.
 - 5. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.
- C. Diaphragm-Operated Safety Valves: ASME labeled.
 - 1. Body: Bronze or brass.
 - 2. Diaphragm: EPT.
 - 3. Wetted, Internal Work Parts: Brass and rubber.
 - 4. Inlet Strainer: Removable without system shutdown.
 - 5. Valve Seat and Stem: Noncorrosive.
 - 6. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and select to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

2.4 HYDRONIC SPECIALTIES

- A. Manual Air Vents:
- B. Bronze body and nonferrous internal parts; 150-psig working pressure, 225 deg F operating temperature; manually operated with screwdriver or thumbscrew; with NPS 1/8 (DN 6) discharge connection and NPS 1/2 (DN 15) inlet connection.

- C. Bladder-Type Expansion Tanks:
- D. Welded carbon steel, 125-psig working pressure, 375 deg F maximum operating temperature. Separate air charge from system water to maintain design expansion capacity, by means of a flexible bladder securely sealed into tank. Provide taps for pressure gage and air charging fitting, and drain fitting. Support vertical tanks with steel legs or base; support horizontal tanks with steel saddles. Tank, with taps and supports, shall be constructed, tested, and labeled according to ASME Pressure Vessel Code: Section VIII.

2.5 SLEEVES AND SLEEVE SEALS

- A. Galvanized-Steel Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- B. PVC Pipe: ASTM D 1785, Schedule 40.
- C. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- D. Stack-Seal Fitting: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with setscrews.

2.6 ESCUTCHEONS AND FLOOR PLATES

- A. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- B. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- C. One-Piece Floor Plates: Cast-iron flange.

2.7 PRESSURE GAGES AND TEST PLUGS

- A. Direct-Mounted, Dial-Type Pressure Gages:
 - 1. Standard: ASME B40.100.
 - 2. Case: Sealed.
 - 3. Movement: Mechanical, with link to pressure element and connection to pointer.
 - 4. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
 - 5. Pointer: Dark-colored metal.
 - 6. Window: Plastic.
 - 7. Ring: Metal.
 - 8. Accuracy: Grade B, plus or minus 2 percent of middle half of scale range.
- B. Test Plug: Corrosion-resistant brass or stainless-steel body with two self-sealing rubber core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping. Minimum pressure and temperature rating of 500 psig at 200 deg F.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
- B. Comply with requirements in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment" for seismic restraints.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping free of sags and bends and install fittings for changes in direction and branch connections.
- E. Use the fewest number of joints belowground and within floor slabs.
- F. Make reductions in pipe sizes using eccentric reducer fitting installed with level side up.
- G. Install branch connections to mains using T-fittings in main with takeoff out the bottom of the main, except for up-feed risers, which shall have swing joint and takeoff out the top of the main line.
- H. Install flexible connectors at inlet and discharge connections to pumps (except in-line pumps) and other vibration-producing equipment.
- I. Remove stems, seats, and packing of valves and accessible internal parts at piping specialties before soldering or brazing.
- J. Escutcheons and Floor Plates:
 - 1. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
 - 2. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 3. Install floor plates for piping penetrations of equipment-room floors.
 - 4. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

3.2 VALVE INSTALLATIONS

- A. Shutoff Duty: Use gate or ball valves.
- B. Throttling Duty: Use globe or ball valves.
- C. Install shutoff-duty valves at each branch connection to supply mains, at supply connection to each piece of equipment, and elsewhere as indicated.

- D. Install throttling-duty valves at each branch connection to return mains, at return connections to each piece of equipment, and elsewhere as indicated.
- E. Install calibrated plug valves on the outlet of each heating or cooling element and elsewhere as required to facilitate system balancing.
- F. Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage, consisting of a T-fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple and cap.
- G. Install check valves on each pump discharge and elsewhere as required to control flow direction.
- H. Install safety relief valves on hot-water generators and elsewhere as required by authorities having jurisdiction. Pipe discharge to floor drain without valves.
- I. Install manual air vents at high points in the system, at heat-transfer coils, and elsewhere as required for system air venting.
- J. Install valves with stem up. Allow clearance above stem for check mechanism removal.

3.3 TESTING, ADJUSTING, AND BALANCING

- A. Clean and flush hydronic piping systems. Remove, clean, and replace strainer screens.
- B. Hydrostatically test completed piping at a pressure one and one-half times operating pressure. Isolate equipment before testing piping. Repair leaks and retest piping until there are no leaks.

3.4 PIPING SCHEDULE

- A. Hot Water:
 - 1. All: PEX piping.
- B. Condensate Drain Lines: Drawn-temper copper tubing with soldered joints or PVC pipe with solvent-welded joints.

END OF SECTION 232113

SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:

1. Product Data: For each type of product indicated.
2. Documentation indicating that duct systems and accessories comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
3. Documentation indicating that duct systems comply with ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air Conditioning" and Section 6.4.4 - "HVAC System Construction and Insulation."
4. Documentation of work performed for compliance with ASHRAE 62.1, Section 7.2.4 - "Ventilation System Start-up."
5. For adhesives and sealants, documentation including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- E. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."
- F. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems" and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- G. Comply with NFPA 96 for ducts connected to commercial kitchen hoods.
- H. Comply with UL 181 for ducts and closures.

2.2 DUCTS

- A. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip galvanized coating.
 - 1. Galvanized Coating Designation: G60
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- B. Joint and Seam Tape, and Sealant: Comply with UL 181A.
- C. Rectangular Metal Duct Fabrication: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Volume Dampers and Control Dampers: Single-blade and multiple opposed-blade dampers, standard leakage rating, and suitable for horizontal or vertical applications; factory fabricated and complete with required hardware and accessories.
- E. Flexible Connectors: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- F. Flexible Ducts: Spiral-wound steel spring with flameproof vinyl sheathing complying with UL 181, Class 1.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Outdoor, Supply-Air Ducts: Seal Class A.
 - 2. Outdoor, Exhaust Ducts: Seal Class C.
 - 3. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg ((500 Pa)) and Lower: Seal Class C.
 - 4. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 5. Conditioned Space, Return-Air Ducts: Seal Class C.
- C. Conceal ducts from view in finished and occupied spaces.
- D. Avoid passing through electrical equipment spaces and enclosures.
- E. Support ducts to comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Hangers and Supports."
- F. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

- G. Install volume and control dampers in lined duct with methods to avoid damage to liner and erosion of duct liner.
- H. Clean duct system(s) before testing, adjusting, and balancing.

3.2 TESTING, ADJUSTING, AND BALANCING

- A. Balance airflow within distribution systems, including submains, branches, and terminals, to indicated quantities.

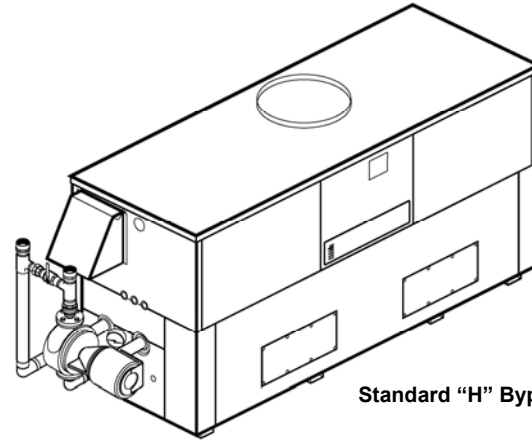
END OF SECTION 233100

Job: _____
 Engineer: _____
 Contractor: _____
 Prepared By: _____ Date: _____
 Model: _____ Indoor/Outdoor: _____ MBTUH Input: _____

Hi Delta® - Type P

Commercial Pool Heaters
 Models 992C-2342C

- ♦ 100% Factory Fire Tested
- ♦ Thermal Efficiency: 83.1%
- ♦ Versa IC® Controller with LCD Display
- ♦ Maximum Setpoint: 106°F (104°F Default)
- ♦ Maximum Outlet Temperature: 160°F
- ♦ Minimum Non-Condensing Inlet Temperature: 105°F
- ♦ Thermal-Shock Proof Heat Exchanger
- ♦ Limited Five-Year Heat Exchanger Warranty
- ♦ Full Safety Diagnostics with Fault History
- ♦ PolyTuf Powder Coated Cabinet
- ♦ No Combustible Floor Shield Required
- ♦ Fan-Assisted
- ♦ Patented Burner Security Blanket
- ♦ Ultra-Low NOx – SCAQMD 1146.2 Certified (992C – 2002C)
- ♦ Cascade Up To 4 Heaters – No External Sequencer Needed



Standard "H" Bypass Shown



Proudly Assembled in the USA

Heat Exchanger

- Brass Headers
- ASME Inspected and HLW Stamped 160 PSIG Working Pressure
- National Board Approved
- Cupro-Nickel Finned Tubing
- ASME Steel Tube Sheet
- Silicone High-Temp O-Rings
- 125 PSIG ASME Pressure Relief Valve
- Temperature and Pressure Gauge
- Water Connections
 - Left – Standard
 - A-6 – Right
- Bronze Pump, 1/2 HP, 120V, 60Hz
- Non-ferrous Pool Bypass Assembly

Controls

- 120V, 60Hz, 1Ø Power Supply
- 120/24V 60Hz Transformer
- Versa IC® Integrated Control
- Cascade up to 4 Heaters
- 100% Shut-Off/Lockout
- Hot Surface Ignition
- Ignition Module
 - 3-Try – Standard
 - C-6 Single Try
- Remote Flame Sensor
- Fixed High Limit, Manual Reset 180°F
- On/Off Power Switch
- Flow Switch
- Blocked Vent Pressure Switch
- Combustion Air Proving Switch
- Programmable Pump Time Delays
 - Heater
 - System
- Enable/Disable
- LCD Display; Status, Fault and Diagnostics

Controls – Cont.

- Modbus RTU BMS Port (Up to 115K Baud Rate, See Cat. 5000.73)
 - B-85 – BMS Gateway – BACnet MS/TP, BACnet IP, N2 Metasys or Modbus TCP
 - B-86 – BMS Gateway – LonWorks
- Cold Water Protection Function
 - CWR Variable-Speed Pump
 - Default H-Bypass

Gas Train

- Combination Valves
- On/Off Firing
- Fuel
 - Natural Gas
 - Propane Gas (HD-5) (Excludes 2002C)
 - G-20 4" WC Nat. Supply Pressure
- Design Certified ANSI Z21.56/CSA 4.7

Burner

- Ultra-low NOx: Less than 20 PPM

Construction

- Indoor/Outdoor Construction
- Enclosed Front Controls
- PolyTuf Powder Coat Finish
- CSA Low Lead Certified ≤ .25% Lead

Venting

- Vent Location
 - Top – Standard
 - D-14 Rear
- Vent Termination Cap
 - D-11 Outdoor
 - D-15 Horizontal
 - Indoor, Vertical (by others)
- Combustion Air
 - D-17 In-Line Filter Kit (TruSeal only)
 - D-16 Air Intake Elbow

Venting – Cont.

- Extractor - Optional
 - By Others
 - Not Required

Options

- C-6 Ignition Module, Manual Reset
- D-21 TruSeal® Direct Vent
 - Left Side - Standard
 - Right Side - Optional
- F-10 Low Water Cut-Off, Remote Probe
- S-1 Low Gas Pressure Switch, Manual Reset
- S-2 High Gas Pressure Switch, Manual Reset
- X-1 SureRack® Kit (Lower Unit Requires Manifold Modification)
- X-2 SureRack Add-On (Lower Unit Requires Manifold Modification)

Additional Options or Accessories

Multi-Heater Controllers

- B-36 2 – 4 Heaters
- B-37 5 – 10 Heaters
- B-38 11 – 16 Heaters
- B-39 EMS 4-20mA Remote Setpoint Module
- B-62 BACnet MS/TP Interface

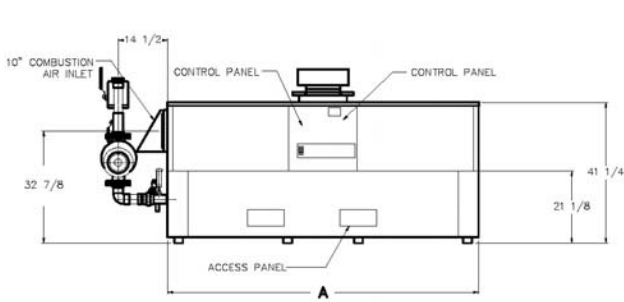


Raypak
 A Rheem Company

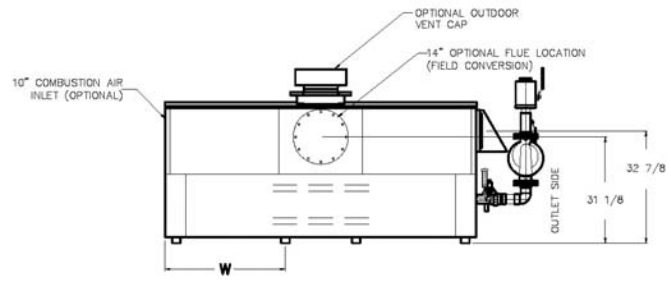
Hi Delta – Type P

Models 1532C-2342C (H-Bypass Option)

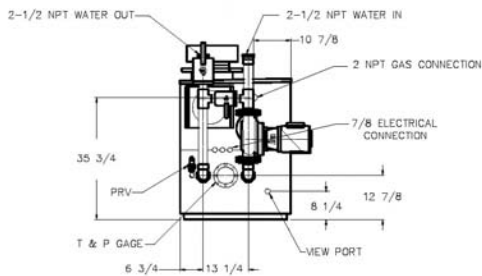
Model _____



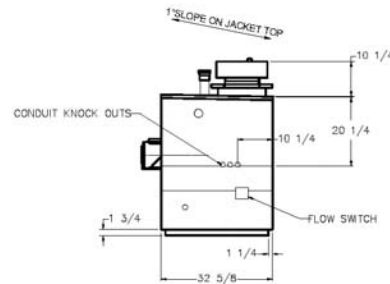
FRONT



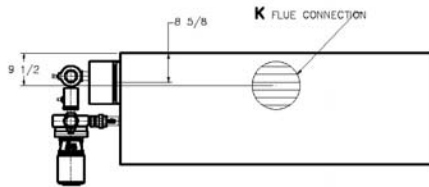
BACK ROTATED 180°



LEFT

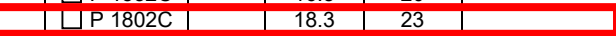


RIGHT

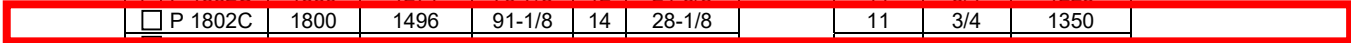


TOP

Rate of Heat Exchanger Flow and Pressure Drop and Temperature Rise			
Model	GPM	ΔP (ft.)	ΔT (°F)
<input type="checkbox"/> P 1532C	132	16.5	20
<input type="checkbox"/> P 1802C		18.3	23
<input type="checkbox"/> P 2002C		19.0	26
<input type="checkbox"/> P 2072C		19.0	27
<input type="checkbox"/> P 2342C		21.4	30



Model	MBTUH		A Width	K	W	Amp. Draw		Pump HP	Shipping Weight (Lbs.)
	Input	Output 83.1%				Heater	Pump		
<input type="checkbox"/> P 1532C	1530	1271	79-7/8	12	24-3/8		11	3/4	1225
<input type="checkbox"/> P 1802C	1800	1496	91-1/8	14	28-1/8		11	3/4	1350
<input type="checkbox"/> P 2002C	1999	1661	102-1/2	14	31-13/16	<12	14	1	1450
<input type="checkbox"/> P 2072C	2070	1720	102-1/2	14	31-15/16		14**	1	1450
<input type="checkbox"/> P 2342C	2070	1945	113-7/8	16	35-11/16		21**	1-1/2	1520



- NOTES:
- Dimensions are in inches.
 - Rates shown are for natural or propane gas, and elevations up to 4,500 feet. For installation above 4,500 feet, please contact manufacturer.
- ** Requires separate circuit breaker

Outdoor Stack Assembly

For Hi Delta[®]
Models 302B – 2342B

Job: _____

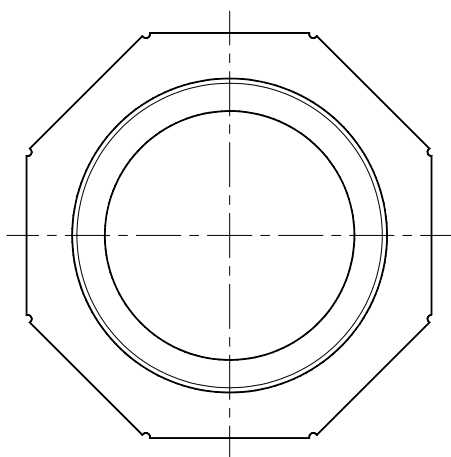
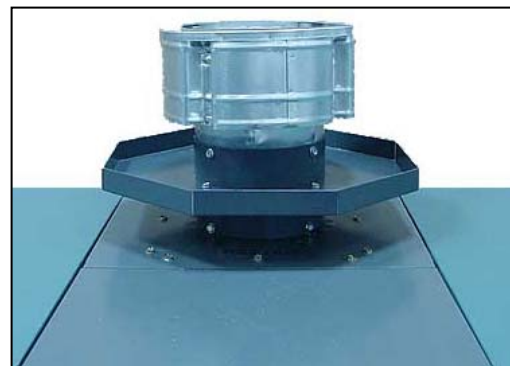
Engineer: _____

Contractor: _____

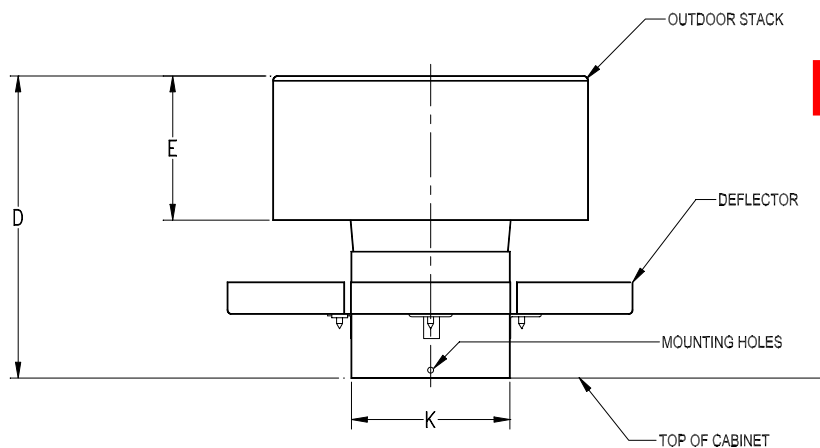
Prepared By: _____ Date: _____

Features

- Low-profile
- Wind-resistant
- Lightweight
- Outdoor use
- Includes covers for combustion air inlet, flow switch and pump



TOP VIEW



FRONT VIEW

Hi Delta Model No.	Part No.	D	E	K
302B	010793	9 ½	7 ½	5
402B-502B	010794	11	9	6
652B-902B	010795	12	10	8
992B	010796	12 ½	10 ½	10
1262B-1532B	010797	14	12	12
1802B-2072B	010798	16	14	14
2342B	010799	17	16	16



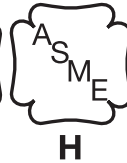
Raypak, Inc. ▪ 2151 Eastman Avenue, Oxnard, CA 93030 ▪ (805) 278-5300 ▪ Fax (800) 872-9725 ▪ www.raypak.com



INSTALLATION & OPERATING INSTRUCTIONS



Models 992C-2342C
Types H, WH & P



WARNING: If these instructions are not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

FOR YOUR SAFETY: Do not store or use gasoline or other flammable vapors and liquids or other combustible materials in the vicinity of this or any other appliance. To do so may result in an explosion or fire.

WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

This manual should be maintained in legible condition and kept adjacent to the heater or in another safe place for future reference.

Raypak[®]
A Rheem[®] Company

Revision 2 reflects the following changes:
Removed California Proposition 65 warning on page 4.

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WARNINGS

Pay Attention to These Terms

DANGER:	Indicates the presence of immediate hazards which will cause severe personal injury, death or substantial property damage if ignored.
WARNING:	Indicates the presence of hazards or unsafe practices which could cause severe personal injury, death or substantial property damage if ignored.
CAUTION:	Indicates the presence of hazards or unsafe practices which could cause minor personal injury or product or property damage if ignored.
NOTE:	Indicates special instructions on installation, operation, or maintenance which are important but not related to personal injury hazards.

DANGER: Make sure the gas on which the heater will operate is the same type as that specified on the heater rating plate.

WARNING: Should overheating occur or the gas supply valve fail to shut, do not turn off or disconnect the electrical supply to the heater. Instead, shut off the gas supply at a location external to the heater.

WARNING: To minimize the possibility of improper operation, serious personal injury, fire, or damage to the heater:

- Always keep the area around the heater free of combustible materials, gasoline, and other flammable liquids and vapors.
- Heater should never be covered or have any blockage to the flow of fresh air to the heater.

WARNING: Do not use this heater if any part has been under water. Immediately call a qualified service technician to inspect the heater and to replace any part of the control system and any gas control which has been under water.

WARNING: All venting types must be of the same material or product throughout the entire exhaust installation to ensure proper securing and sealing.

WARNING: Both natural gas and propane have an odorant added to aid in detecting a gas leak. Some people may not physically be able to smell or recognize this odorant. If you are unsure or unfamiliar with the smell of natural gas or propane, ask your local gas supplier. Other conditions, such as "odorant fade," which causes the odorant to diminish in intensity, can also hide, camouflage, or otherwise make detecting a gas leak by smell more difficult.

WARNING: UL recognized fuel gas detectors are recommended in all enclosed propane and natural gas applications wherein there is a potential for an explosive mixture of fuel gas to accumulate and their installation should be in accordance with the detector manufacturer's recommendations and/or local laws, rules, regulations, or customs.

WARNING: Risk of electrical shock. More than one disconnect switch may be required to deenergize the equipment before servicing.

CAUTION: Operation of this heater in low-temperature systems requires special piping. Harmful internal condensation will occur if the inlet water temperature does not exceed 105°F. Warranty claims will be denied when condensation occurs.

CAUTION: If this heater is to be installed above radiation level, it must be provided with a low water cut-off device at the time of heater installation.

CAUTION: If this heater is to be installed in a negative or positive pressure equipment room, there are special installation requirements. Consult factory for details.

BEFORE INSTALLATION

Raypak strongly recommends that this manual be reviewed thoroughly before installing your Hi Delta® heater. Please review the General Safety information before installing the heater. Factory warranty does not apply to heaters that have been improperly installed or operated. (Refer to the warranty at the back of this manual.) Installation and service must be performed by a qualified installer, service agency or gas supplier. If, after reviewing this manual, you still have questions which this manual does not answer, please contact the manufacturer or your local Raypak representative.

Thank you for purchasing a Raypak product. We hope you will be satisfied with the high quality and durability of our equipment.

Product Receipt

On receipt of your heater it is suggested that you visually check for external damage to the shipping crate. If the crate is damaged, make a note to that effect on the Bill of Lading when signing for the shipment. Remove the heater from the shipping packaging. Report any damage to the carrier immediately.

On occasion, items are shipped loose. Be sure that you receive the correct number of packages as indicated on the Bill of Lading.

Claims for shortages and damages must be filed with the carrier by consignee. Permission to return goods must be received from the factory prior to shipping. Goods returned to the factory without an authorized Returned Goods Receipt number will not be accepted. All returned goods are subject to a restocking charge.

When ordering parts, you must specify the model and serial number of the heater. When ordering under warranty conditions, you must also specify the date of installation.

Purchased parts are subject to replacement only under the manufacturer's warranty. Debits for defective replacement parts will not be accepted and will be replaced in kind only per Raypak's standard warranties.

Model Identification

The model identification number and heater serial number are found on the heater rating plate located on the lower right outside jacket of the heater. The model

number will have the form H9-1262C or similar depending on the heater size and configuration. The letter(s) in the first group of characters identifies the application (H = Hydronic Heating, WH = Domestic Hot Water, P = Pool). The number which follows identifies the firing mode (3 = 2-stage, 8 = 3-stage and 9 = 4-stage). The second group of characters identifies the size of the heater (four numbers representing the approximate MBTUH input), and, where applicable, a letter, indicating the manufacturing series.

Ratings and Certifications

Standards:

- ANSI Z21.13 · CSA 4.9 - latest edition, Gas-Fired Hot Water Boilers
- CAN1 3.1 - latest edition, Industrial and Commercial Gas-Fired Package Boilers
- ANSI Z21.56 · CSA 4.7 - latest edition Gas-Fired Pool Heaters
- ANSI Z21.10.3 · CSA 4.3 - latest edition Gas Water Heaters
- CSA certified compliance with California AB1953 and Vermont Legislative Act 193 requirements.

All Raypak heaters are National Board registered, and design-certified and tested by the Canadian Standards Association (CSA) for the U.S. and Canada. Each heater is constructed in accordance with Section IV of the American Society of Mechanical Engineers (ASME) Heater Pressure Vessel Code and bears the ASME stamp. The heater also complies with the latest edition of ASHRAE 90.1 Standard.

WARNING: Altering any Raypak pressure vessel by installing replacement heat exchangers, tube bundle headers, or any ASME parts not manufactured and/or approved by Raypak will instantly void the ASME and CSA ratings of the vessel and any Raypak warranty on the vessel. Altering the ASME or CSA ratings of the vessel also violates national, state, and local approval codes.

Installations at Elevation

Rated inputs are suitable for up to 4,500 ft elevation without de-rating. Consult the factory for installations at altitudes over 4,500 ft above sea level. Orifices are not affected.

Component Locations

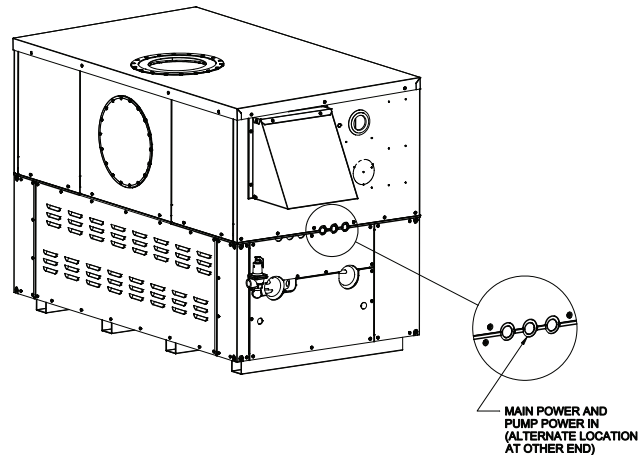


Fig. 1: Component Locations – Back

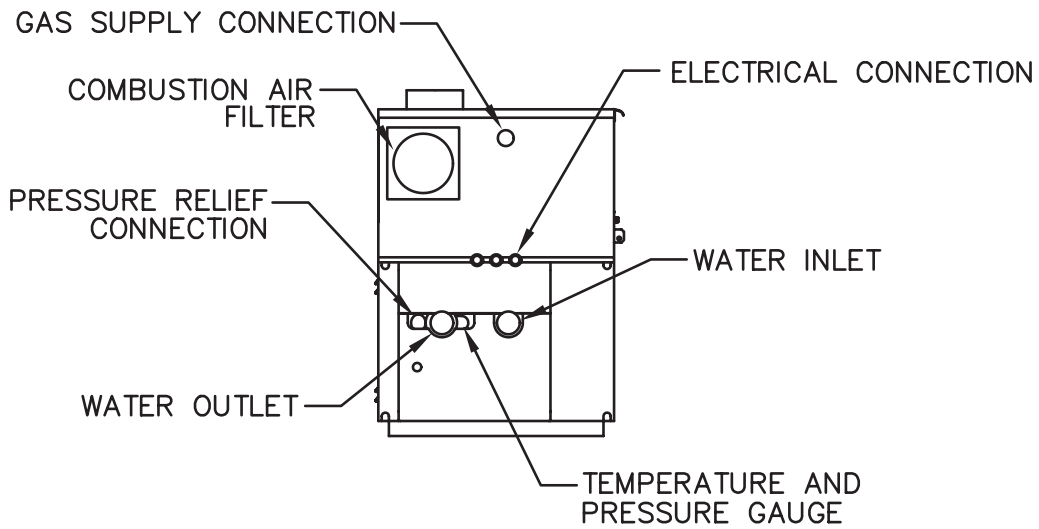
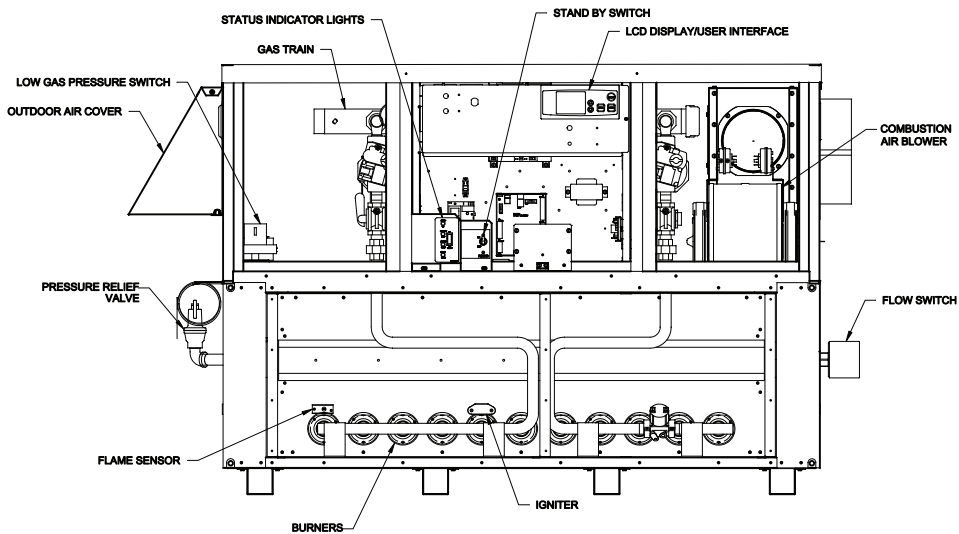


Fig. 2: Component Locations – Left Side



Panels removed for clarity
Fig. 3: Component Locations – Front

General Information

Model No.	Quantity of			Vent Size (in.)	
	Burners	Gas Valves	Blowers	Flue	Intake
992C	11	2 + 1*	2	10	10
1262C	14	3 + 1*	2	12	10
1532C	17	4	2	12	10
1802C	20	4	2	14	10
2002C	23	5	3	14	10
2072C	23	5	3	14	10
2342C	26	5	3	16	10

*Hidden solenoid valve located inside of air plenum.

Table A: Basic Data

Model No.	Burners per Valve					Stages				% Fire at Stages			
	1	1A	2	3	4	1	2	3	4	1	2	3	4
992C	6		3	2		1	1, 2	1, 2, 3		54	82	100	
1262C	5		3	3	3	1	1, 2	1, 2, 3	1, 2, 3, 4	36	57	79	100
1532C	6		4	4	3	1	1, 2	1, 2, 3	1, 2, 3, 4	35	59	82	100
1802C	6		4	5	5	1	1, 2	1, 2, 3	1, 2, 3, 4	30	50	75	100
2002C	4	5	5	5	4	1, 1A	1, 1A, 2	1, 1A, 2, 3	1, 1A, 2, 3, 4	39	61	83	100
2072C	4	5	5	5	4	1, 1A	1, 1A, 2	1, 1A, 2, 3	1, 1A, 2, 3, 4	39	61	83	100
2342C	5	6	5	5	5	1, 1A	1, 1A, 2	1, 1A, 2, 3	1, 1A, 2, 3, 4	42	62	81	100

Table B: Manifold Data

GENERAL SAFETY

To meet commercial hot water use needs, the high limit safety control on this water heater is adjustable up to 210°F. However, water temperatures over 125°F can cause instant severe burns or death from scalds. When supplying general purpose hot water, the recommended initial setting for the temperature control is 125°F.


Safety and energy conservation are factors to be considered when setting the water temperature on the thermostat. The most energy-efficient operation will result when the temperature setting is the lowest that satisfies the needs of the application.

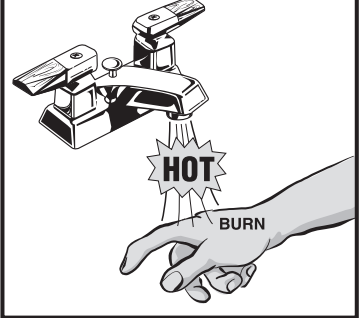
Water temperature over 125°F can cause instant severe burns or death from scalds. Children, disabled and elderly are at highest risk of being scalded.

- Feel water before bathing or showering.
- Temperature limiting valves are available.

NOTE: When this water heater is supplying general purpose hot water for use by individuals, a thermostatically controlled mixing valve for reducing point of use water temperature is recommended to reduce the risk of scald injury. Contact a licensed plumber or the local plumbing authority for further information.

Maximum water temperatures occur just after the heater’s burner has shut off. To determine the water temperature being delivered, turn on a hot water faucet and place a thermometer in the hot water stream and read the thermometer.


DANGER



Water temperature over 125°F can cause instant severe burns or death from scalds.

Children, disabled, and elderly are at highest risk of being scalded.

See instruction manual before setting temperature at water heater.

Feel water before bathing or showering.

Temperature limiting valves are available, see manual.

Time/Temperature Relationships in Scalds

The following chart details the relationship of water temperature and time with regard to scald injury and may be used as a guide in determining the safest water temperature for your applications.

Water Temp.	Time to Produce Serious Burn
120°F	More than 5 minutes
125°F	1-1/2 to 2 minutes
130°F	About 30 seconds
135°F	About 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	About 1-1/2 seconds
155°F	About 1 second

Table courtesy of The Shriners Burn Institute

Table C: Time to Produce Serious Burn

The temperature of the water in the heater can be regulated by adjusting the setpoint, this process is fully described in the manual in the “Controls” section (see page 47).

For accurate control of water temperature, the sensors must be properly installed according with the piping configuration, see “Applications & Modes” section for detailed information (see page 19).

CAUTION: Hotter water increases the risk of scalding! There is a hot water scald potential if the thermostat is set too high.

Temperature & Pressure Gauge

The temperature and pressure gauge is factory-mounted in the in/out header.

INSTALLATION

Installation Codes

Installations must follow these codes:

- Local, state, provincial, and national codes, laws, regulations and ordinances
- National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition (NFGC)
- National Electrical Code, ANSI/NFPA 70 - latest edition (NEC)
- Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1, when required (CSD-1)
- For Canada only: CAN/CSA B149 Installation Code (B149) and CSA C22.1 C.E.C. Part 1 (C22.1)

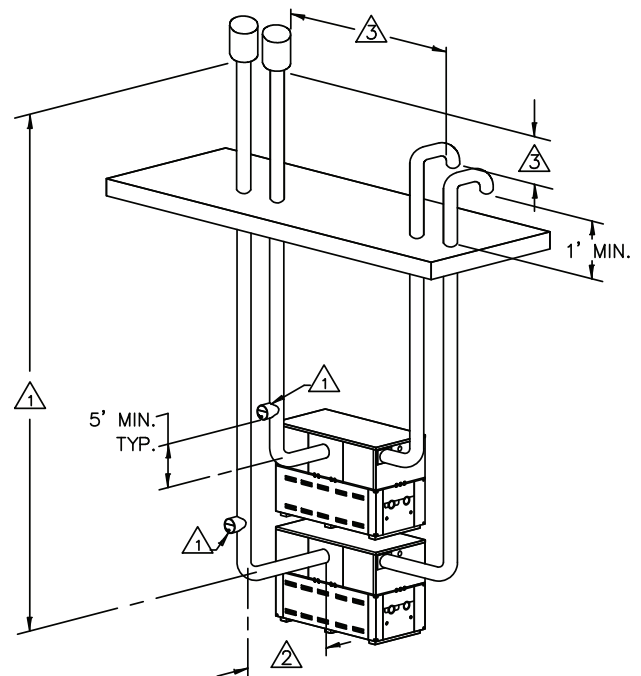
Equipment Base

The heater should be mounted on a level, structurally sound surface. The heater is approved for installation on a combustible surface but must NEVER be installed on carpeting. Gas-fueled equipment installed in enclosed parking garages must be located at least 18 in. above the floor.

Stacking

Hi Delta units can be stacked two units high with an optional stacking rack. A stacking kit (sales order option X-1) is available from Raypak for this type of installation. For installations above grade, a reinforcing kit (sales order option X-2) may also be required.

CAUTION: The heaters should be located in an area where water leakage will not result in damage to the area adjacent to the appliances or to the structure. When such locations cannot be avoided, it is recommended that a suitable catch pan, adequately drained, be installed under the appliance. The pan must not restrict air flow.



NOTE:

- △1 FOR CAT I VENT HEIGHT UP TO 25 FEET, NO DRAFT RELIEF REQUIRED. FOR CAT I VENT HEIGHT 25–50 FEET, USE A SINGLE-ACTING BAROMETRIC DAMPER AS SHOWN. FOR CAT I VENT HEIGHT OVER 50 FEET, USE A BALANCING BAFFLE IMMEDIATELY ABOVE THE DAMPER.
- △2 PER NATIONAL FUEL GAS CODE (NFGC).
- △3 REQUIRED SEPARATION IS 3 FEET VERTICAL OR 3 FEET HORIZONTAL.

Fig. 4: Typical Stacked Installation

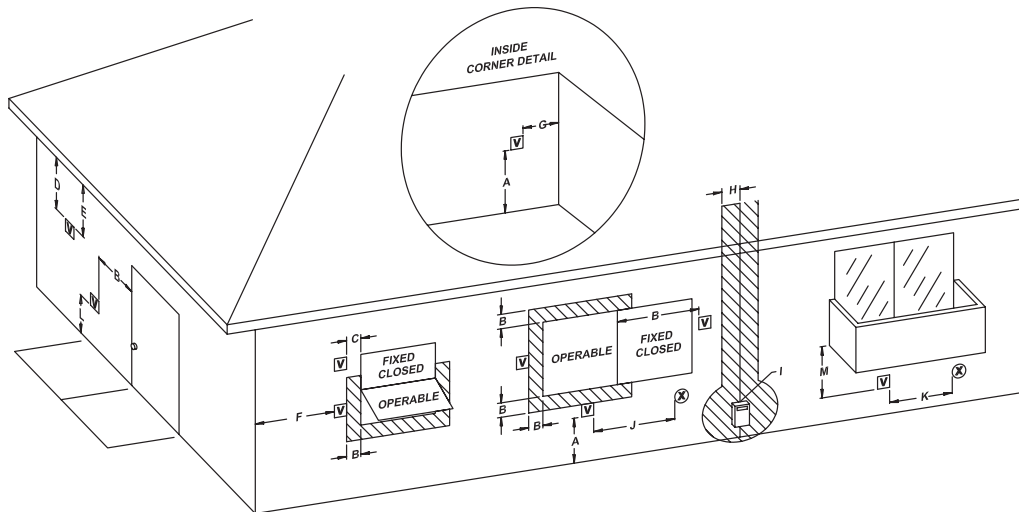


Fig. 5: Minimum Clearances from Vent/Air Inlet Terminations – Indoor and Outdoor Installations

		U.S. Installations¹	Canadian Installations²
A	Clearance above grade, veranda, porch, deck, or balcony	1 ft (30 cm)	1 ft (30 cm)
B	Clearance to window or door that may be opened	4 ft (1.2m) below or to side of opening; 1 foot (30 cm) above opening	3 ft (91 cm)
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 ft (61cm) from the centerline of the terminal	5 ft (1.5m)	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	6 ft (1.83m)	*
H	Clearance to each side of center line extended above meter/regulator assembly	*	3 ft (91 cm) within a height 15 ft above the meter/regulator assembly
I	Clearance to service regulator vent outlet	*	6 ft (1.83m)
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	4 ft (1.2m) below or to side of opening; 1 ft (30 cm) above opening	3 ft (91 cm)
K	Clearance to mechanical air supply inlet	3 ft (91 cm) above if within 10 ft (3m) horizontally	6 ft (1.83m)
L	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13m)	7 ft (2.13m) ^t
M	Clearance under veranda, porch, deck or balcony	*	12 in. (30 cm) ^{TT}

¹ In accordance with the current ANSI Z223.1/NFPA 54 National Fuel Gas Code

² In accordance with the current CAN/CSA-B149 Installation Codes

^t Vent terminal shall not terminate directly above sidewalk or paved driveway located between 2 single family dwellings that serves both dwellings

^{TT} Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor and top of terminal and underside of veranda, porch, deck or balcony is greater than 1 ft (30cm)

* Clearances in accordance with local installation codes and the requirements of the gas supplier

Table D: Vent/Air Inlet Termination Clearances

In addition, the heater shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation or service (circulator replacement, control replacement, etc.).

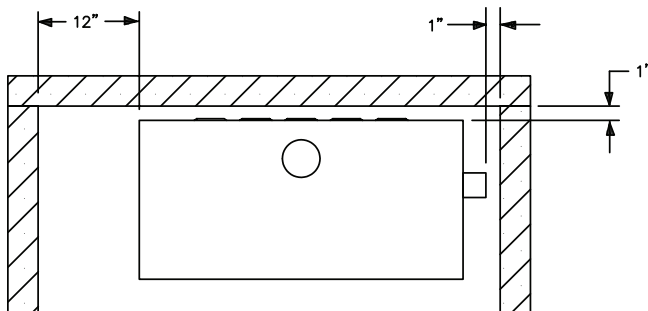
Clearances

Indoor Installations

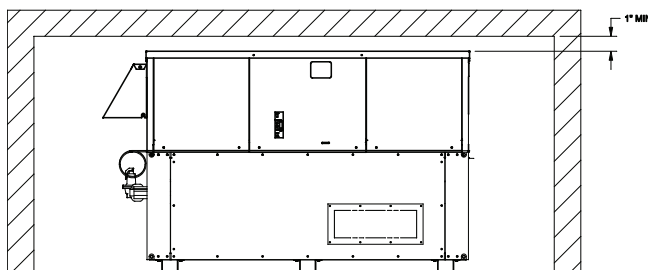
Heater Side	Minimum Clearance from Combustible Surfaces	Recommended Service Clearance
Floor*	0"	0"
Rear	1"	6"
Water Side	12"	24"
Other Side	1"	24"
Top	1"	6"
Front	Open	24"
Vent	2"	2"

* DO NOT install on carpeting.

Table E: Clearances – Indoor Installations



Top View



Front View

Fig. 6: Minimum Clearances from Combustible Surfaces – Indoor Installations

When installed according to the listed minimum clearances from combustible construction, these heaters can still be serviced without removing permanent structural construction around the heater. Combustible clearances can be reduced per the NFGC; see paragraph 10.2.3. However, for ease of servicing, we recommend a clearance of at least 24 in. in front, and at least 12 in. on the water connection side. This will allow the heater to be serviced in its installed location without movement or removal of the heater.

Service clearances less than the minimums may require removal of the heater to service either the heat exchanger or the burner tray. In either case, the heater must be installed in a manner that will enable the heater to be serviced without removing any structure around the heater.

Outdoor Installations

These heaters are design-certified for outdoor installation. Heaters must not be installed under an overhang that is less than 3 ft from the top of the heater. Three sides must be open in the area under the overhang. Roof water drainage must be diverted away from heaters installed under overhangs.

Heater Side	Min. Clearance from Combustible Surfaces	Recommended Service Clearance
Front	Open	24"
Rear	12"	6"
Water Side	36"	36"
Other Side	36"	36"
Top	Unobstructed	36"
Vent	N/A	N/A

Table F: Clearances – Outdoor Installations

These clearances are required when the outdoor vent cap is used. If installing the heater outdoors with a vent stack, the indoor clearances may be utilized.

The combustion air intake hood **MUST** be used for outdoor installations. The hood is shipped loose and installed on the side of the heater over the filter box at the jobsite.

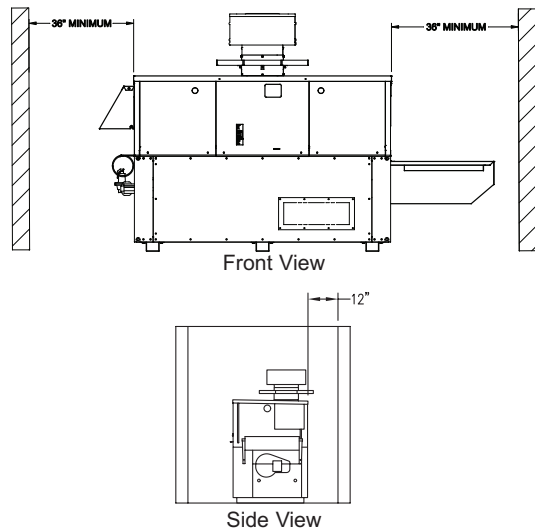


Fig. 7: Minimum Clearances from Combustible Surfaces – Outdoor Installations

1. Remove the four screws and the dust cover from the right-hand side of the heater.
2. Remove the four screws and the air filter bracket from the left-hand side of the heater.
3. Reverse the components and reattach in the new location, making sure that the air filter locking bracket is on the bottom. (The air filter locking bracket is reversible.)

Direct Vent

If outside air is drawn through the intake pipe directly to the unit for combustion:

1. Install combustion air direct vent in accordance with Fig. 31 (horizontal) or Fig. 32 (vertical) of this manual (pages 33 and 34, respectively).
2. Ventilation of the space occupied by the heater(s) is recommended and can be provided by an opening(s) for ventilation air at within 12" of the ceiling or the highest practical point communicating with the outdoors. The total cross-sectional area should be at least 1 in.² of free area per 20,000 BTUH (111 mm² per kW) of total input rating of all equipment in the room when the opening is communicating directly with the outdoors or through vertical duct(s). The total cross-sectional area should be at least 1 in.² of free area per 10,000 BTUH (222 mm² per kW) of total input rating of all equipment in the room when the opening is communicating with the outdoors through horizontal duct(s). Damage to the equipment due to inadequate ventilation of the space is not a warrantable failure.

Combustion and Ventilation Air

NOTE: Use of the heater in construction areas where fine particulate matter, such as concrete or dry-wall dust, is present may result in damage to the heater that is not covered by the warranty. If operated in a construction environment, a clean source of combustion air must be provided directly to the heater.

Indoor Units

The heater must be supplied with sufficient quantities of non-contaminated air to support proper combustion and equipment ventilation. Combustion air can be supplied via conventional means where combustion air is drawn from the area immediately surrounding the heater, or via direct vent, where combustion air is drawn directly from outside. All installations must comply with the requirements of the NFGC (U.S.) and B149 (Canada), and all local codes.

CAUTION: Combustion air must not be contaminated by corrosive chemical fumes which can damage the heater and void the warranty. (See the Appendix.)

NOTE: It is recommended that the intake vent be insulated to minimize sweating.

Reversing Air Filter

Follow these instructions to change the air duct connection from the left-hand side (standard) to the right-hand side:

NOTE: In cold climates, and to mitigate potential freeze-up, Raypak highly recommends the installation of a motorized sealed damper to prevent the circulation of cold air through the heater during the non-operating hours.

Direct-Ducted Combustion Air

In certain applications it may be desirable to duct the combustion air directly to the heater. This should be done with PVC, CPVC or single-wall galvanized ducting. The duct will attach directly to the collar on the air filter housing located on the side of the heater. The ducting is attached to the air filter housing collar using

three or four sheet metal screws (not supplied) equally distributed around the circumference of the duct. All ducting should be self-supported. The filter housing is not designed to support the air duct.

CAUTION: Use TruSeal combustion air if damaging airborne contaminants are or will be present in the heater area. See the Appendix regarding air contamination.

TruSeal® Combustion Air

In certain applications it may be necessary to utilize the TruSeal option (sales order option D-21 or D-22) and duct the combustion air directly to the blower. Combustion air may be ducted directly to the heater by using PVC, CPVC or sealed single-wall galvanized ducting. The duct will attach directly to the air collar located on the side of the heater, using three or four sheet metal screws (not supplied) equally positioned around the circumference of the duct. The screws and duct connection point must be sealed with RTV (not supplied). An in-line intake air filter kit (sales order option D-17) must be installed in the combustion air duct. TruSeal is generally used when damaging contaminants are present in the mechanical room.

TruSeal heater connection points are available as follows:

992C to 1802C	Left side – standard Right side – optional
2002C to 2342C	Right side only

CAUTION: This type of installation is recommended if damaging airborne contaminants are or will be present in the heater area. See the Appendix regarding air contamination.

Conventional Combustion Air Supply

U.S. Installations

All Air from Inside the Building

The confined space shall be provided with **TWO** permanent openings communicating directly with an additional room(s) of sufficient volume so that the combined volume of all spaces meets the criteria for a room large in comparison (NFGC). The total input of all gas utilization equipment installed in the combined

space shall be considered in making this determination. Each opening shall have a minimum free area of 1 in.² per 1,000 BTUH (2,225 mm² per kW) of the total input rating of all gas utilization equipment in the confined space, but not less than 100 in.² (645 cm²). One opening shall commence within 12 in. (305 mm) of the top, and one opening shall commence within 12 in. (305 mm) of the bottom of the enclosure. The minimum dimension of air openings shall be not less than 3 in. (76 mm) in any direction.

All Air from Outdoors

The confined space shall communicate with the outdoors in accordance with one of the methods below. The minimum dimension of air openings shall not be less than 3 in. (76 mm) in any direction. Where ducts are used, they shall be of the same cross-sectional area as the net free area of the openings to which they connect.

1. **Two permanent openings**, one commencing within 12 in. (305 mm) of the top, and one commencing within 12 in. (305 mm) of the bottom of the enclosure, shall be provided. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.
 - a. Where directly communicating with the outdoors or where communicating to the outdoors through vertical ducts, each opening shall have a minimum free area of 1 in.² per 4,000 BTUH (550 mm² per kW) of total input rating of all equipment in the enclosure.
 - b. Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 in.² per 2,000 BTUH (1,100 mm² per kW) of total input rating of all equipment in the enclosure.
2. **One permanent opening**, commencing within 12 in. (305 mm) of the top of the enclosure, shall be permitted where the equipment has clearances of at least 1 in. (25 mm) from the sides and back and 6 in. (152 mm) from the front of the appliance. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces that freely communicate with the outdoors, and shall have a minimum free area of:
 - a. 1 in.² per 3,000 BTUH (740 mm² per kW) of the total input rating of all equipment located in the enclosure, and

- b. Not less than the sum of the areas of all vent connectors in the confined space.

WARNING: Do not use one permanent opening method if the equipment room is under negative pressure conditions or the equipment is common vented with other gas-fired appliances.

Canadian Installations

CAUTION: All combustion air must be drawn from the air outside of the building; the mechanical equipment room must communicate directly with the outdoors.

1. Ventilation of the space occupied by the heater shall be provided by an opening(s) for ventilation air at the highest practical point communicating with the outdoors. The total cross-sectional area of such an opening(s) shall be at least 10% of the area required in 2. and 3. (below), but in no case shall the cross-sectional area be less than 10 in.² (65 cm²).
2. For heaters using a barometric damper in the vent system there shall be a permanent air supply opening(s) having a cross section area of not less than 1 in.² per 7,000 BTUH (320 mm² per kW) up to and including 1 million BTUH, plus 1 in.² per 14,000 BTUH (160 mm² per kW) in excess of 1 million BTUH. This opening(s) shall be either located at or ducted to a point not more than 18 in. (450 mm) nor less than 6 in. (152 mm) above the floor level. The duct can also “goose neck” through the roof. The duct is preferred to be straight down and terminated 18 in. (450 mm) from the floor, but not near piping. This air supply opening requirement shall be in addition to the air opening for ventilation air required in 1. (above).

WARNING: Care must be taken to ensure that the equipment room is not under negative pressure conditions or that the equipment is not common-vented with other gas-fired appliances.

3. For heaters not using a barometric damper in the vent system, and when air supply is provided by natural air flow from outdoors for a power burner and there is no draft regulator, draft hood or similar flue gas dilution device installed in the same space, in addition to the opening for ventilation air required in 1., there shall be a permanent air supply opening(s) having a total cross-sectional area

of not less than 1 in.² for each 30,000 BTUH mm² per kW) of total rated input of the burner(s), and the location of the opening(s) shall not interfere with the intended purpose of the opening(s) for ventilation air referred to in (1). This opening(s) can be ducted to a point not more than 18 in. (450 mm) nor less than 6 in. (152 mm) above the floor level. The duct can also “goose neck” through the roof. The duct is preferred to be straight down 18 in. (450 mm) from the floor, but not near piping.

4. Refer to B149 Installation code for additional information.

Water Piping

General

The heater should be located so that any water leaks will not cause damage to the adjacent area or structures.

CAUTION: This heater requires forced water circulation when the burner is operating. See Table G and Table H for minimum and maximum flow rates and water pump selection. The pump must be interlocked with the heater to prevent heater operation without water circulation.

NOTE: Minimum pipe size for in/out connections is 2 ½ NPT. Verify proper flow rates and ΔT as instructed in this manual.

Reversing Water Connections

Follow these instructions to change the water connections from the left-hand side (standard) to the right-hand side.

1. Disconnect all electrical power from the heater (if applicable).
2. Label all electrical connections and conduit lines. This may include the flow switch, low water cut-off probe and/or pump.
3. Disconnect or isolate the main gas pipe from the heater (if applicable).
4. Remove both in/out and return header access panels by removing all sheet metal screws.

5. Remove all plumbing fittings to the header. This will include both inlet and outlet water pipe unions and the pressure relief valve and drain piping.
6. Remove limits, control bulbs and/or thermocouples.
7. Remove the eight flange nuts and the in/out header from the left-hand side.
8. Remove the eight flange nuts and the return header from the right-hand side.
9. Reverse the headers to the new location.
10. Install NEW red beveled O-rings flush against both tube sheets with the bevel facing outward.
11. Push the header firmly against the O-rings. Install and tighten the flange nuts onto the stud bolts until finger tight.
12. Slowly tighten the flange nuts, starting from the center nut (number 1) in Fig. 8 and working sequentially around the header as indicated. Torque all nuts to 25 ft/lb. **DO NOT OVER-TIGHTEN.**
13. Re-route the capillary(s), wiring etc. to the new location, adding thermal paste and shim to the capillary well.

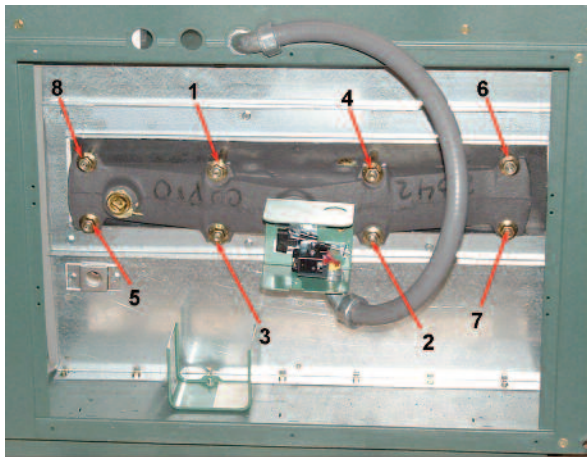


Fig. 8: Torque Sequence

Relief Valve Piping

WARNING: Pressure relief valve discharge piping must be piped near the floor and close to a drain to eliminate the potential of severe burns. Do not pipe to any area where freezing could occur. Refer to local codes.

Hydrostatic Test

Unlike many types of heaters, this heater does not require hydrostatic testing prior to being placed in operation. The heat exchanger has already been factory-tested and is rated for 160 psi operating pressure. However, Raypak does recommend hydrostatic testing of the piping connections to the heater and the rest of the system prior to operation. This is particularly true for hydronic systems using expensive glycol-based anti-freeze. Raypak recommends conducting the hydrostatic test before connecting gas piping or electrical supply.

Leaks must be repaired at once to prevent damage to the heater. NEVER use petroleum-based stop-leak compounds.

To perform hydrostatic test:

1. Connect fill water supply. With bleed valve open, fill heater with water. When water flows from bleed valve, shut off water. Close bleed valve. Carefully fill the rest of the system, making sure to eliminate any entrapped air by using high-point vents. Close feed valve. Test at standard operating pressure for at least 24 hours.
2. Make sure constant gauge pressure has been maintained throughout test.
3. Check for leaks. Repair if found.

Cold Water Protection (CWP)

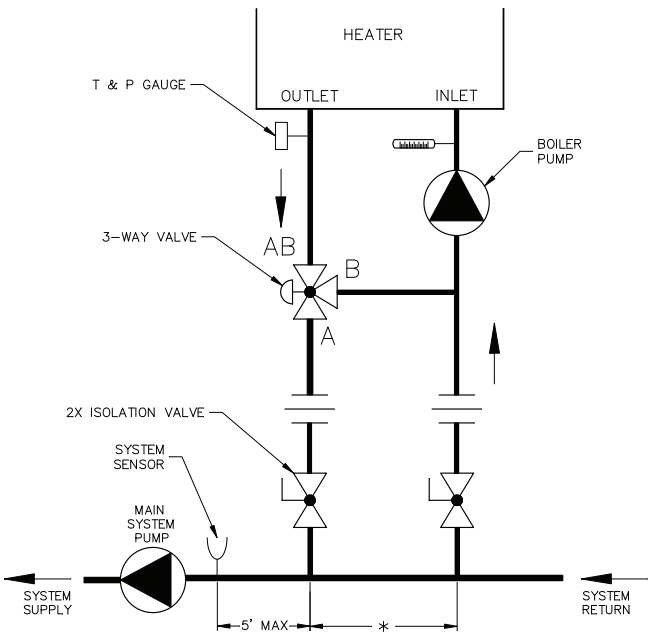
This heater must operate with a stable inlet temperature of 105°F (41°C), long periods of operation with temperatures below 105°F (41°C) can excessively cool the products of combustion, resulting in collection of condensate in the heat exchanger, damaging the heat exchanger, combustion chamber, significantly reducing the life of the equipment. The following applications are approved configurations supported by Raypak for CWP systems.

A bypass allows part of the heater discharge water to be mixed with the cooler water returning to the heater inlet, to increase the heater inlet temperature above 105°F (41°C). This precautionary measure should prevent the products of combustion from condensing in most installations.

CAUTION: Damage due to internal condensation may occur if the heater inlet water temperature does not exceed 105°F (41°C) within 7 minutes of start-up. Warranty claims will be denied for damage or failures caused by condensation.

H models: MIX TYPE = VALVE

Heating Systems, where the inlet water temperature remains below 105°F (41°C) **must have cold water protection**. Known protection methods consist of mixing heated outlet water with the inlet water using a bypass to raise the inlet to 105°F (41°C) or higher. Once the system is heated up and has return water temperatures of 105°F (41°C) or higher, the mixing of outlet water with inlet water is no longer needed and the bypass can be shut off. If the bypass is not shut off as the system heats up, the outlet temperature may continue to climb and trip the high limit, thereby shutting down the heater. Thus an automatic valve system, such as a three-way proportional valve to control the bypass, should be used. The integrated VERSA IC® control system provides automatic functionality to control a proportional 3-way valve to provide Cold Water Protection for Single or Cascade configurations. See Fig. 9.



*Maximum 4 times the pipe diameter or 12", whichever is less.

Fig. 9: CWP-Hydronic Single-Boiler (BOIL 3-way) Mode 1

H models: MIX TYPE = PUMP

H models include a second option for individual Cold Water Protection method ("PUMP"). MIX TYPE = PUMP uses a Variable Speed Pump as a CWP mechanism recommended for those systems that require low-lead/non-ferrous plumbing. Applications that require a working setpoint over 150°F must use an H model with a storage tank. See Figs.10,11 and 12.

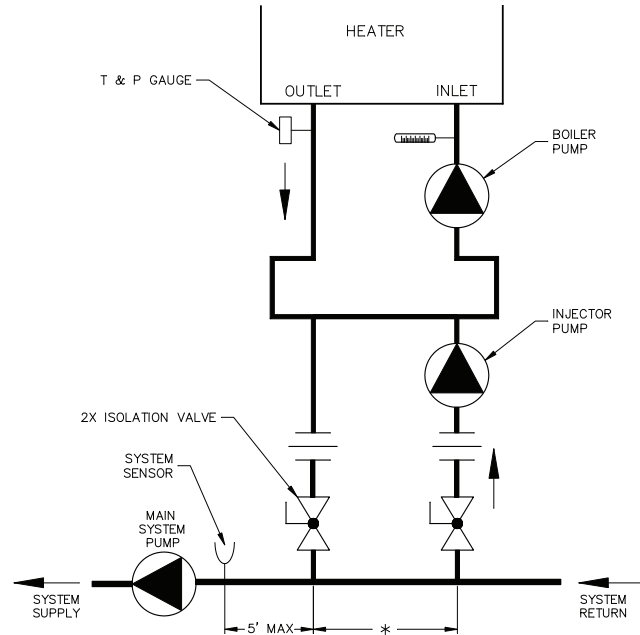


Fig. 10: H - Hydronic - Single Boiler with CWP (VS Pump - MIX TYPE = 2)

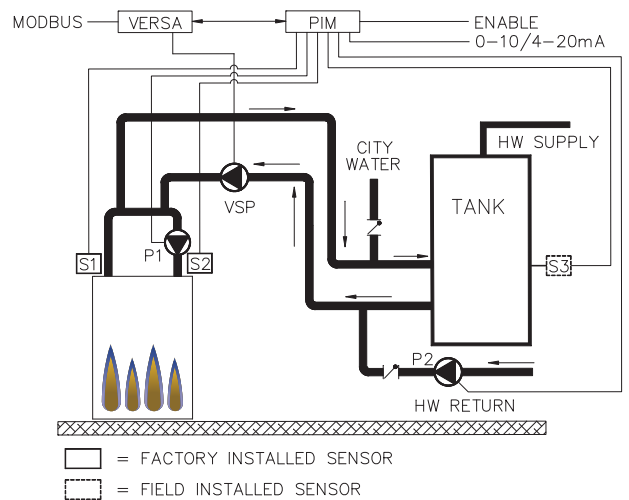


Fig. 11: Low Temp Process - Open Loop: H model, Single with Storage Tank

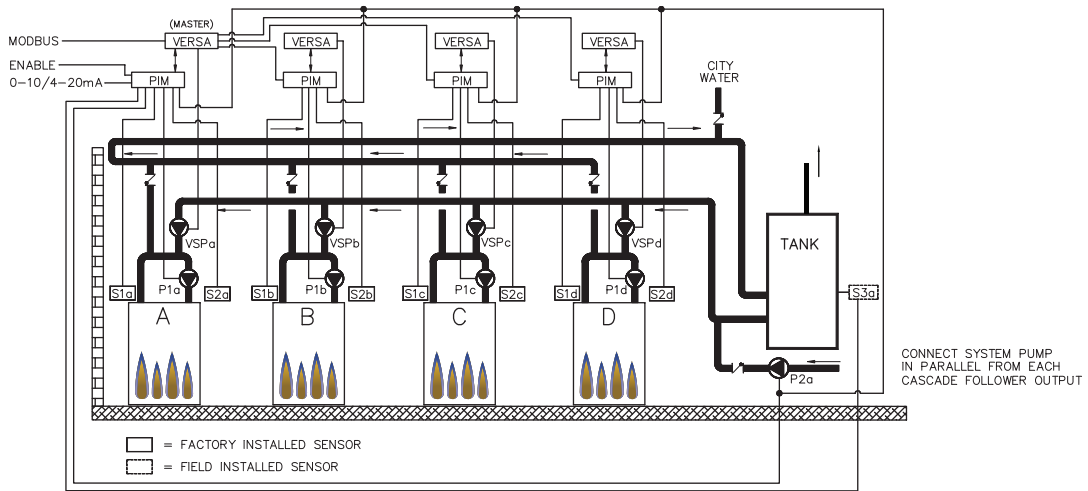


Fig. 12: Low Temp Process - Open Loop: H model, Cascade with Storage Tank

Cold Water Protection: WH models

Direct DHW heating systems utilize a variable speed pump arrangement (MIX TYPE = PUMP) to keep the heater inlet at or above 105°F (41°C). The integrated VERSA IC control system provides functionality to control a single variable speed injection pump via an added inverter drive to provide Cold Water Protection to the system.

See Fig. 13 as an example of a single heater application. For more information regarding this function see VERSA IC manual, catalog 5000.72.

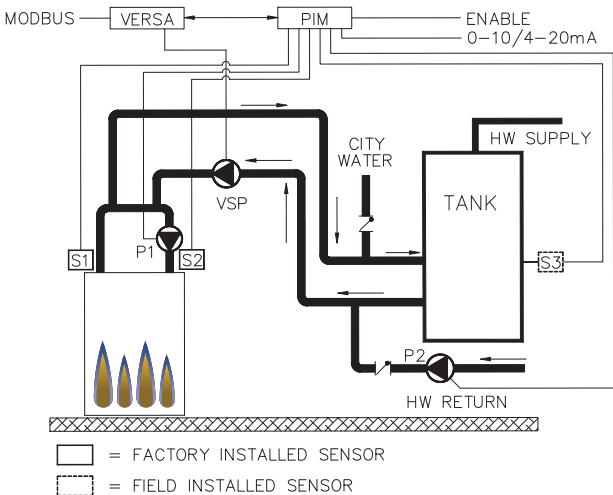


Fig. 13: WH Direct DHW - Single Heater with CWP (VS Pump - MIX TYPE = 2)

Hydronic Heating

System Design

Hot water heating systems all have unique levels of operating diversity. Raypak equipment design utilizes as little water mass as possible to ensure maximum operating efficiency. Primary / Secondary piping arrangement is the method recommended and the only method supported by Raypak for installation of Hi Delta equipment. Proper system design should always include system flow in excess of the connected boiler flow for proper operation (Boiler Flow + 15% = Min. System Flow). When appropriate, a Buffer/Decoupler Tank can be used where system flow may be reduced below the connected boiler flow. Failure to design for adequate system flow (i.e. bypasses, 3-way control valves, flow limiting balance devices, buffer tanks, etc.) will result in boiler short-cycling and poor system performance. Always contact your local Raypak representative for system design assistance to avoid these issues.

Pump Selection

In order to ensure proper performance of your heater system, you must install a correctly sized pump. Raypak recommends using a 20°F ΔT as design ΔT. (ΔT is the temperature difference between the inlet and outlet water when the heater is firing at full rate). If a ΔT of larger than 20°F is necessary, see Table G for flow rate requirements.

Model No.	20°FΔT		30°FΔT		39°FΔT		Min. Flow			Max. Flow		
	gpm	ΔP (ft)	gpm	ΔP (ft)	gpm	ΔP (ft)	gpm	ΔP (ft)	ΔT	gpm	ΔP (ft)	ΔT
992C	83	5.2	55	2.3	43	1.4	43	1.4	39	132	13.1	13
1262C	106	9.6	71	4.3	54	2.5	54	2.5	39	132	14.8	16
1532C	129	15.7	86	7.1	66	4.2	66	4.2	39	132	16.5	19
1802C	N/A	N/A	101	10.7	78	6.3	78	6.3	39	132	18.3	23
2002C	N/A	N/A	112	13.8	86	8.3	86	8.3	39	132	19.0	25
2072C	N/A	N/A	116	14.8	89	8.9	89	8.9	39	132	19.0	26
2342C	N/A	N/A	132	21.1	101	12.7	101	12.7	39	132	21.4	30

Notes: 1. Basis for minimum flow is 40°F ΔT. Basis for maximum flow is 132 GPM.
2. Rear-mounted pumps may provide higher flow rates on smaller models than the system requirements

Table G: Heater Rates of Flow and Pressure Drops

Feedwater Regulator

Raypak recommends that a feedwater regulator be installed and set at 12 psi minimum pressure at the highest point of the system. Install a check valve or back flow device upstream of the regulator, with a manual shut-off valve as required by local codes.

Piping

All high points should be vented. Purge valves and a bypass valve should be installed. A heater installed above radiation level must be provided with a low water cut-off device (sales order option F-10). The heater, when used in connection with a refrigeration system, must be installed so that the chilled medium is piped in parallel with the heater with appropriate valves to prevent the chilled medium from entering the heater.

The piping system of a hot water heater connected to heating coils located in air handling units where they may be exposed to circulating refrigerated air, must be equipped with flow control valves or other automatic means to prevent gravity circulation of the heater water during the cooling cycle. It is highly recommended that the piping be insulated.

Air-Separation/Expansion Tank

All heaters should be equipped with a properly sized expansion tank and air separator fitting as shown in Fig. 14.

System Sensor Installation

The System Sensor (S3) is required for all selectable mode unless the unit's firing rate will be controlled by

an external source such as the Temp Tracker MOD+ Hybrid sequencer (sales option B-36). Proper placement and method of installation are critical for proper operation of the system. (See Fig. 7) The sensor must be installed in a drywell in conjunction with heat conductive compound as shown in the following images. The drywell must be installed no more than 5 equivalent feet of pipe/tubing downstream of the de-coupler and installed in such a way that ensures the sensor bulb is in the flow path.

CAUTION: Be careful when installing the drywell not to over-tighten the well as this can damage the well and may prevent the sensor from fitting properly.

Three-Way Valves

Valves designed to blend water temperatures or reduce water circulation through the heater should not be used. Raypak heaters are high-recovery, low-mass heaters which are not subject to thermal shock.

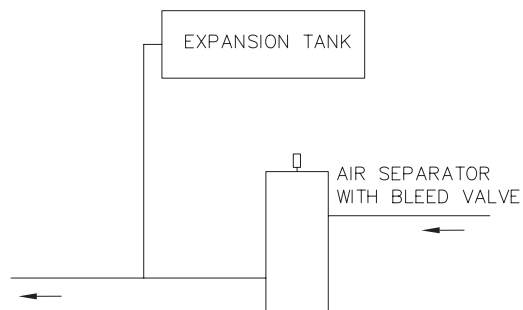


Fig. 14: Air-Separation/Expansion Tank

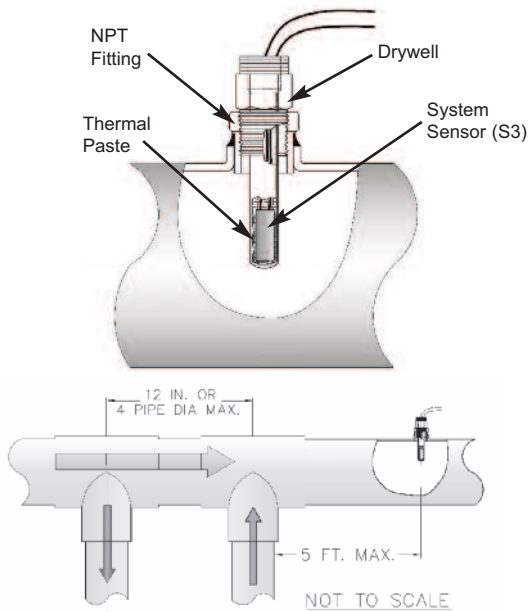
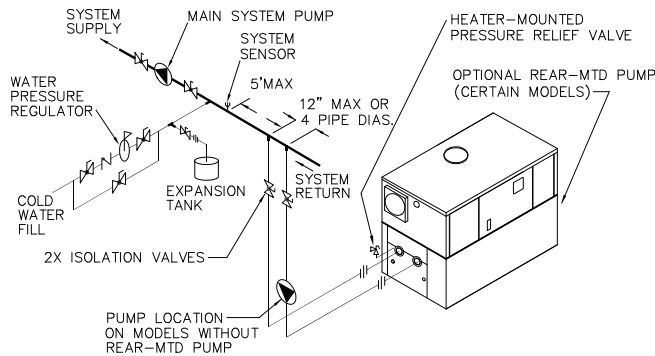


Fig. 15: System Sensor Installation



*Maximum 4 times the pipe diameter or 12", whichever is less.

Fig. 16: Single Heater - Space Heating Application with Primary/Secondary Piping

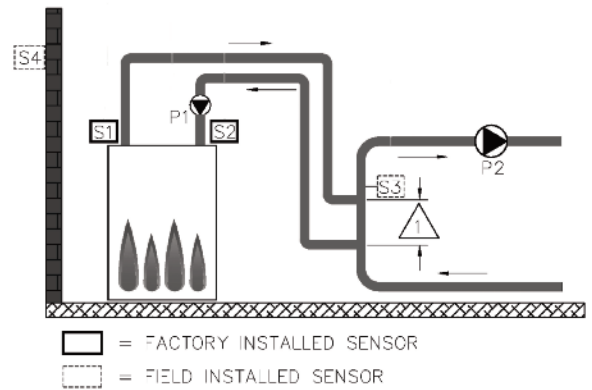
Applications & Modes

The VERSA IC Control system is designed for a wide range of applications. The installer/design engineer should refer to the following Modes to determine which best fits the intended application and functionality for the unit being installed.

Type H models of Hi Delta have three modes available to them to address the various applications the units can be applied to. Type WH and P units will only have one configuration available to them.

For detailed information on the Versa IC control system, see Catalog 5000.72. This manual can be found in the document library at www.raypak.com.

S1 - Outlet Sensor
S2 - Inlet Sensor



MODE 1

△ MAXIMUM DISTANCE NOT TO EXCEED 4 PIPE DIAMETERS OR 12 INCHES, WHICHEVER IS LESS.

Fig. 17: MODE 1 - Single Boiler with Primary/Secondary Piping

Mode 1 (Type H Units Only)

This mode selection is for hydronic heating systems with single or multiple boilers (Maximum 4 boilers) in primary/secondary piping configuration with or without Outdoor Air Reset (S4). The system temperature is controlled by the System sensor (S3). The Boiler Pump (P1) runs during any call for heat. The System Pump (P2) runs whenever the system is enabled for heating and the outdoor air temperature is lower than the warm weather shut down (WWSD) temperature setting (if utilized). The Boiler Pump is delayed "off" as user-defined in the BOILER menu and System Pump is delayed "off" as user-defined in the **ADJUST** menu.

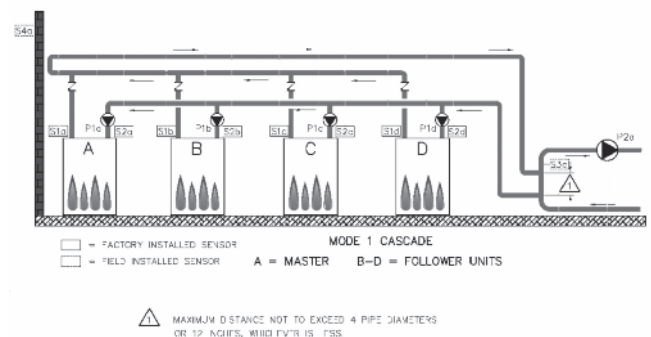


Fig. 18: MODE 1 - Boiler Cascade with Primary/Secondary Piping

NOTE: MODE 1 can also be used for process heating applications in conjunction with a buffer/storage tank when operating temperatures above 150°F are required. Care must be given to ensure water hardness is no more than 15 grains per gallon for scale free operation.

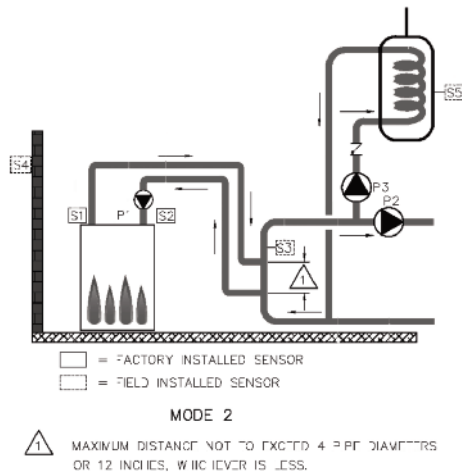


Fig. 19: MODE 2 - Single Boiler with Indirect on System Loop

Mode 2 (Type H Units Only)

This mode selection is for hydronic heating systems with single or multiple boilers (Maximum 4 boilers) in primary/secondary piping configuration with or without Outdoor Air Reset (S4) with indirect DHW on the system loop (with or without priority). The system temperature is controlled by the System sensor (S3). The Indirect DHW sensor (S5) determines the indirect call/tank setpoint. The system temperature is boosted to Target Max when using the Indirect DHW sensor (S5) during an indirect call for heat. Priority mode toggles off the System Pump (P2) when an indirect call for heat is present. The Boiler Pump (P1) runs during any call for heat. The Indirect DHW Pump (P3) runs during an indirect call for heat with no "off" delay. The Boiler Pump (P1) is delayed "off" as user-defined in the BOILER menu and System Pump (P2) delay "off" as user-defined in the **ADJUST** menu. The System Pump (P2) runs whenever the system is enabled for heating and the outdoor air temperature is lower than the WWSD temperature setting (if utilized) unless an indirect call for heat is present with priority.

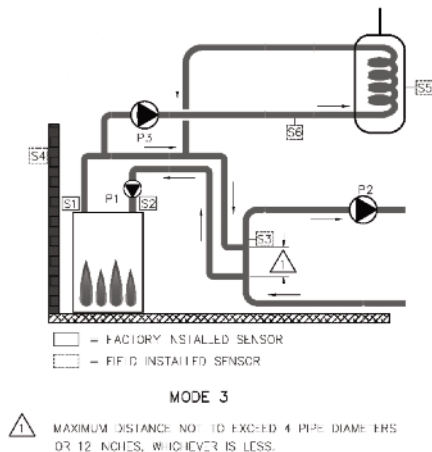
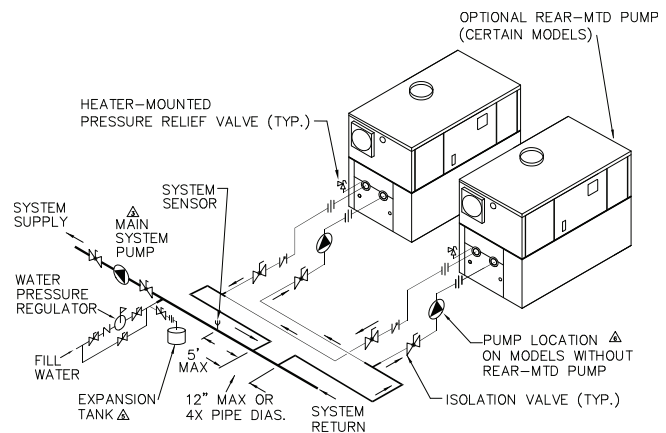


Fig. 20: MODE 3 - Single Boiler with Indirect on Boiler Loop

Mode 3 (Type H Units Only)

This mode selection is for hydronic heating systems with single or multiple boilers (Maximum 4 boilers) in primary/secondary piping configuration with or without Outdoor Air Reset (S4) with indirect DHW on the boiler loop (with priority). The system temperature is controlled by the Supply sensor (S3) whenever the indirect call for heat is **not active**. The DHW Supply sensor (S5) determines the indirect call/tank setpoint. During an indirect call for heat the boiler firing rate is determined by the water temperature at the Indirect Supply sensor (S6) and the Target Max setting when using the Indirect DHW sensor (S5). The Boiler Pump (P1) runs during all heat calls regardless of priority. The Indirect DHW Pump (P3) runs during an indirect call for heat with no "off" delay. The Boiler Pump (P1) is delayed "off" as user-defined in the BOILER menu and System Pump (P2) delay "off" as user-defined in the **ADJUST** menu. The system pump (P2) runs whenever the system is enabled for heating and the outdoor air temperature is lower than the WWSD temperature setting (if utilized) unless an indirect call for heat is present.

NOTE: A Tank Aquastat can be used in lieu of the Indirect DHW Sensor (S5). See the Versa IC manual for additional details.



*Maximum 4 times the pipe diameter or 12", whichever is less.

Fig. 21: Dual Heaters (Reverse/Return) with Primary/Secondary Piping

Domestic Hot Water

When designing the water piping system for domestic hot water applications, water hardness should be considered. Table H indicates the suggested flow rates for soft, medium and hard water. Water hardness is expressed in grains per gallon.

Potable Water and Space Heating

CAUTION: When this heater is used for both potable water and space heating, observe the following to ensure proper operation.

1. All piping materials and components connected to the water heater for the space heating application shall be suitable for use with potable water.
2. Toxic chemicals, such as used for boiler treatment, shall not be introduced into the potable water used for space heating.
3. If the heater will be used to supply potable water, it shall not be connected to any heating system or components previously used with a non-potable water heating appliance.
4. When the system requires water for space heating at temperatures higher than 140°F (60°C), a means such as a mixing valve shall be installed to temper the water in order to reduce scald hazard potential.

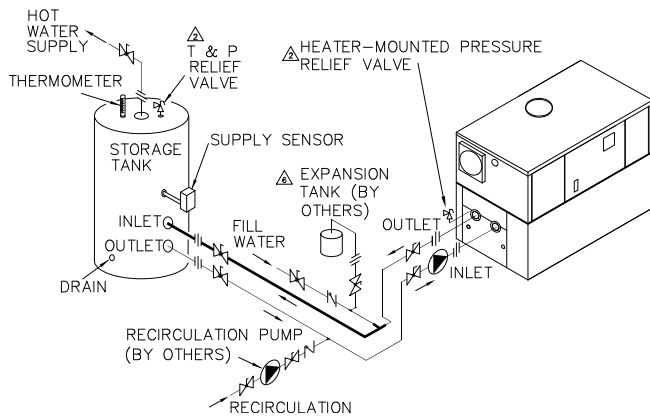
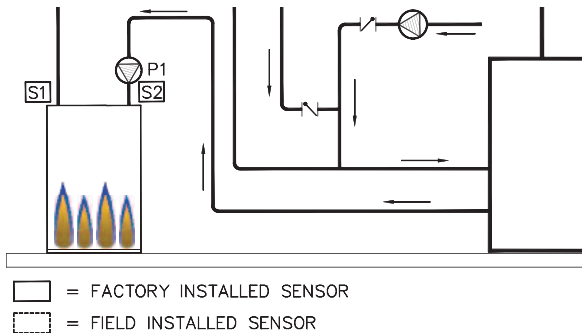


Fig. 22: Single Domestic Hot Water Heater and Storage Tank

WH – Direct DHW Configuration

When the unit is ordered as a “WH” configuration the only application available to it is direct DHW with single or multiple heaters (Maximum 4 heaters). The tank temperature is controlled by the System sensor (S3). The Boiler Pump (P1) runs during any call for heat. The System Pump (P2) output is active whenever the system is enabled. The Boiler Pump is delayed “off” after the Tank Target temperature is achieved and as user defined in the **BOILER** menu.



**Fig. 23: WH Units - Single Water Heater with Tank
H Units - Single Boiler with Process Tank**

NOTE: WH units will operate to a maximum tank temperature of 150°F. For temperatures required above 150°F, an “H” model boiler must be used and great care must be given to ensure water hardness is no more than 15 grains per gallon for scale free operation. MODE 1 should be used and configured for setpoint operation for process heating applications.

NOTE: If local codes require a vacuum relief valve, acquire one locally and install per valve manufacturer’s instructions.

Automatic Chemical Feeders

All chemicals must be introduced and completely diluted into the water before being circulated through the heater. High chemical concentrations will result when the pump is not running (e.g. overnight).

NOTE: High chemical concentrates from feeders that are out of adjustment will cause rapid corrosion to the heat exchanger. Such damage is not covered under the warranty.

NOTE: Failure of a heat exchanger due to lime scale build-up on the heating surface, low pH or other chemical imbalance is non-warrantable.

CAUTION: Combustion air must not be contaminated by corrosive chemical fumes which can damage the heater and void the warranty.

Model No.	Soft* (3-4 grains per gallon)					Medium (5-15 grains per gallon)					Hard* (16+** grains per gallon)				
	ΔT	GPM	ΔP	MTS	SHL	ΔT	GPM	ΔP	MTS	SHL	ΔT	GPM	ΔP	MTS	SHL
992C	29	60	2.7	2½	5.2	17	98	7.3	2½	13.3	13	132	13.1	2½	23.6
1262C	29	72	4.4	2½	7.9	19	115	11.3	2½	19.4	16	132	14.8	2½	25.3
1532C	29	86	7.1	2½	11.9	22	120	13.7	2½	22.5	20	132	16.5	2½	27.0
1802C	29	102	10.9	2½	17.4	26	120	15.1	2½	23.9	23	132	18.3	2½	28.7
2002C	29	112	13.9	2½	21.6	26	132	19.0	2½	29.5	26	132	19.0	2½	29.5
2072C	31	117	15.1	2½	23.4	27	132	19.0	2½	29.5	27	132	19.0	2½	29.5
2342C	33	120	17.8	2½	26.5	30	132	21.4	2½	31.8	30	132	21.4	2½	31.8

ΔT = Temperature rise, °F

ΔP = Pressure drop through heat exchanger, ft

SHL = System head loss, ft. Includes 50 eq ft of tubing each way (total 100 eq ft).

GPM = Gallons per minute, flow rate

MTS = Minimum tubing size

*Must utilize optional cupro-nickel tubes.

**If over 25 grains per gallon, a water softener/treatment system must be utilized.

Caution: For scale free operation with "Hard Water" (16-25 grains per gallon of total hardness), the operating control must NOT be set higher than 130 °F. For higher than 130 °F operation, a water softener/treatment system must be utilized.

Caution: Water softened below 3 grains per gallon is known to be aggressive and corrosive.

Table H: Domestic Water Heater Flow Rate Requirements

Pool Heating

CAUTION: Power to the heater should be interlocked with the main system pump to make sure the heater does not fire without the main system pump in operation. Improper flow control can damage the heater. Uncontrolled flow (too high) or restricted flow (too low) can seriously damage the heater. Follow these instructions to make sure your heater is properly installed.

All Raypak pool heaters are certified to ANSI Z21.56, which is the nationally recognized standard for swimming pools. Some heaters being sold in the marketplace for heating commercial swimming pools are often certified as hot water boilers or water heaters. Regardless of which standard they are certified to, they are generally trimmed out either by the manufacturer or the installer with controls that are suitable for maintaining normal swimming pool temperatures and water conditions.

The P-992C-2342C models are configured to accommodate locating the outlet temperature controller in the pool system piping that supplies the heated water to the pool. This arrangement facilitates controlling or limiting the temperature of the water supplied to the pool. The heater must be plumbed in a primary/secondary arrangement, wherein only a portion of the water flowing in the piping system is pulled off, heated, and then returned to the system. The water coming out of the heater is mixed with the filtered water in the main pipe and thus tempered before returning to the

pool. This arrangement permits operation of the heater at a temperature range that has been optimized both to avoid forming condensation on the heat exchanger and to mitigate the formation of scale in the heat exchanger tubes.

For a Pool heating application, always verify that the Hi Delta unit has been ordered as a pool heater. To avoid issues related to high temperatures not appropriate to a pool application.

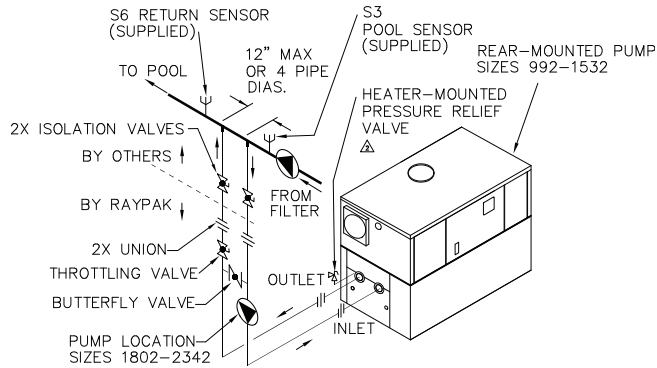
NOTE: The recommended setting for the outlet thermostat is 110°F.

The Hi Delta pool heater is offered with bypass options: manual H-Bypass, or automatic Cold Water Run (CWR) bypass made of CPVC. These arrangements both blend outlet water with the inlet water to increase the inlet water temperature, thereby reducing the likelihood of condensation forming on the heat exchanger. The pump also serves to circulate water through the heater from the main system piping.

To complete installation of the heater, the system sensor (S3) must be installed in the return water line, upstream of the heater. The supplied electronic operating control is configured to operate as the poolstat. A separate sensor (S6) is shipped loose to be installed in the system piping downstream of the heater outlet.

WARNING: To ensure safe operation of the Hi Delta heater, all plumbing from the heater to the main loop must be CPVC, copper or brass.

See Fig. 23 for the poolstat/sensor location. Install limit in supply to pool as shown in Fig. 22. For data on acceptable pool chemistry, see Table I.



*Maximum 4 times the pipe diameter or 12", whichever is less.

Fig. 24: Single Pool Heater - H-Bypass

H-Bypass (Standard)

Adjustment of the manual bypass valve is critical to proper operation of the heater. The manual bypass valve should be adjusted to achieve a minimum inlet water temperature of 105°F and an outlet water temperature below 140°F. When starting with a cold pool, make initial adjustments. Make final adjustments when pool water approaches desired temperature.

The use of a bypass is required for proper operation in a pool heating application. Refer to Fig. 24. Use the following instructions to set the manual bypass:

1. Set Valve A (the bypass) to ½ open position, and Valve B to fully open position.
2. Turn on pump.
3. Turn on heater and wait until heater goes to full fire.
4. Adjust Valve A until the inlet water temperature is 105°F. NOTE: Opening the valve will increase the temperature and closing the valve will decrease the temperature.
5. If this process does not raise the inlet water temperature to 105°F and Valve A is fully open, then slowly throttle Valve B closed to increase the inlet water temperature to 105°F.

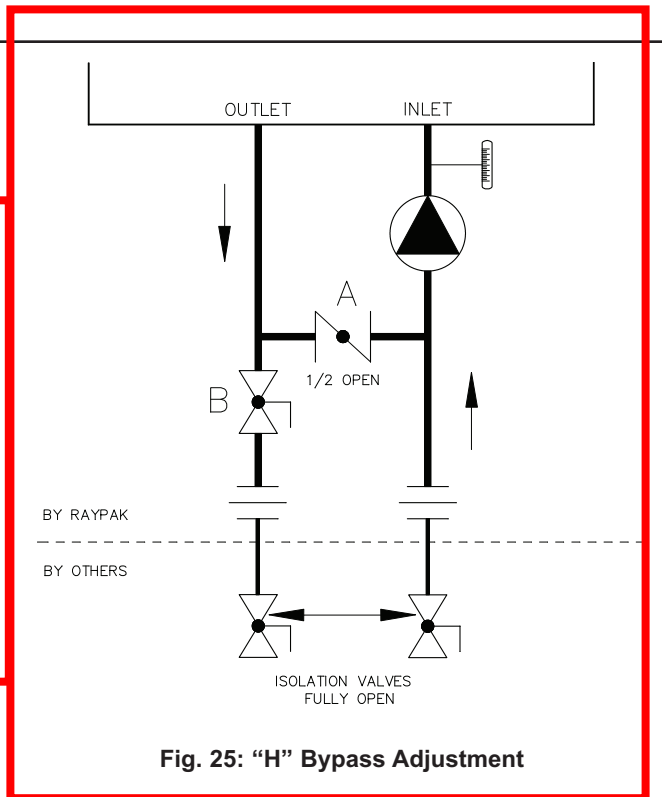
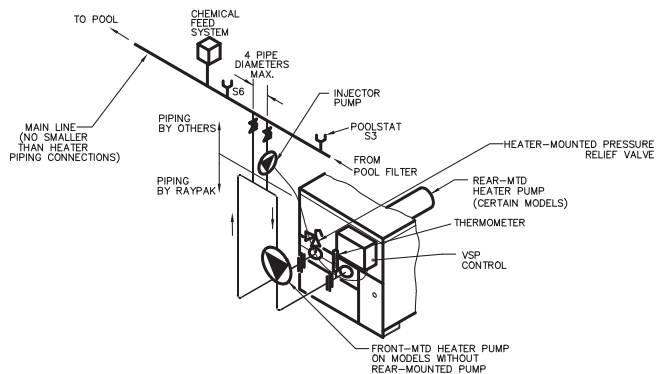


Fig. 25: "H" Bypass Adjustment

Automatic Cold Water Protection (Optional)

P models use a variable speed pump to maintain the inlet water temperature 105°F.



*Maximum 4 times the pipe diameter or 12", whichever is less.

Fig. 26: Single Pool Heater - Automatic Bypass

Winterizing Your Heater

Heaters installed outdoors in freezing climate areas should be shut down for the winter. To shut down heater, turn off manual main gas valve and main gas shut-off. Close isolation valves and remove water piping from the in/out header on the heater. Drain the heater and any piping of all water that may experience below-freezing temperatures.

Pool/Spa Water Chemistry

NOTE: Chemical imbalance can cause severe damage to your heater and associated equipment.

pH of Water

pH is a measure of relative acidity, neutrality or alkalinity. Dissolved minerals and gases affect water's pH. The pH scale ranges from 0 to 14. Water with a pH of 7.0 is considered neutral. Water with a pH lower than 7 is considered acidic. Water with a pH higher than 7 is considered alkaline. A neutral pH (around 7) is desirable for most potable water applications. Corrosion damage and water heater failures resulting from water pH levels of lower than 6 or higher than 8 are non-warrantable. The ideal pH range for water used in a storage tank or a copper water heater system is 7.2 to 7.8.

Total Dissolved Solids

Total dissolved solids (TDS) is the measure of all minerals and solids that are dissolved in the water. The concentration of total dissolved solids is usually expressed in parts per million (ppm) as measured in a water sample. Water with a high TDS concentration will greatly accelerate lime and scale formation in the hot water system. Most high TDS concentrations will precipitate out of the water when heated. This can

generate a scale accumulation on the heat transfer surface that will greatly reduce the service life of a pool heater. This scale accumulation can also impede adequate flow of water and may totally block the water passages in the tubes of the heat exchanger. A heat exchanger that is damaged or blocked by lime/scale accumulation must be replaced. Failure of a water heater due to lime scale build up on the heating surface is non-warrantable. The manufacturer of the pool heater has no control of the water quality, especially the TDS levels in your system. Total dissolved solids in excess of 1,500 ppm will accelerate lime and scale formation in the heat exchanger. Heat exchanger failure due to total dissolved solids in excess of 1,500 ppm is a non-warrantable condition.

NOTE: Failure of a heat exchanger due to lime scale build-up on the heating surface, low pH or other chemical imbalance is non-warrantable.

COPY TO PLANS

Recommended Level(s)	Fiberglass Pools	Fiberglass Spas	Other Pool and Spa Types
Water-Temperature	68-88°F (20-31°C)	89-104°F (31-40°C)	68-104°F (20-40°C)
pH	7.3-7.4	7.3-7.4	7.6-7.8
Total Alkalinity (ppm)	120-150	120-150	80-120
Calcium Hardness (ppm)	200-300	150-200	200-400
Salt (ppm)	3000 Maximum	3000 Maximum	3000 Maximum
Free Chlorine (ppm)*	2-3	2-3	2-3
Total Dissolved Solids (ppm)	1500 Maximum**	1500 Maximum**	1500 Maximum**

*Free Chlorine **MUST NOT EXCEED 5 ppm!**

**In salt water chlorinated pools, the total TDS can be as high as 4500 ppm

NOTE: The allowable concentrations of salt and of the Total Dissolved Solids are lower for the Hi Delta than for a typical residential pool heater, due to the higher water temperatures at which a Hi Delta operates.

Table I: Water Chemistry

Gas Supply

DANGER: Make sure the gas on which the heater will operate is the same type as specified on the heater's rating plate.

Gas piping must have a sediment trap ahead of the heater gas controls, and a manual shut-off valve located outside the heater jacket. It is recommended that a union be installed in the gas supply piping adjacent to the heater for servicing. A pounds-to-inches regulator must be installed to reduce the gas supply pressure to a maximum of 10.5 in. WC for natural gas and 13.0 in. WC for propane gas. The regulator should be placed a minimum distance of 10 times the pipe diameter up-stream of the heater gas controls. Refer to Table J for maximum pipe lengths.

Gas Supply Connection

CAUTION: The heater must be disconnected from the gas supply during any pressure testing of the gas supply system at test pressures in excess of 1/2 psi (3.45 kPa).

The heater must be isolated from the gas supply piping system by closing the manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psi (3.45 kPa). Relieve test pressure in the gas supply line prior to reconnecting the heater and its manual shut-off valve to the gas supply line. **FAILURE TO FOLLOW THIS PROCEDURE MAY DAMAGE THE GAS VALVES.** Over pressurized gas valves are not covered by warranty. The heater and its gas connections shall be leak-tested before placing the appliance in operation. Use soapy water for leak test. DO NOT use an open flame.

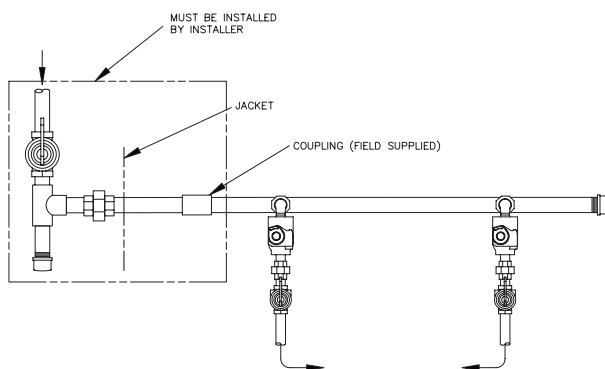


Fig. 27: Gas Supply Connection

CAUTION: Do not use Teflon tape on gas line pipe thread. A pipe compound rated for use with natural and propane gases is recommended. Apply sparingly only on male pipe ends, leaving the two end threads bare.

CAUTION: Support gas supply piping with hangers, not by the heater or its accessories. Make sure the gas piping is protected from physical damage and freezing, where required.

Reversing Gas Supply Connection

Reversing the standard fuel connection from the left-hand to the right-hand side is a simple field operation.

1. Disconnect all electrical power from the heater (if applicable).
2. Disconnect the main gas pipe from the heater (if applicable).
3. Remove the left and right front panels from the heater.
4. Locate the main gas line that traverses across the heater above the manifold risers.
5. Remove the pipe cap from the right-hand end of the main gas line.
6. Reinstall the pipe cap on the left-hand end of the main gas line.
7. Remove the rubber grommet from the left-hand-side panel and reinstall into the standard main gas opening, located on the right-hand side of the heater.
8. Remove plastic cap from the right-hand side panel and reinstall into the standard main gas opening located on the left-hand side of the heater.
9. Install a coupling, nipple, union and sediment trap onto the right-hand end of the main gas line and then install the gas line, making sure that a manual shut-off valve has been installed within 10 ft of the heater.
10. Replace the left and right front panels on the heater.

Model No.	2"		2-1/2"		3"		4"	
	N	P	N	P	N	P	N	P
992C	120	300	300					
1262C	75	180	170	325	560			
1532C	50	120	125	250	400			
1802C	40	100	100	225	340			
2002C	30	80	75	175	260			
2072C	30	80	75	175	260			
2342C	20	55	55	135	160	400	600	

Natural gas – 1,000 BTU per ft³, .60 specific gravity at 0.5 in. WC pressure drop
Propane gas (HD-5) – 2,500 BTU per ft³, 1.53 specific gravity at 0.6 in. WC pressure drop

Table J: Maximum Equivalent Pipe Length

Gas Supply Pressure

A minimum of 5.6 in. WC upstream gas pressure under full load and a maximum gas supply pressure set point of 10.5 in. WC under load and no-load conditions are required for natural gas. A minimum of 11.0 in. WC upstream gas pressure under full load and a maximum gas supply pressure set point of 13.0 in. WC are required for propane gas. The gas pressure regulator(s) supplied on the heater is for low-pressure service. If upstream pressure exceeds 14.0 in. WC (1/2 psi) **at any time**, an intermediate gas pressure regulator, of the lockup type, must be installed.

When connecting additional gas utilization equipment to the gas piping system, the existing piping must be checked to determine if it has adequate capacity for the combined load.

The gas valve pressure regulator(s) on the heater are nominally preset at 3.5 in. WC for natural gas, and 10.5 in. WC for propane gas. The pressure at the gas valve outlet tap, measured with a manometer, while in operation should be 3.5 ± 0.1 in. WC for natural gas and 10.5 in. ± 0.1 in. WC for propane gas. If an adjustment is needed, remove the adjustment screw cover and turn the adjustment screw clockwise to increase pressure or counter-clockwise to lower pressure.

NOTE: The maximum allowable pressure drop from static to dynamic at full fire is 30%.

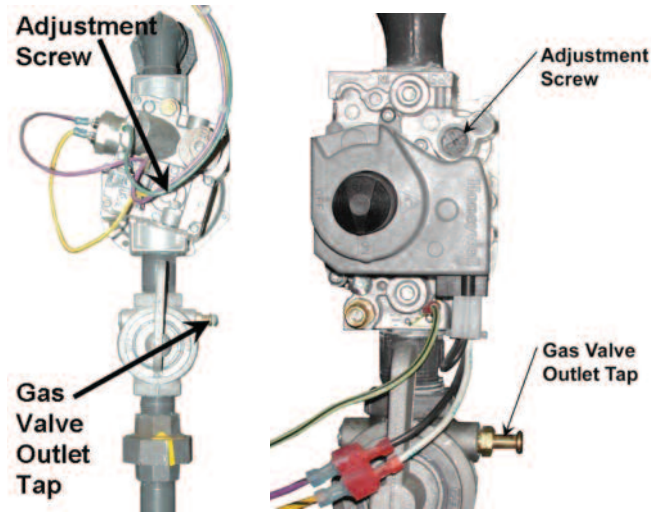


Fig. 28: Gas Valves

Electrical Power Connections

Installations must follow these codes:

- National Electrical Code and any other national, state, provincial or local codes or regulations having jurisdiction.
- Safety wiring must be NEC Class 1.
- Heater must be electrically grounded as required by the NEC.
- In Canada, CSA C22. 1 C.E.C. Part 1.

The heater is wired for 120 VAC, less than 12 amps in its basic configuration. Additional options may increase the amp draw of the unit. The voltage is indicated on the tie-in leads. Consult the wiring diagram

shipped with the heater in the instruction packet. Before starting the heater check to ensure proper voltage to the heater and pump.

Install a separate disconnect means for each load. Use appropriately sized wire as defined by NEC, CSA and/or local code. All primary wiring should be at least 125% of minimum rating.

If any of the original wire as supplied with the heater must be replaced, it must be replaced with 105°C wire or its equivalent.

Check the Power Source

WARNING: Using a multi-meter, check the following voltages at the terminal block inside the unit. Make sure proper polarity is followed and house ground is proven. (See Fig. 20.)

NOTE: Minimum 18 AWG, 105°C, stranded wire must be used for all low voltage (less than 30 volts) external connections to the unit. Solid conductors should not be used because they can cause excessive tension on contact points. Install conduit as appropriate. All high voltage wires must be the same size (105°C, stranded wire) as the ones on the unit or larger.

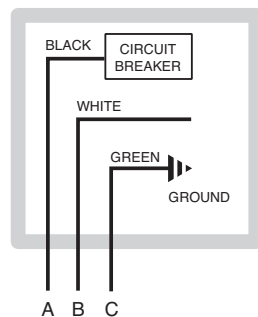


Fig. 29: Wiring Connections

Check the power source:

AC = 108 VAC Minimum, 132 VAC MAX

AB = 108 VAC Minimum, 132 VAC MAX

BC = less than 1 VAC Maximum

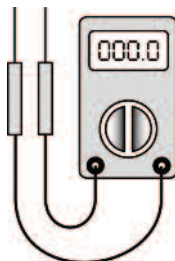


Fig. 30: Multi-meter

Making the Electrical Connections

Refer to Fig. 27-31.

1. Verify that circuit breaker is properly sized by referring to heater rating plate. A dedicated circuit breaker should be provided.
2. Turn off all power to the heater. Verify that power has been turned off by testing with a multi-meter prior to working with any electrical connections or components.
3. Observe proper wire colors while making electrical connections. Many electronic controls are polarity sensitive. Components damaged by improper electrical installation are not covered by warranty.
4. Provide overload protection and a disconnect means for equipment serviceability as required by local and state code.
5. Install heater controls, thermostats, or building management systems in accordance with the applicable manufacturers' instructions.
6. Conduit shall not be used as the earth ground.

NOTE: A grounding electrode conductor shall be used to connect the equipment grounding conductors, the equipment enclosures, and the grounded service conductor to the grounding electrode.

Field Wiring Connection

CAUTION: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

NOTE: Do not combine low and high voltage in the same conduit.

DANGER: SHOCK HAZARD

Make sure electrical power to the heater is disconnected to avoid potential serious injury or damage to components.

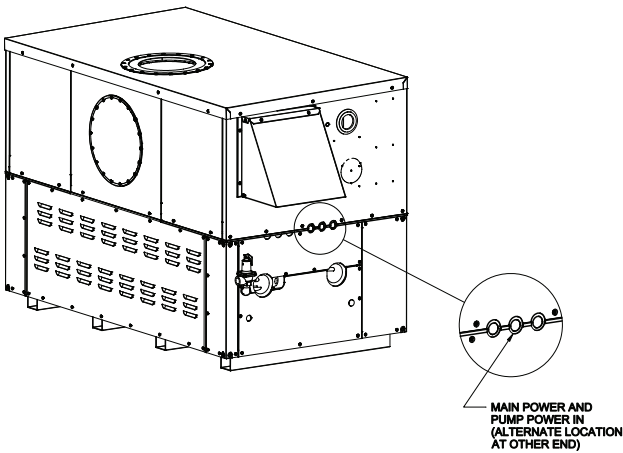


Fig. 31: Wiring Location

Wiring the Enable/Disable

Connect the Enable/Disable wiring (terminals 11 and 12) to the field wiring terminals (shown in Fig. 30). Alternately, any dry contact closure (including a

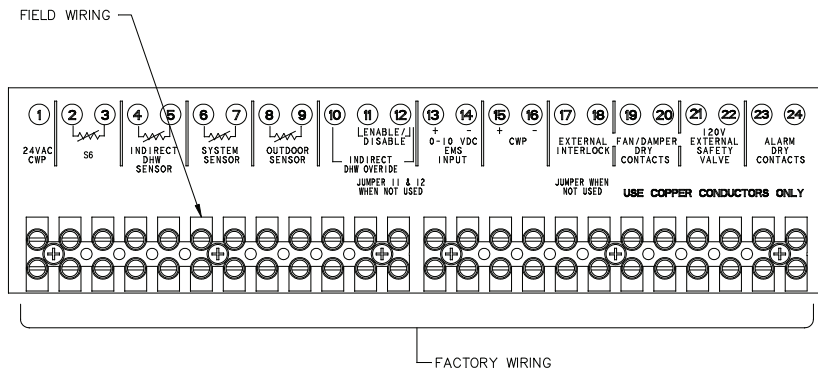


Fig. 33: Low Voltage Field Wiring

remote thermostat) across these terminals will enable the Hi Delta unit to run. Caution should be used to ensure neither of the terminals becomes connected to ground.

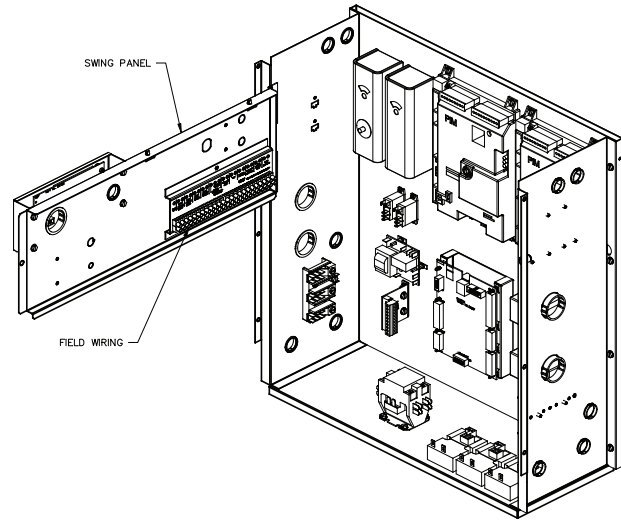


Fig. 32: Low Voltage Field Wiring Location

Wiring the Outdoor Sensor

1. There is no connection required if an outdoor sensor is not used in this installation.
2. If using an Outdoor Sensor (option B-32), connect the sensor wires to the terminals marked OUTDOOR SENSOR (see Fig. 33). Caution should be used to ensure neither of these terminals becomes connected to ground.
3. Use a minimum 18 AWG wire for runs of up to 150 feet.
4. Mount the outdoor sensor on an exterior surface of the building, preferably on the north side in an area that will not be affected by direct sunlight and that will be exposed to varying weather conditions.

Wiring the Indirect Sensor

1. An indirect sensor connection is not required if an indirect water heater is not used in the installation.
2. When the Indirect DHW call for heat is active, the PIM communicates this to the VERSA. The VERSA calculates the optimal operation and sends the firing rate and pump output requests to the PIM so it can activate the Indirect DHW pump and Boiler pump as needed. If an optional Indirect DHW sensor is connected, the PIM will pass this signal to the VERSA. This allows the VERSA to optimize the Indirect DHW demand to maintain the Indirect DHW setpoint. The Indirect DHW thermostat switch closure is still required when using the Indirect DHW sensor. If a VERSA is not present the PIM shall activate the Indirect DHW pump whenever the Indirect DHW call is active. The Boiler pump will also be activated based on the Indirect DHW piping configuration setting. Consult the VERSA IC manual (Cat. 5000.72) for additional configurations.
3. Connect the indirect tank sensor to the terminals marked INDIRECT DHW SENSOR (see wiring diagram). Caution should be used to ensure neither of these terminals becomes connected to ground. When using an indirect DHW sensor to control tank temperature contact closure is required across the indirect override connections for proper operation during "limp along" mode set PIM operator dial to be equal to DHW Target temperature to prevent an over temperature condition from occurring.

NOTE: Alternately, a thermostat contact closure can be used in lieu of the sensor for indirect operation. Connect the thermostat to the terminals marked INDIRECT DHW OVERRIDE.

CAUTION: Sensor and control wiring must **NOT** be run in conduit or chases with line voltage.

Wiring the Optional 0–10 Volt Building Control Signal

1. A signal from an energy management system may be connected to the Hi Delta boiler. This signal should be a 0-10 volt positive DC signal, and an energy management system can be used to control either the setpoint temperature of a single Hi Delta or a cascade of up to 4 boilers, or the firing rate of a single Hi Delta boiler.

2. To enable this remote control function, set dip switch 5 to the UP position on the PIM. DIP switch 5 Toggles between an EMS (UP) signal or a demand signal from the VERSA (DOWN). DIP switch 2 on the PIM toggles between a Direct Drive (UP) input and a Target Temperature (DOWN) setpoint.
3. For a 4-20mA application, refer to the VERSA IC manual (Cat. 5000.72).
4. Connect an Energy Management system or other auxiliary control signal to the terminals marked 0-10V (+ /-) on the field wiring terminals (see Fig. 30). Caution should be used to ensure that the +0-10V connection does not create a short to ground.

Wiring the Cascade System Communication Bus

1. Designate the primary boiler as the master boiler/boiler1 by leaving DIP switch 2 on the VERSA in the ON position. All other VERSA controls require DIP switch 2 to be toggled OFF, designating them as followers. Follower VERSA boards are ignored by their corresponding PIM modules. Use standard 18 AWG wire to connect the master VERSA to the PIM on the followers. A total of 3 followers can be connected to the VERSA on the master. For systems requiring more than 4 connected boilers, an external sequencer such as the Raypak Temp Tracker Mod+ Hybrid can be used.
2. It is recommended that the shortest length cable possible be used to reach between the boilers. Do not run unprotected cables across the floor or where they will become wet or damaged. Do not run communication cables parallel with, or close to or against, high voltage (120 volt or greater) wiring. Raypak recommends that the total maximum length of each set of communication bus cables not exceed 200 feet.
3. Connect the FT_BUS wires to the PIM by pressing down on the slots with a small screwdriver and then inserting the wires into the holes. See Fig. 33.

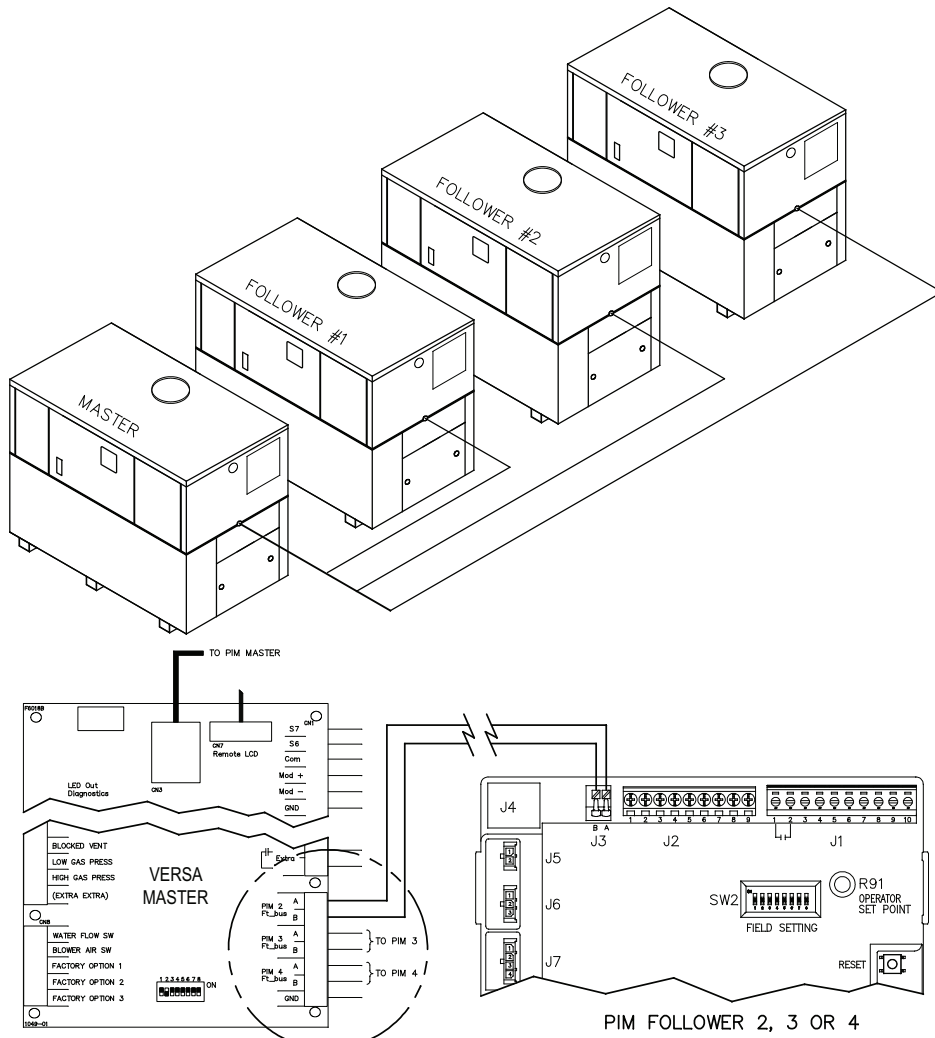


Fig. 34: Hi Delta Cascade System Wiring

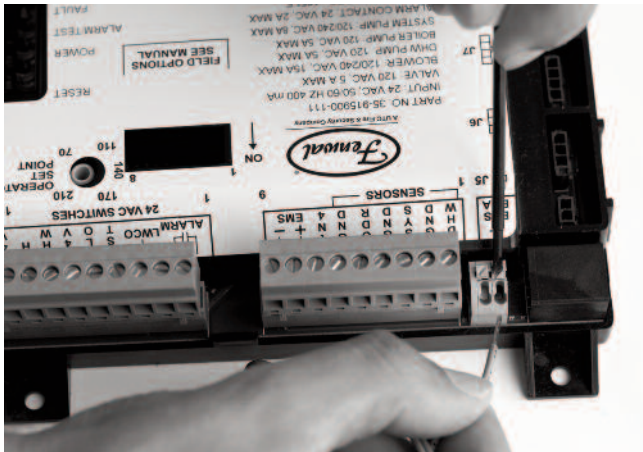


Fig. 35: FT_BUS Wire Connection

Cascade System Pump and Sensor Wiring

1. On the boiler designated as the Master, connect the system pump enable wiring to the terminal block at the rear of the unit. The connections are dry contacts rated for pilot duty only (5A maximum).
2. Connect the boiler pump enable wires to the terminal block at the rear of their unit. The connections are dry contacts rated for pilot duty only (5A maximum).
3. Connect the system supply sensor to terminals 6 and 7 on the field wiring strip located on the Master PIM (See Fig. 33).
4. Connect the Outdoor sensor (if used) to terminals 8 and 9 on the field wiring strip located on the Master boiler (See Fig. 33).

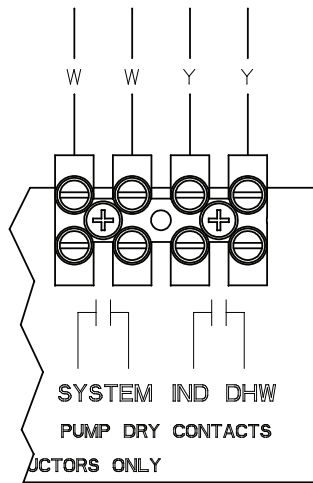


Fig. 36: Cascade Master Pumps

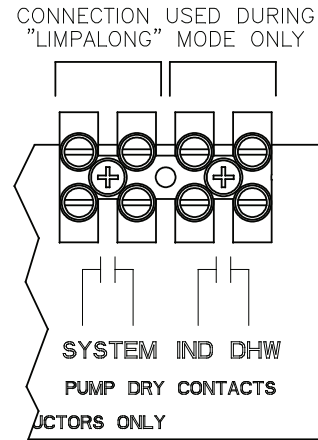


Fig. 37: VERSA Follower

5. Connect the Enable/Disable wiring to terminals 11 and 12 on the field wiring strip located on the Master boiler (See Fig. 33). This connection must be provided through dry contacts closure.

NOTE: This dry contacts closure can come from a room thermostat or a remote relay. No power of any kind should be applied to either of these terminals.

Cascade Follower Pump and Sensor Wiring

1. Once the primary boiler has been identified, additional boilers will be designated as follower boilers. Ensure dip switch 2 on each follower VERSA is set to the OFF/Down position.
2. For each follower boiler, connect the boiler pump enable wires to the terminal block at the rear of each unit. The connections are dry contacts rated for pilot duty only (5A maximum).
3. For Cascade configurations System pump (all models) and DHW pump (H models) Follower outputs must be connected in parallel order to support operation during "Limp Along" mode. For detailed wiring instructions see VERSA IC manual, catalog 5000.72.

Modbus BMS Communication

The VERSA IC control is equipped as standard with a communications port for connectivity to building automation via Modbus protocol. Refer to the VERSA IC manual (5000.72) for further information.

Alarm Connection

An alarm annunciator or light may be connected to the alarm contacts on the field wiring terminal strip. The Alarm Contacts are 3A rated dry contacts on a normally-open relay that close during fault or lockout conditions, and the maximum voltage across the contacts is 30 VAC or 30 VDC. See the Field Wiring as shown in Fig. 33.

In a cascade system, in the event of an alarm condition at one or more units, all alarm contacts within the cascade will be energized indicating a fault condition.

Venting

CAUTION: Proper installation of flue venting is critical for the safe and efficient operation of the heater.

General

Flue Exhaust Tee

An optional Flue Exhaust Tee is available to facilitate horizontal venting. Any reference to horizontal venting that exits the back of the heater requires this tee. Refer to Table K for the appropriate kit for your model.

Model	Diameter	Order Number
992C	10"	011841
1262C, 1532C	12"	011842
1802C, 2002C, 2072C	14"	011843
2342C	16"	011844

Table K: Flue Exhaust Tee Kits

Appliance Categories

Heaters are divided into four categories based on the pressure produced in the exhaust and the likelihood of condensate production in the vent.

Category I – A heater which operates with a non-positive vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent.

Category II – A heater which operates with a non-positive vent static pressure and with a vent gas temperature that may cause excessive condensate production in the vent.

Category III – A heater which operates with a positive vent pressure and with a vent gas temperature that avoids excessive condensate production in the vent.

Category IV – A heater which operates with a positive vent pressure and with a vent gas temperature that may cause excessive condensate production in the vent.

See Table L for appliance category requirements.

Hi Delta units have internal fans, and carrying capacity for CAT I vents is determined using the 'Fan' column.

NOTE: For additional information on appliance categorization, see appropriate ANSI Z21 Standard and the NFPA (U.S.), or B149 (Canada), or applicable provisions of local building codes.

CAUTION: When condensate traps are installed, condensate must be routed to an appropriate container for treatment before disposal, as required by local codes.

CAUTION: Condensate is acidic and highly corrosive.

WARNING: Contact the manufacturer of the vent material if there is any question about the appliance categorization and suitability of a vent material for application on a Category III or IV vent system. Using improper venting materials can result in personal injury, death or property damage.

Support of Vent Stack

The weight of the vent stack or chimney must not rest on the heater vent connection. Support must be provided in compliance with applicable codes. The vent should also be installed to maintain proper clearances from combustible materials.

Use insulated vent pipe spacers where the vent passes through combustible roofs and walls.

NOTE: During winter months check the vent cap and make sure no blockage occurs from build-up of snow or ice.

Vent Terminal Location

1. Condensate can freeze on the vent cap. Frozen condensate on the vent cap can result in a blocked flue condition.
2. Give special attention to the location of the vent termination to avoid possibility of property damage or personal injury.
3. Gases may form a white vapor plume in winter. The plume could obstruct a window view if the termination is installed near windows.
4. Prevailing winds, in combination with below-freezing temperatures, can cause freezing of condensate and water/ice build-up on buildings, plants or roofs.
5. The bottom of the vent terminal and the air intake shall be located at least 12 in. above grade, including normal snow line.
6. Un-insulated single-wall metal vent pipe shall not be used outdoors in cold climates for venting gas-fired equipment.
7. Through-the-wall vents for Category II and IV appliances and non-categorized condensing appliances shall not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves, or other equipment. Where local experience indicates that condensate is a problem with Category I and III appliances, this provision shall also apply.
8. Locate and guard vent termination to prevent accidental contact by people or pets.

9. DO NOT terminate vent in window well, stairwell, alcove, courtyard or other recessed area.
10. DO NOT terminate above any door, window, or gravity air intake. Condensate can freeze, causing ice formations.
11. Locate or guard vent to prevent condensate from damaging exterior finishes. Use a rust-resistant sheet metal backing plate against brick or masonry surfaces.
12. DO NOT extend exposed vent pipe outside of building. Condensate could freeze and block vent pipe.

U.S. Installations

Refer to the latest edition of the National Fuel Gas Code.

Vent termination requirements are as follows:

1. Vent must terminate at least 4 ft below, 4 ft horizontally from or 1 ft above any door, window or gravity air inlet to the building.
2. The vent must not be less than 7 ft above grade when located adjacent to public walkways.
3. Terminate vent at least 3 ft above any forced air inlet located within 10 ft.
4. Vent must terminate at least 4 ft horizontally, and in no case above or below unless 4 ft horizontal distance is maintained, from electric meters, gas meters, regulators, and relief equipment.
5. Terminate vent at least 6 ft away from adjacent walls.

Combustion Air Supply	Exhaust Configuration	Heater Venting Category	Certified Materials	Combustion Air Inlet Material
From Inside Building (Room Air)	Vertical Natural Draft Venting	I FAN	"B" Vent	
	Horizontal Through-the-Wall Venting	III	Stainless Steel (Gas Tight)	
From Outside Building (Ducted Air)	Vertical Natural Draft Venting	I FAN	"B" Vent	Galvanized Steel PVC ABS CPVC
	Horizontal Through-the-Wall Venting	III	Stainless Steel (Gas Tight)	

Table L: Venting Category Requirements

6. DO NOT terminate vent closer than 5 ft below roof overhang.
7. The vent terminal requires a 12 in. vent terminal clearance from the wall.
8. Terminate vent at least 1 ft above grade, including normal snow line.
9. Multiple direct vent installations require a 4 ft clearance between the ends of vent caps located on the same horizontal plane.

Canadian Installations

Refer to latest edition of B149 Installation code.

A vent shall not terminate:

1. Directly above a paved sidewalk or driveway which is located between two single-family dwellings and serves both dwellings.
2. Less than 7 ft (2.13 m) above a paved sidewalk or paved driveway located on public property.
3. Within 6 ft (1.8 m) of a mechanical air supply inlet to any building.
4. Above a meter/regulator assembly within 3 ft (915 mm) horizontally of the vertical centre-line of the regulator.
5. Within 6 ft (1.8 m) of any gas service regulator vent outlet.
6. Less than 1 ft (305 mm) above grade level.
7. Within the 3 ft (915 mm) of a window or door which can be opened in any building, any non-mechanical air supply inlet to any building or the combustion air inlet of any other appliance.
8. Underneath a verandah, porch or deck, unless the verandah, porch or deck is fully open on a minimum of two sides beneath the floor, and the distance between the top of the vent termination and the underside of the verandah, porch or deck is greater than 1 ft (305 mm).

Changing the Flue Outlet

The flue connection may be changed from the top to the rear of the heater using the optional flue exhaust tee kit (see Fig. 35). Follow the directions given in the Flue Exhaust Tee kit instruction, Catalog No. 1000.59.

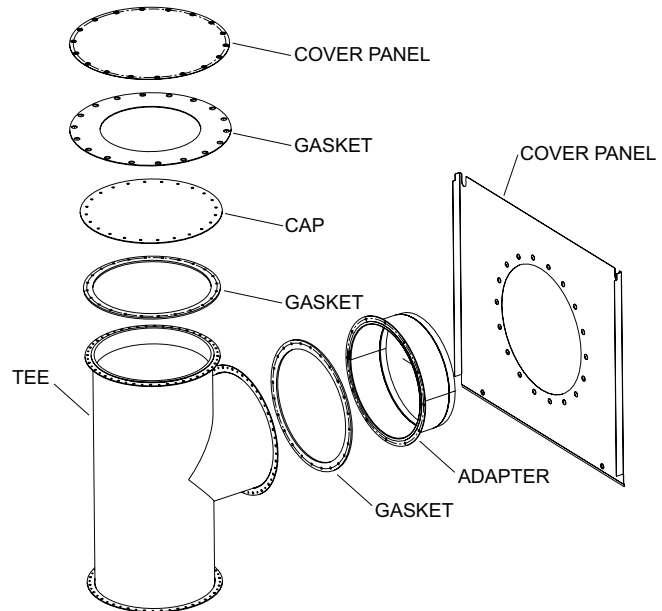


Fig. 38: Flue Exhaust Tee Kit

CAUTION: The silicone vent gaskets must be properly reinstalled to prevent flue gas leakage. Replace any torn or worn vent gaskets.

Venting Installation Tips

Support piping:

- horizontal runs - at least every 5 ft
- vertical runs - use braces
- under or near elbows

WARNING: Examine the venting system at least once a year. Check all joints and vent pipe connections for tightness, corrosion or deterioration.

Venting Configurations

For heaters connected to gas vents or chimneys, vent installations shall be in accordance with the NFGC (U.S.), or B149 (Canada), or applicable provisions of local building codes.

Natural Draft Vertical Venting (Category I, Fan Assisted)

Installation

Natural draft venting uses the natural buoyancy of the heated flue products to create a thermal driving head that expels the exhaust gases from the flue. The negative draft must be within the range of $-.01$ to $-.08$ in. WC as measured 12 in. above the appliance flue outlet to ensure proper operation. Vent material must be listed by a nationally recognized test agency.

The maximum and minimum venting length for Category I appliances shall be determined per the NFGC (U.S.) or B149 (Canada).

The diameter of vent flue pipe should be sized according to the NFGC (U.S.) and B149 (Canada). The minimum flue pipe diameter for conventional negative draft venting using double-wall Type B vent is: 10 in. for Model 992C; 12 in. for Models 1262C and 1532C; 14 in. for Models 1802C, 2002C and 2072C; and 16 in. for 2342C.

NOTE: A vent adapter (field-supplied) must be used to connect Type B vent to the unit.

The connection from the appliance vent to the stack must be as direct as possible and shall be the same diameter as, or larger than, the vent outlet. The horizontal breaching of a vent must have an upward slope of not less than $1/4$ inch per linear foot from the heater to the vent terminal. The horizontal portions of the vent shall also be supported for the design and weight of the material employed to maintain clearances and to prevent physical damage or separation of joints. See table M for Category I venting guidelines.

Termination

The vent terminal should be vertical and should terminate outside the building at least 2 ft above the highest point of the roof that is within 8 ft. for Model 992C and 10 ft for all other models. The vent cap should have a minimum clearance of 4 ft horizontally from and in no case above or below (unless a 4 ft horizontal distance is maintained) electric meters, gas meters, regulators

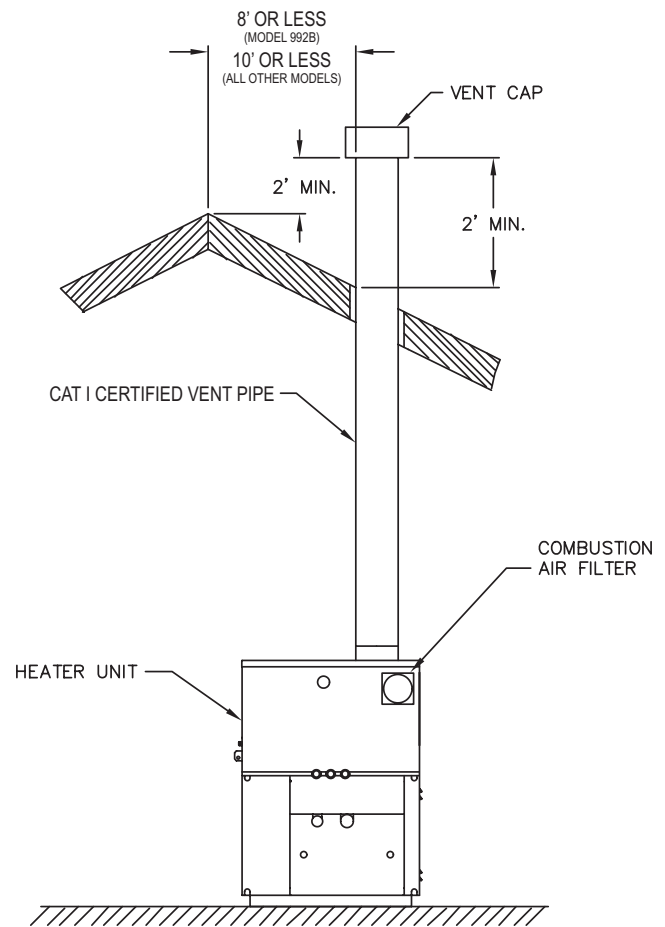


Fig. 39: Natural Draft Vertical Venting (Category I)

and relief equipment. The distance of the vent terminal from adjacent public walkways, adjacent buildings, open windows and building openings must be consistent with the NFGC (U.S.) or B149 (Canada). Gas vents supported only by flashing and extended above the roof more than 5 ft should be securely guyed or braced to withstand snow and wind loads.

CAUTION: A listed vent cap terminal, adequately sized, must be used to evacuate the flue products from the heaters.

Common Venting System

Manifolds that connect more than one heater to a common chimney must be sized to handle the combined load. Consult available guides for proper sizing of the manifold and the chimney. At no time should the area of the common vent be less than the area of the largest heater exhaust outlet.

WARNING: Vent connectors serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under a positive pressure.

CAUTION: Vent connectors for natural draft venting systems must be Type B or better.

Common venting systems may be too large once an existing unit is removed. At the time of removal of an existing appliance, **the following steps must be followed** with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

1. Seal any unused opening in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and verify there is no blockage, restriction, leakage, corrosion or other unsafe condition.
3. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common vent system. Turn on any exhaust fans, such as range

hoods and bathroom exhausts, at maximum-speed. Do not operate summer exhaust fan. Close fireplace dampers.

4. Place in operation the appliances being inspected. Follow the manufacturer's instructions for lighting each appliance. Adjust thermostat so appliance will operate continuously.
5. Check the pressure at a pressure tap located 12 in. above the bottom joint of the first vertical vent pipe. Pressure should be anywhere between -0.01 and -0.08 in. WC.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and other gas burning appliances to their previous conditions of use.
7. Any improper operation of the common venting system should be corrected so that the installation conforms with the NFGC (U.S.) or B149 (Canada). When re-sizing any portion of the common venting system, the common venting system should be re-sized to approach the minimum size as determined using the appropriate tables in the NFGC (U.S.) or B149 (Canada).
8. Common venting under CAT III (positive vent pressure) conditions is not supported.

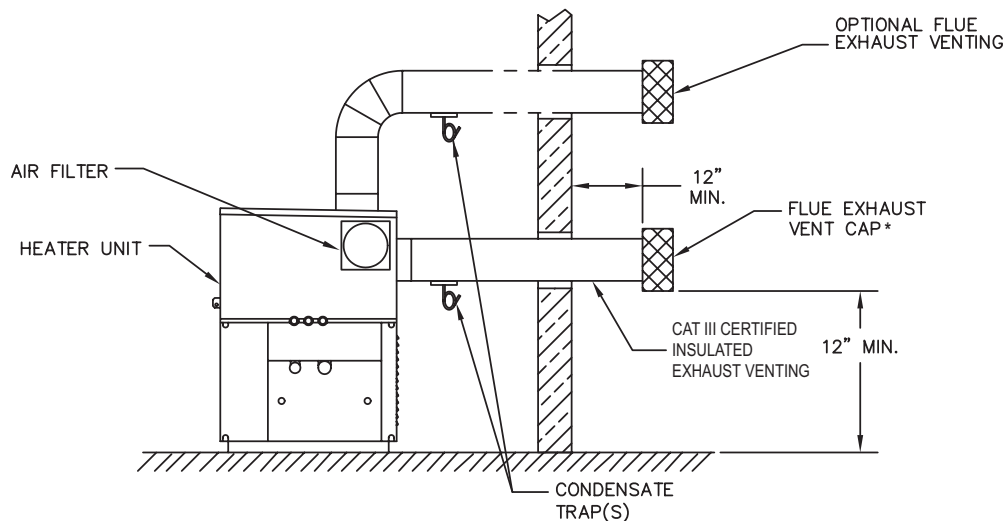
Model	Certified Venting Material	Vent Size	Vertical Venting Height*		Combustion Air Intake Pipe Material	Air Inlet Max. Length**	
			Min.	Max.		10"	12"
992C	Category I*** (Type B Equivalent)	10"	5'	25'	Galvanized Steel, PVC, ABS, CPVC	75'	100'
1262C		12"					
1532C		14"				40'	75'
1802C							
2002C							
2072C							
2342C		16"				40'	75'

* Vent lengths are based on a lateral length of 2 ft. Refer to the latest edition of the NFGC for further details. When vertical height exceeds 25 ft, consult factory prior to installation.

** Subtract 10 ft per elbow. Max. 3 elbows.

*** Vertical direct vent applications require the use of positive pressure vent systems. Maximum combustion air duct length terminated at 100 equivalent ft.

Table M: Category I Vertical Venting



*Requires rear vent tee, sales option D-14.

**Fig. 40: Horizontal Through-the-Wall Venting
(Category III)**

Horizontal Through-the-Wall Venting (Category III)

Installation

These installations utilize the heater-mounted blower to vent the combustion products to the outdoors. Combustion air is taken from inside the room and the vent is installed horizontally through the wall to the outdoors. Adequate combustion and ventilation air must be supplied to the equipment room in accordance with the NFGC (U.S.) or B149 (Canada).

The total length of the horizontal through-the-wall flue system should not exceed 70 equivalent ft in length. If horizontal run exceeds 70 equivalent ft, an appropriately sized extractor must be used. Each elbow used is equal to 10 ft of straight pipe. This will allow installation in one of the four following arrangements:

- 70' of straight flue pipe
- 60' of straight flue pipe and one elbow
- 50' of straight flue pipe and two elbows
- 40' of straight flue pipe and three elbows

The vent cap is not considered in the overall length of the venting system.

The vent must be installed to prevent flue gas leakage. Care must be taken during assembly to ensure that all joints are sealed properly and are airtight. The vent must be installed to prevent the potential accumulation of condensate in the vent pipes. It is required that:

1. The vent must be installed with a slight downward slope of not more than 1/4 inch per foot of horizontal run to the vent terminal.

2. The vent must be insulated through the length of the horizontal run.

For installations in extremely cold climate, it is required that:

1. The vent must be installed with a slight upward slope of not more than 1/4 inch per foot of horizontal run to the vent terminal. In this case, an approved condensate trap must be installed per applicable codes.

2. The vent must be insulated through the length of the horizontal run.

Termination

The flue direct vent cap **MUST** be mounted on the exterior of the building. The direct vent cap cannot be installed in a well or below grade. The direct vent cap must be installed at least 1 ft above ground level and above normal snow levels. The Raypak-approved stainless steel flue direct vent cap **MUST** be used (sales order option D-15).

WARNING: No substitutions of flue pipe or vent cap material are allowed. Such substitutions would jeopardize the safety and health of inhabitants.

CAUTION: Condensate is acidic and highly corrosive.

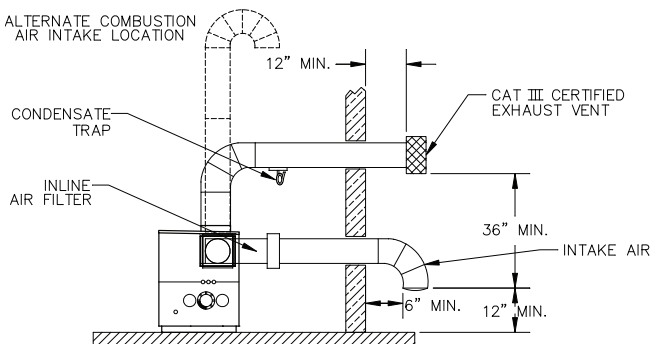
Model No.	Certified Venting Material	Vent Size	Maximum Equivalent Vent Length*	Combustion Air Intake Pipe Material	Air Inlet Max. Length*	
					10"	12"
992C	Category III	10"	70' Room Air	Galvanized Steel, PVC, ABS, CPVC	75'	100'
1262C		12"				
1532C			40' Ducted Combustion Air		40'	75'
1802C						
2002C						
2072C						
2342C						

* Subtract 10 ft per elbow. Max. 3 elbows.
Maximum combustion air duct length terminated at 100 equivalent ft.

Table N: Category III Horizontal and Ducted Air

Use only the special gas vent pipes listed for use with Category III gas burning heaters, such as the stainless steel vents offered by Heat Fab Inc. (800-772-0739), Protech System, Inc. (800-766-3473), Z-Flex (800-654-5600) or American Metal Products (800-423-4270). Pipe joints must be positively sealed. Follow the vent manufacturer's installation instructions carefully.

Ducted Air - Horizontal Through-the-Wall



Note: When vertical height exceeds 25 ft, consult factory prior to installation.

Fig. 41: Ducted Air - Horizontal Through-the-Wall

Installation

These installations utilize the heater-mounted blower to draw combustion air from outdoors and vent combustion products to the outdoors.

The total length of the through-the-wall flue cannot exceed 40 equivalent ft in length for the flue outlet. Each elbow used is equal to 10 ft of straight pipe. This

will allow installation in one of the three following arrangements:

- 40' of straight flue pipe
- 30' of straight flue pipe and one elbow
- 20' of straight flue pipe and two elbows.

The total length of air supply pipe cannot exceed the distances listed in Table N. Each elbow used is equal to 10 ft of straight pipe. This will allow installation in any arrangement that does not exceed the lengths shown in Table N.

The flue direct vent cap is not considered in the overall length of the venting system.

Care must be taken during assembly that all joints are sealed properly and are airtight.

The vent must be installed to prevent the potential accumulation of condensate in the vent pipes. It is required that:

1. The vent must be installed with a slight downward slope of not more than 1/4 inch per foot of horizontal run to the vent terminal.
2. The vent must be insulated through the length of the horizontal run.

For installations in extremely cold climate, it is required that:

1. The vent must be installed with a slight upward slope of not more than 1/4 inch per foot of horizontal run to the vent terminal. In this case, an

approved condensate trap must be installed per applicable codes.

- The intake vent must be insulated through the length of the horizontal run.

Units with ducted combustion air DO NOT meet the requirements for direct venting, unless they are equipped with internal ducting to fully isolate the combustion system from room air. The internal ducting is the TruSeal® option (Sales order option, D-21 if factory-installed or D-22 if field-installed).

Termination

The flue direct vent cap MUST be mounted on the exterior of the building. The direct vent cap cannot be installed in a well or below grade. The direct vent cap must be installed at least 1 ft above ground level and above normal snow levels.

The direct vent cap MUST NOT be installed with any combustion air inlet directly above a direct vent cap. This vertical spacing would allow the flue products from the direct vent cap to be pulled into the combustion air intake installed above.

This type of installation can cause non-warrantable problems with components and poor operation of the heater due to the recirculation of flue products. Multiple direct vent caps should be installed in the same horizontal plane with a 4 ft clearance from the side of one vent cap to the side of the adjacent vent cap(s).

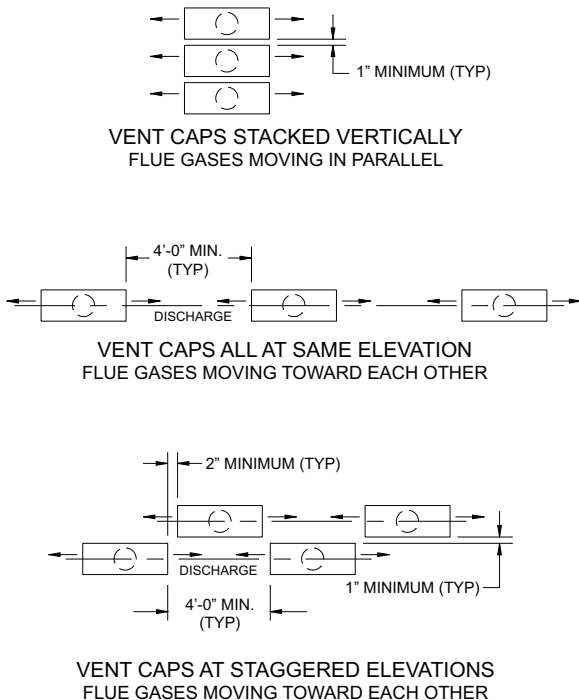


Fig. 42: Vent Cap Configurations

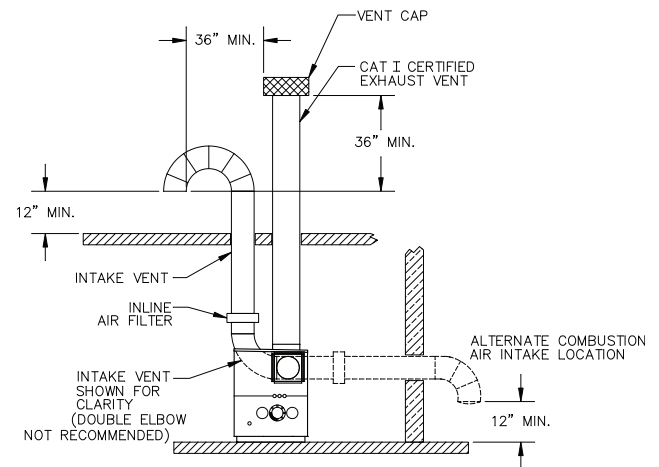
Combustion air supplied from outdoors must be free of particulate and chemical contaminants. To avoid a blocked flue condition, keep the vent cap clear of snow, ice, leaves, debris, etc.

WARNING: No substitutions of flue pipe or vent cap material are allowed. Such substitutions would jeopardize the safety and health of inhabitants.

The stainless steel flue direct vent cap **MUST** be furnished by the heater manufacturer in accordance with its listing (sales order option D-15).

Use only the special gas vent pipes listed for use with Category III gas burning heaters, such as the stainless steel vents offered by Heat Fab Inc. (800-772-0739), Protech System, Inc. (800-766-3473), Z-Flex (800-654-5600) or American Metal Products (800-423-4270). Pipe joints must be positively sealed. Follow carefully the vent manufacturer's installation instructions.

CAUTION: Condensate is acidic and highly corrosive.



Note: When vertical height exceeds 25 ft, consult factory prior to installation.

Note: When vertical height exceeds 25 ft, consult factory prior to installation.

Fig. 43: Ducted Air - Vertical

Ducted Air - Vertical

Installation

These installations utilize the heater-mounted blower to draw combustion air from outdoors and force the heated flue products through the vent pipe under positive pressure. The vent material must be in accordance with the above instructions for vent materials. Vent material must be listed by a nationally recognized test agency.

The connection from the appliance flue to the stack must be as direct as possible and should be the same size or larger than the vent outlet.

Unsealed flue pipe may allow flue products to enter a room containing contaminated air, creating a hazard. Raypak does not support the use of unsealed flue pipe such as B-Vent in direct vent applications.

Use only the special gas vent pipes listed for use with Category III gas burning heaters, such as the stainless steel vents offered by Heat Fab Inc. (800-772-0739), Protech System, Inc. (800-766-3473), Z-Flex (800-654-5600) or American Metal Products (800-423-4270). Pipe joints must be positively sealed. Follow carefully the vent manufacturer's installation instructions.

See Table M for Category I venting guidelines.

It is recommended that in colder climates, the intake vent be insulated.

Termination

The flue terminal should be vertical and should terminate outside the building at least 2 ft above the highest point of the roof within 8 ft. for Model 992C or 10 ft. for all other models. The vent cap should have a minimum clearance of 4 ft horizontally from and in no case above or below (unless a 4 ft horizontal distance is maintained) electric meters, gas meters, regulators and relief equipment. The distance of the vent terminal from adjacent public walkways, adjacent buildings, open windows and building openings must be consistent with the NFGC (U.S.) or B149 (Canada).

Flues supported only by flashing and extended above the roof more than 5 ft should be securely guyed or braced to withstand snow and wind loads.

The air inlet opening **MUST** be installed 1 ft above the roof line or above normal snow levels that might obstruct combustion air flow. This dimension is critical to the correct operation of the heater and venting system and reduces the chance of blockage from snow. The vent cap must have a minimum 3 ft vertical clearance from the air inlet opening.

Outdoor Installation

Outdoor models are self-venting when installed with the optional factory-supplied outdoor vent kit and require no additional vent piping. A special vent cap, flow switch cover and air intake hood are provided in accordance with CSA requirements, which must be installed

directly on the heater. Correct clearances can be found earlier in this section.

Care must be taken when locating the heater outdoors, because the flue gases discharged from the vent cap can condense as they leave the cap. Improper location can result in damage to adjacent structures or building finish. For maximum efficiency and safety, the following precautions must be observed:

1. Outdoor models must be installed outdoors and must use the outdoor vent cap, flow switch cover and air intake hood available from the manufacturer (sales order option D-11).
2. Periodically check venting system. The heater's venting areas must never be obstructed in any way and minimum clearances must be observed to prevent restriction of combustion and ventilation air. Keep area clear and free of combustible and flammable materials.
3. Do not locate adjacent to any window, door walkway, or gravity air intake. The vent must be located a minimum of 4 ft horizontally from such areas.
4. Install above grade level and above normal snow levels.
5. Vent terminal must be at least 3 ft above any forced air inlet located within 10 ft.
6. Adjacent brick or masonry surfaces must be protected with a rust-resistant sheet metal plate.

NOTE: Condensate can freeze on the vent cap. Frozen condensate on the vent cap can result in a blocked flue condition.

NOTE: The vent cap, flow switch cover and air intake hood must be furnished by the heater manufacturer in accordance with its listing (sales order option D-11).

Sequence of Operation

Models 992C-1262C

1. Upon initial application of 24VAC power, the PIM resets with all outputs in the "OFF" state.
2. The PIM and VERSA IC Control perform a processor and memory self-test to ensure proper operation.

-
3. The PIM confirms the presence of a valid ID Card which matches the configuration stored in memory at the factory. If a valid ID Card is NOT present, the PIM generates a diagnostic fault and will shut down waiting for this fault to be addressed.
 4. The PIM reads the DIP switch settings and configures itself for the desired operation.
 5. The PIM scans the Ft_bus communications for the VERSA IC Control and if found, system operation is controlled by the VERSA IC Control.
 6. Non-volatile memory is checked for any active lockout conditions. If any exist, they must be addressed before the PIM will allow a new trial for ignition to start.
 7. The PIM continually monitors the flame status to ensure that no flame is present during standby. If an erroneous flame is detected, the PIM generates a False Flame error fault.
 8. A Call-for-heat is initiated by the presence of any one or more of the 4 sources below:
 - a. A heat demand (contact closure) on the TH field wiring terminals.
 - b. A voltage greater than 0.5 VDC on the analog 0-10 VDC EMS signal input.
 - c. A heat demand present on the DHW field wiring terminals.
 - d. A heat demand from the VERSA IC control based on the DHW sensor temperature.
 9. The PIM initiates a trial for ignition counter to the programmed number of trials for ignition (1 or multiple) and proceeds to Pump Purge mode.
 10. The VERSA IC Control will turn on the system, boiler and/or DHW pump as necessary to address the call-for-heat. This is dependent on the Mode of operation selected. The pumps will proceed through their purge period before the control will move into a Trial for Ignition (TFI). For systems with CWP enabled, the MIX output is sent to the MIX MIN % value.
 11. The VERSA Control Board and PIM check the safety circuit and will stop from going into a trial for ignition if any of the safety devices is in an error/fault condition.
 12. If no fault condition is found, the air pressure switch (if present) is verified to be in the open position before the blower is energized.
 13. The blower(s) are energized.
 14. The air pressure switches are verified closed within 60 seconds to prove air flow.
 15. Once the air pressure switches close, the blower proceeds to pre-purge for the specified period.
 16. The voltage level of the 24VAC supply input is confirmed to be above 18.0VAC – if not, a Low Voltage fault will be recorded and the heater will go into a soft lockout condition until the voltage rises above 18.0VAC consistently.
 17. If all checks have passed, the system proceeds to ignition.
 18. The PIM re-initializes the ignition counter to the configured number of trials (typically 1 or 3).
 19. The Hi Limit sensor is confirmed to read below the Hi Limit setpoint.
 20. The gas valve relay contacts are verified open – if closed, a fault code will be issued and the heater will post-purge and go into a hard lockout condition.
 21. The Hi-Delta units are equipped with a Hot Surface Igniter:
 - a. The control turns on the HSI and the HSI proving current is verified to be above the configured value.
 - b. The configured heat-up delay takes place to allow the HSI element to reach ignition temperature.
 - c. The gas valve output is energized for the trial-for-ignition time to light the burner.
 - d. The HSI is de-energized during the last second of the trial-for-ignition period to sense for the burner flame.
 - e. The flame sense is checked for successful lighting of the burner. If a valid flame is detected, the main gas valve, operating pumps and blower relay remain energized and the PIM proceeds to the Heating mode.
-

- f. For systems with CWP enabled, the MIX output is released to its control point based on distance from Inlet temperature target.
- g. When power is sent to the first gas valve it is also used to energize the stage module, which also receives a proportional signal generated by the PIM that will stage the firing rate based on the calculated heat demand.
- h. The proportional signal will determine the exact time when the 2nd Stage relay is activated. At the moment of activation a Time Delay Relay 1 (TDR-1) will be energized, which starts a 5-second countdown.
- i. After the 5-second countdown TDR-1 energizes Gas Valve 2 and provides power on one side of the Stage 3 relay dry contact (NO).
- j. The proportional signal will determine the exact time when the 3rd Stage relay is activated. At the moment of activation a Time Delay Relay 2 (TDR-2) will be energized, which starts a 5-second countdown.
- k. After the 5-second countdown TDR-2 energizes Gas Valve 3.
- l. (1262C) When Gas Valve 3 activates, power is also provided on one side of the Stage 4 relay dry contact (NO).
- m. (1262C) The proportional signal will determine the exact time when the 4th Stage relay is activated, at the moment of activation a Time Delay Relay 3 (TDR-3) will be energized, which starts a 5-second countdown.
- n. (1262C) After the 5-second countdown TDR-3 energizes Gas Valve 4.

22. If flame is not detected during the trial-for-ignition period, the gas valve output is disabled immediately and the blower goes to post-purge.

23. On single trial-for-ignition models, the PIM enters ignition lockout and the LED on the PIM indicates the fault code for ignition lockout. The VERSA IC Display should also state Ignition Lockout.

On multi-trial-for-ignition models, the control goes through an interpurge delay before additional ignition attempts are started. If no flame is detected after the final trial-for-ignition, the PIM enters ignition lockout and the LED on the PIM indicates the fault code for ignition lockout. The VERSA IC Display should also state Ignition Lockout.

Models 1532C-2342C

1. Upon initial application of 24VAC power, the PIM resets with all outputs in the "OFF" state.
2. The Primary PIM and VERSA IC Control perform a processor and memory self-test to ensure proper operation.
3. The Primary PIM and Secondary PIM confirm the presence of a valid ID Card which matches the configuration stored in memory at the factory. If valid ID Cards are NOT present, the individual PIM generates a diagnostic fault and will shut down waiting for this fault to be addressed.
4. The Primary PIM reads the DIP switch settings and configures itself for the desired operation.
5. The Primary PIM scans the Ft_bus communications for the VERSA IC Control and if found, system operation is controlled by the VERSA IC Control. Additionally the Primary PIM, once confirmed the Dual PIM configuration by the ID card, scans for the Secondary PIM. If not found, the system generates a diagnostic fault and will proceed operation with the available capacity.
6. Non-volatile memory is checked for any active lockout conditions. If any exist, they must be addressed before the Primary PIM will allow a new trial for ignition to start.
7. The Primary PIM and Secondary PIM continually monitor the flame status to ensure that no flame is present during standby. If an erroneous flame is detected, the individual PIM generates a False Flame error fault.
8. A Call-for-heat is initiated by the presence of any one or more of the 4 sources below:
 - a. A heat demand (contact closure) on the TH field wiring terminals.
 - b. A voltage greater than 0.5 VDC on the analog 0-10 VDC EMS signal input.
 - c. A heat demand present on the DHW field wiring terminals.
 - d. A heat demand from the VERSA IC control based on the DHW sensor temperature.
9. The Primary PIM initiates a trial for ignition counter to the programmed number of trials for ignition

-
- (1 or multiple) and proceeds to Pump Purge mode.
10. The VERSA IC Control will turn on the system, boiler and/or DHW pump as necessary to address the call-for-heat. This is dependent on the Mode of operation selected. The pumps will proceed through their purge period before the control will move into a Trial for Ignition (TFI). For systems with CWP enabled, the MIX output is sent to the MIX MIN % value.
 11. The VERSA Control Board and PIM check the safety circuit and will stop from going into a trial for ignition if any of the safety devices is in an error/fault condition.
 12. If no fault condition is found, the air pressure switch (if present) is verified to be in the open position before the blower is energized.
 13. The blower(s) are energized.
 14. The air pressure switch is verified to close within 60 seconds to prove air flow.
 15. Once the air pressure switch closes, the blowers proceed to pre-purge for the specified duration.
 16. At this point all safeties have been verified and Primary PIM activates the Interlock Signal, which indicates to the Secondary PIM that it is ready to attempt an ignition sequence whenever the VERSA Control Board indicates.
 17. The voltage level of the 24VAC supply input is confirmed to be above 18.0VAC – if not, a Low Voltage fault will be recorded and the heater will go into a soft lockout condition until the voltage rises above 18.0VAC consistently.
 18. If all checks have passed, the system proceeds to ignition.
 19. Either Primary or Secondary PIM (depending on the rotation sequence) re-initializes the ignition counter to the configured number of trials (typically 1 or 3). (For the sequence of operation description it is assumed that the Primary PIM is leading the rotation sequence)
 20. The Hi Limit sensor is confirmed to read below the Hi Limit setpoint.
 21. The gas valve relay contacts are verified open – if closed, a fault code will be issued and the heater will post-purge and go into a hard lockout condition.
 22. The Hi Delta units are equipped with a Hot Surface Igniter:
 - a. The Primary PIM control turns on the HSI and the HSI proving current is verified to be above the configured value.
 - b. The configured heat-up delay takes place to allow the HSI element to reach ignition temperature.
 - c. The “Gas Valve 1” output (from Primary PIM) is energized for the trial for-ignition time to light the burner.
 - d. The HSI is de-energized during the last second of the trial-for-ignition period to sense for the burner flame.
 - e. The flame sense is checked for successful lighting of the burner. If a valid flame is detected, the main gas valve, operating pumps and blower relay remain energized and the Primary PIM proceeds to the Heating mode.
 - f. For systems with CWP enabled, the MIX output is released to its control point based on distance from Inlet temperature target.
 - g. (2002C-2342C) when power is sent from Primary PIM to main gas valve (1) it is also sent to Time Delay Relay 1 (TDR-1), which starts a 5-second countdown.
 - h. (2002C-2342C) after the 5-second countdown TDR-1 energizes Gas Valve 1A.
 - i. The second stage will be triggered by the Primary PIM using the second relay build into the Primary PIM hardware (J14- 2, 5).
 - j. When heat demand is reached the Primary PIM will be required by the VERSA Control Board to activate Gas Valve 2.
 - k. At this point if the Interlock remains activated and heat demand is still present, the Secondary PIM is called to continue the ramp up process.
 - l. The Secondary PIM control turns on the HSI and the HSI proving current is verified to be above the configured value.
-

- m. The configured heat-up delay takes place to allow the HSI element to reach ignition temperature.
 - n. The “Gas Valve 3” output (from Secondary PIM) is energized for the trial-for-ignition time to light the burner.
 - o. The HSI is de-energized during the last second of the trial-for-ignition period to sense for the burner flame.
 - p. The flame sense is checked for successful lighting of the burner. If a valid flame is detected, the main gas valve, operating pumps and blower relay remain energized.
 - q. The Fourth Stage will be triggered by the Secondary PIM using the second relay build into the Secondary PIM hardware (J14- 2, 5).
 - r. When heat demand is reached Secondary PIM will be required by the VERSA Control Board to activate Gas Valve 4.
23. If flame is not detected during the trial-for-ignition period by Primary or Secondary PIM, only the correspondent gas valves outputs are disabled immediately at the individual PIM with the ignition failure.
24. The system will command the blower to go into a post-purge if the no secured stages are active and monitored by the remaining PIM. If Heat is still required the remaining healthy PIM will take over the demand.
25. If any safety is compromised the Primary PIM will terminate the Interlock signal as a hardwire notification of the failure. The lack of Interlock signal will terminate any active stage monitored by the Secondary PIM.
26. As a safety redundancy Primary PIM will communicate through the FT_BUS to the Secondary PIM to terminate all active stages.
27. On single trial-for-ignition models, the PIM enters ignition lockout and the LED on the PIM indicates the fault code for ignition lockout. The VERSA IC Display should also state Ignition Lockout.

On multi-trial-for-ignition models, the control goes through an interpurge delay before additional ignition attempts are started. If no flame is detected after the final trial-for-ignition, the PIM enters ignition lockout

and the LED on the PIM indicates the fault code for ignition lockout. The VERSA IC Display should also state Ignition Lockout.

Freeze Protection

To enable freeze protection, DIP switch position 7 (on the PIM) must be turned on (UP position). This is the default position.

If the water temperature drops below 45°F on the Outlet or Inlet sensors, the Boiler pump is enabled. The pump is turned off when both the Inlet and Outlet temperatures rise above 50°F.

If either the Outlet or Inlet temperature drops below 38°F, the VERSA starts the burner at the minimum firing rate. The burner cycle will terminate when both the Inlet and Outlet temperatures rise above 42°F.

Controls

WARNING: Installation, adjustment and service of heater controls, including timing of various operating functions, must be performed by a qualified installer, service agency or the gas supplier. Failure to do so may result in control damage, heater malfunction, property damage, personal injury, or death.

WARNING: Turn off the power to the heater before installation, adjustment or service of any heater controls. Failure to do so may result in board damage, heater malfunction, property damage, personal injury, or death.

CAUTION: This appliance has provisions to be connected to more than one supply source. To reduce the risk of electric shock, disconnect all such connections before servicing.

CAUTION: Risk of electric shock: More than one disconnect switch may be required to de-energize the equipment before servicing.

Ignition Control Functions

When there is a call for heat, and all safeties are closed, then the combustion air blower starts to purge air from the combustion chamber. After the pre-purge, the igniter is energized. The standard ignition module will lock-out after failing to light 3 times during a call for heat. To reset the lock-out, press and release the

RESET button located on the user interface. The control will automatically reset after 1 hour. When in lock-out the control will run the blower through a post-purge cycle.

The single-try ignition module (part of the CSD-1 option) will attempt to light only one time before lock-out occurs. To reset the lock-out, press and release the **RESET** button located on the user interface.

Turning off the power to the heater WILL NOT reset the single-try ignition module.

High Limit—Manual Reset

This heater is equipped with a fixed-setting manual reset high limit temperature device as standard. It may also have an additional optional adjustable manual-reset high-temperature device.

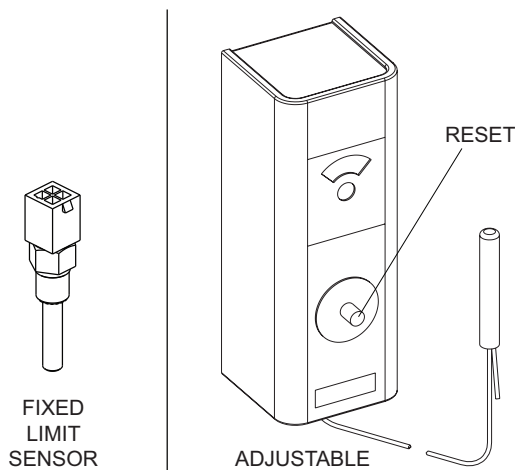


Fig. 40: High Limit (Manual Reset)

Standard

The fixed setting manual-reset high limit is built into the PIM, it utilizes a dual-element sensor located on the outlet (see Fig. 40). To reset a high limit lock-out, press and release the **RESET** button located on the user interface.

High Limit—Auto-Reset (Optional)

This heater may be equipped with an optional adjustable auto-reset high limit temperature device.

Adjust the setting to approx. 20°F (10°C) above desired outlet temperature.

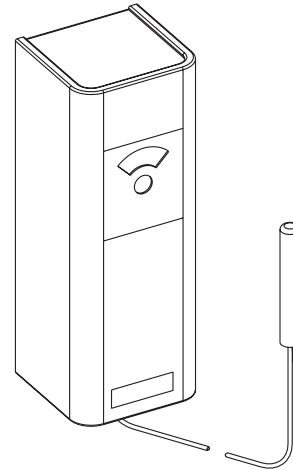


Fig. 41: Adjustable High Limit (Auto Reset)

Flow Switch

The flow switch is provided as standard and is factory mounted and wired. The switch shuts off heater in case of pump failure or low water flow.

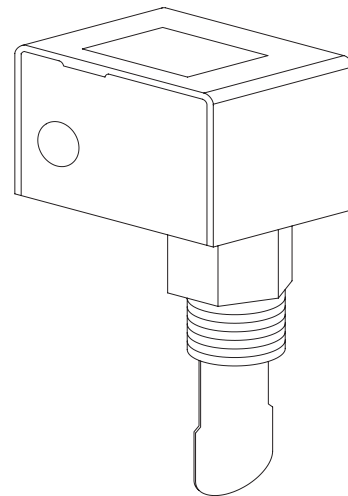


Fig. 42: Flow Switch

Low Water Cut-Off (Optional)

The low water cut-off (Sales option F-10) automatically shuts down the burner whenever water level drops below the level of the sensing probe. A 5-second time delay prevents premature lockout due to temporary conditions such as power fluctuations or air pockets.

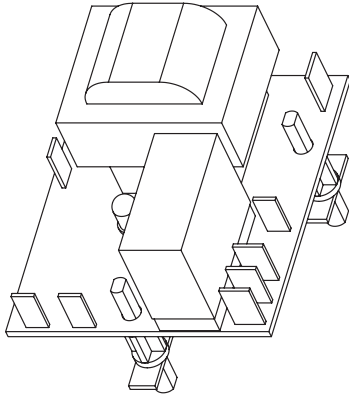


Fig. 43: Low Water Cut-Off

High and Low Gas Pressure Switches

The low gas pressure switch (standard) connection mounts upstream of the gas valve to ensure that sufficient gas pressure is present for proper regulator performance. The low gas pressure switch automatically shuts down the heater if gas supply drops below the factory setting of 5.0 in. WC for natural gas, and 10.0 in. WC for propane gas.

The high gas pressure switch (Sales option S-2) connection mounts down-stream of the stage-1 gas valve. If the gas pressure regulator fails, the high gas pressure switch automatically shuts down the burner. The high gas pressure switch automatically shuts down the heater if gas manifold pressure rises above the setting of 5.0 in. WC for natural gas, and 11.5 in. WC for propane gas.

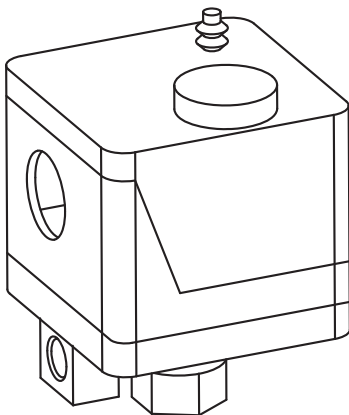


Fig. 44: High/Low Gas Pressure Switch

These safety devices can emit small amounts of fuel gas, and must be vented to a safe discharge location outdoors, per local code requirements.

Air Pressure Switch

This heater is equipped with a one or more air pressure switches to prove blower operation prior to ignition. This switches are located on the blower housing.

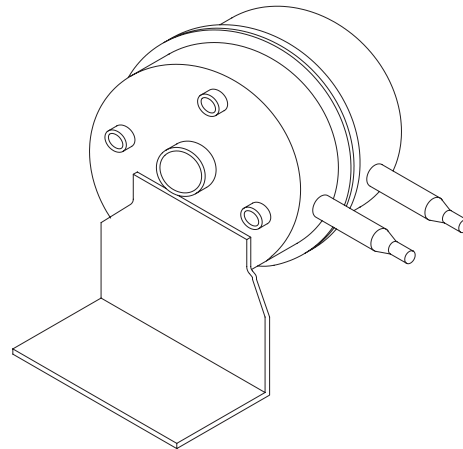


Fig. 45: Air Pressure Switch

Blocked Vent Switch

This heater is equipped with a blocked vent pressure switch to prevent the operation of the heater when too much of the vent is blocked. This switch is located inside the left upper cabinet adjacent the control box.

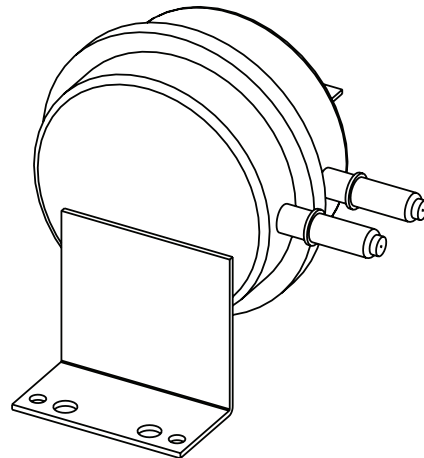


Fig. 46: Blocked Vent Switch

User Interface

The user interface consists of several Menu options. Press the **MENU** button to scroll through the different menus in the interface. Press the **ITEM** button to scroll through available items within a selected menu. And, the **UP** and **DOWN** buttons allow for setting changes to items in the **ADJUST** menu. Refer to Fig. 47 for display and key locations.

For detailed descriptions of the various screens, consult the VERSA IC Control I&O Manual (Catalog #5000.72).

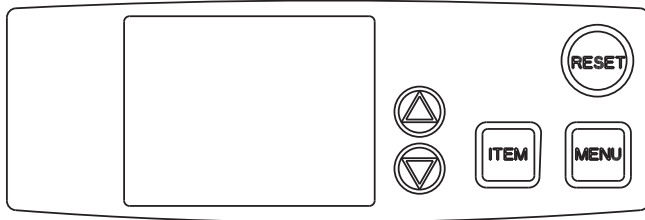


Fig. 47: User Interface

Adjusting the Hi Delta Setpoint

Use the **MENU** key to scroll to the **SETUP/ADJUST** menu, then use the **ITEM** key to scroll to the **SET-POINT** item. Adjust the Setpoint using the **UP** and **DOWN** arrow keys. Minimum setpoint for H, WH and P models is 50°F, Maximum setpoint for H models is 220°F, for WH models 150°F. Maximum setpoint for P models is 106°F.

View Menu

The **VIEW** menu is the default menu. It displays sensor temperatures, the modulation rate of the blower, heater cascade status, pump operation and CFH (Call For Heat) information. Some of the items displayed are mode specific and are only observable when its corresponding mode is active.

Menu - Initial Adjustment

To change settings use the **MENU** key to scroll to the **SETUP/ADJUST** menu. The **ADJUST** menu allows the installer to make adjustments to items shown in Table P.

Refer to the VERSA IC Control I&O Manual (Catalog #5000.72) for detailed setup instructions.

View Menu

The “View” icon is turned on. BOILER and 1 segment are turned on if BOILER 2, 3 or 4 are set to ON.

Item	Display Range	When is it Displayed	Description
OUTDOOR	---, -76 to 149°F	MASTER PIM Identity is H TARGET = RSET	Outdoor air temperature, the number field displays “----” if OUTDOOR sensor has a fault.
TARGET	---, -22 to 266°F	MASTER MODBUS RATE EMS RATE	Current target water temperature, the number field displays “----” when there is no current target.
POOL	“----”, -22 to 266°F	PIM Identity is P	Current pool temperature, the number field displays “----” if the pool sensor fails.
TANK	----, -22 to 266°F	PIM Identity is WH	Current system supply temperature, the number field displays “----” if Tank sensor fails.
SUPPLY	---, -22 to 266°F	MASTER	Current system supply temperature, the number field displays “----” if the SUPPLY
IND SUPPLY	---, -22 to 266°F	PIM Identity is H MODE = 3	Current temperature being supplied to the indirect, the number field displays “----” if the indirect DHW sensor fails.
Boil OUTLET	---, -22 to 266°F	Always	Current boiler outlet temperature as communicated from the PIM, the number field displays “----”
Boil INLET	---, -22 to 266°F	Always	Current boiler inlet temperature as communicated from the PIM, the number field displays “----” if the outlet sensor fails.
Boil ΔT	0 to 252°F	Always	Current boiler inlet temperature as communicated from the PIM, the number field displays “----” if the inlet and/or outlet sensor fails.
DHW Supply	---, -22 to 266°F	MASTER PIM Identity is H MODE = 2 OR 3 DHW SENSOR = ON	Current Indirect DHW Supply temperature, the number field displays “----” if the DHW sensor has a fault.
Boiler 1	IDLE, POST, PREP, STG 1, 2, 3, 4	MASTER	Shows the operation status of master boiler.
Boiler 2, 3, 4	IDLE, POST, PREP, STG 1, 2, 3, 4	MASTER	Shows the operation status of all boilers in cascade.

Table O: View Menu

Item	Application	Range	Description	Default
TARGET	H MODE 1,2,3	RSET <> SETP	RSET = Outdoor Reset, SETP =Setpoint.	SETP
TANK SETP	WH	OFF, 50°F to 150°F	Tank setpoint temperature.	125°F
TANK DIFF	WH	2°F to 10°F	Tank differential temperature.	3
POOL SETP	P	50°F to 104°F, 106°F	Pool setpoint temperature.	80°F
POOL DIFF	P	1°F to 5°F	Pool differential temperature.	2°F
POOL MAX	P	110°F to 120°F	Max supply temperature to pool (Hold UP & DOWN for arrow adjustment.)	110°F
MODE	H MODE 1,2,3	1,2,3	Piping and application configuration.	1
SETPOINT	H MODE 1,2,3	50°F to 220°F	Boiler target temperature while a heat demand is present for setpoint operation.	180°F
OUT START	H MODE 1,2,3	35°F to 85°F	Outdoor starting temperature - outdoor reset.	70°F
OUT DESIGN	H MODE 1,2,3	-60°F to 45°F	Outdoor design temperature - outdoor reset.	10°F
Boil START	H MODE 1,2,3	35°F to 150°F	Starting boiler target temperature when the outdoor temperature is at outdoor start outdoor reset.	70°F
Boil DESIGN	H MODE 1,2,3	70°F to 200°F	Design boiler target temperature when the outdoor temperature is at outdoor design outdoor reset.	180°F
TARGET MAX	H MODE 1,2,3	100°F to PIM value*	Maximum target system temperature.	220°F
TARGET MIN	H MODE 1,2,3	OFF, 50°F to 190°F	Minimum target system temperature.	50°F
TARGET DIFF	H MODE 1,2,3	2°F to 42°F	Differential for target system temperature.	10°F
IND SENSOR	H MODE 1,2,3	OFF <> ON	Selects whether a DHW sensor is used for indirect DHW tank.	OFF
IND SETP	H MODE 2,3	OFF, 50°F to 180°F	Target Indirect DHW temperature (IND Sensor = ON, to enable this setting).	140°F
DHW DIFF	H MODE 2,3	2°F to 10°F	Differential for the target indirect DHW tank temperature, requires IND Sensor = ON.	6°F
IND SUPPLY	H MODE 2,3	OFF, 50°F to PIM value*	Target boiler temperature for the DHW heat exchanger during indirect DHW operation, requires IND Sensor = OFF.	180°F
DHW PRIORITY	H MODE 2	OFF <> ON	Selects whether or not Indirect DHW priority is active during indirect DHW operation.	OFF
PRI OVR	H MODE 2,3	Au, 0:10hr to 2:00hr	Sets the length of the indirect DHW priority override time.	1:00hr
SYS PURGE	All	OFF, 0:20min to 20:00min	Sets the length of the system pump post purge.	20 seconds
MIX TYPE	H/WH/P MIX	H (BOIL <> PLNT) WH (1 <> 2)	Selects the type of control depending on pipe configuration for CWP.	H BOIL WH 2
MIX TARGET	H/WH/P MIX	50°F to 140°F	Inlet Target temperature.	120°F
MIX LOCK	H/WH/P MIX	ON <> OFF	The equipment will trigger a warning when "MIX Target" is not reached within 7 minutes. MIX LOCK = ON; Alarm and lockout, MIX LOCK = OFF; Alarm only.	OFF
MIX TRIM	H/WH/P MIX	-5°F to 5°F	This adjustment is for various types and sizes of units as well as various actuator motor speeds and types supplied by Raypak.	0
MIX SPEED	H/WH/P MIX	FAST <> MED <> SLOW	This setting defines speed of response.	MED
MIX INV	H/WH/P MIX	ON <> OFF	This option is related to the use of spring return actuators with a proportional valve.	OFF
WWSD	H MODE 1,2,3	40°F to 100°F	The system warm weather shutdown temperature outdoor reset, requires TARGET = RSET.	70°F
UNITS	All	deg F <> deg C	Show units using icons in display.	deg F
MODBUS	All	OFF <> MNTR <> TEMP <> RATE	ModBus Operating Mode: Off, Monitor, Temp Control, Rate Control.	OFF
ADDRESS	All	1 to 247	ModBus slave address.	1
DATA TYPE	All	RTU <> ASCI	Modbus data type.	RTU
BAUD RATE	All	2400 <> 9600 <> 19K2 <> 57K6 <> 115K		19K2
PARITY	All	NONE <> EVEN <> ODD		EVEN

* Fixed values based on ID Card.

Table P: Setup/Adjust Menu

Boiler Menu

The Boiler View displays various items regarding ignition, temperature monitoring, and modulation rates. As well as software and hardware information.

Item	Application	Description
BOILER 1	ALL	Enables Boiler for operation.
BOILER 2	CASCADE	Enables Boiler for cascade operation.
BOILER 3	CASCADE	Enables Boiler for cascade operation.
BOILER 4	CASCADE	Enables Boiler for cascade operation.
IGNITION (IGNITION 1/2, models 1532-2342)	ALL	IDLE=no CFH; PREP=pre-purge or inter-purge between trials for ignition; IGN=trial for ignition; BURN=burner operating; POST=post purge; HARD=a hard lockout fault has occurred requiring manual high limit); and SOFT=a soft lockout fault has occurred which interrupts the manual high limit). The CFH will resume after the soft lockout fault has been corrected and a 15 min. waiting period has expired.
VENT WALL	Not Available	Not Available.
LIMIT TEMP	ALL	Current Outlet -Limit temperature.
EMS VDC	ALL	Current EMS signal in Volts DC.
FIRE RATE	ALL	PIM firing rate.
OUTLET MAX	H Mode 1,2,3	Defines Max Outlet temperature offset above Target Setpoint (Press and hold up and down arrows for 3 seconds to enable adjustment), see VERSA IC manual, catalog 5000.72.
OPERATOR	ALL	Operator Potentiometer setting on PIM.
DIFF	ALL	Current auto differential – Fixed by PIM.
PUMP POST	ALL	Sets the length of the boiler pump purge.
FLAME CUR	ALL	Flame current in micro-amps (μ A).
MASS	ALL	Thermal mass recovery, see VERSA IC manual, catalog 5000.72.
IDENTITY	ALL	Identifies the unit as boiler, water heater or pool heater.
IGN TYPE	ALL	PIM Board type.
ID CARD	ALL	Identifies Raypak Identity Card.
SW ID	ALL	PIM Software identification number.
ERROR CODE	ALL	Current Error Code.

Table Q: Boiler Menu

* Fixed values based on ID card

Monitor Menu

The Monitor Menu records and displays critical Boiler information, such as, Cycle times, Run times, and Maximum/Minimum temperature readings depending on the setup.

Item	Application	Description
RUN TIME Burner 1	All	Burner run time (hours). Press UP/DOWN for 1 sec to clear.
Cycles Burner	All	Number of burner cycles. Press UP/DOWN for 1 sec to clear.
RUN TIME Boiler pump	All	Boiler pump run time (hours). Press UP/DOWN for 1 sec to clear.
RUN TIME System pump	All	System pump run time (hours). Press UP/DOWN for 1 sec to clear.
RUN TIME DHW pump	H MODE 2,3	DHW pump run time (hours). Press UP/DOWN for 1 sec to clear.
OUTLET HI	All	Records the highest boiler outlet temperature. Press UP/DOWN for 1 sec to clear.
OUTLET LO	All	Records the lowest boiler outlet temperature. Press UP/DOWN for 1 sec to clear.
INLET HI	All	Records the highest boiler inlet temperature. Press UP/DOWN for 1 sec to clear.
INLET LO	All	Records the lowest boiler outlet temperature. Press UP/DOWN for 1 sec to clear.
DELTA T	All	Captures the highest Delta T temperature recorded Press UP & DOWN buttons for 3 sec to clear this entry.
OUTDOOR HI	H MODE 1,2,3	Records the highest outdoor temperature. Press UP/DOWN for 1 sec to clear.
OUTDOOR LO	H MODE 1,2,3	Records the lowest outdoor temperature. Press UP/DOWN for 1 sec to clear.
SYSTEM HI	All	Records the highest supply temperature. Press UP/DOWN for 1 sec to clear.
SYSTEM LO	All	Records the lowest supply temperature. Press UP/DOWN for 1 sec to clear.
IND HI	H MODE 1,2,3	Records the highest Indirect supply temperature. Press UP/DOWN for 1 sec to clear.
IND LO	H MODE 1,2,3	Records the lowest Indirect supply temperature. Press UP/DOWN for 1 sec to clear.
TANK HI	WH	Records the highest Tank temperature. Press UP/DOWN for 1 sec to clear.
TANK LO	WH	Records the lowest Tank temperature. Press UP/DOWN for 1 sec to clear.
POOL HI	P	Records the highest pool temperature. Press UP/DOWN for 1 sec to clear.
POOL LO	P	Records the lowest pool temperature. Press UP/DOWN for 1 sec to clear.

Table R: Monitor Menu

Toolbox Menu

The Toolbox Menu logs all error codes from the VERSA and PIM, as well as other functions. Up to 15 error codes can be logged for a maximum of 24 days.

Item	Description
Lookup Active Error	Look up and display the active error info.
USER TEST	Select ON to start the function. The setting returns to default after the test is run. (See Page 47 for details.)
MAX HEAT	Select ON to start the function. The setting will time out to OFF after 24 hours or can be set to OFF again by the user. (See VERSA IC Manual for details.)
J1214I	Software number of the Raypak VERSA
DEFAULTS	Resets to factory settings. Press UP and DOWN for 1 second to show CLR and load factory defaults to all settings. This will also clear all history.
HISTORY <i>lookup logged error</i>	Displayed when an error code is present. 1 indicates the most recent error code. Press UP and DOWN for 1 second to clear the error logs.

Table S: Toolbox Menu

Outdoor Reset Concept

The Temperature controller can change the System Setpoint based on outdoor temperature (Outdoor Reset). The temperature controller varies the temperature of the circulating heating water in response to changes in the outdoor temperature. The heating water temperature is controlled through the modulation and/or sequencing of the cascade.

The Temperature controller can also control the system circulating pump with an adjustable Outdoor Cutoff. When the outdoor temperature is above the Outdoor Cutoff, the pump is turned off and no heating water is circulated through the system. When the outdoor temperature drops below the Outdoor Cutoff, the system pump relay is activated and the heating water circulates through the system. The temperature of the heating water is controlled by the Reset Ratio, Water Offset, and changes with the outdoor temperature.

Reset Ratio/Outdoor Reset

When a building is being heated, heat escapes through the walls, doors, and windows to the colder outside air. The colder the outside temperature, the more heat escapes. If you can input heat into the building at the same rate that it is lost out of the building, then the building temperatures will remain constant. The Reset Ratio is an adjustment that lets you achieve this equilibrium between heat input and heat loss.

The starting point for most systems is the 1.00 (OD):1.00 (SYS) (Outdoor Temperature: Heating Water Temperature) ratio. This means that for every degree the outdoor temperature drops, the temperature of the heating water will increase one degree. With the VERSA, both ends of the slope are adjustable. It is factory set at 70°F water temperature (Boil START) at 70°F outdoor air (OUT START), and 180°F water temperature (Boil DESIGN) at 10°F outdoor air (OUT DESIGN).

Each building has different heat loss characteristics. A very well insulated building will not lose much heat to the outside air, and may need a Reset Ratio of 2.00 (OD):1.00 (SYS) (Outdoor: Water). This means the outdoor temperature would have to drop 2 degrees to increase the water temperature 1 degree. On the other hand, a poorly insulated building may need a Reset Ratio of 1.00 (OD):2.00 (SYS). This means that for each degree the outdoor temperature dropped the water temperature will increase 2 degrees. The VERSA control Reset Ratio allows for full customization to match any buildings heat loss characteristics.

A heating curve that relies not only on Outdoor temperature but also on the type of radiation will improve heat comfort. The user can fine-tune these adjustments based on the specific building need.

RESET RATIO (See Fig. 52)

The control uses the four following settings to determine the reset ratio:

Boiler Start (**Boil START**)

The Boil START temperature is the theoretical boiler supply water temperature that the heating system requires when the outdoor air temperature equals the OUT START temperature setting. The Boil START is typically set to the desired building temperature.

Outdoor Start (**OUT START**)

The OUT START temperature is the outdoor air temperature at which the control provides the Boil START water temperature to the system. The OUT START is typically set to the desired building temperature.

Outdoor Design (**OUT DESIGN**)

The OUT DESIGN is the outdoor air temperature that is the typical coldest annual temperature where the building is located. This temperature is used when completing heat loss calculations for the building.

Boiler Design (**Boil DESIGN**)

The Boil DESIGN temperature is the water temperature required to heat the boiler zones when the outdoor air is as cold as the OUT DESIGN temperature.

Warm Weather Shut Down (**WWSD**)

When the outdoor air temperature rises above the WWSD setting, the control turns on the WWSD segment in the display. When the control is in Warm Weather Shut Down, the Dem 1 segment is displayed if there is a heat demand. However, the control does not operate the boiler to satisfy this demand. The control continues to respond to DHW demands.

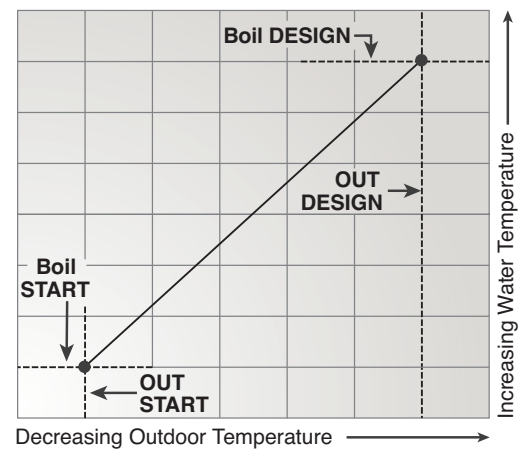


Fig. 48: Reset Ratio

Reset Ratio

The controller uses the following four settings to calculate the Reset Ratio (RR):

$$\text{RESET RATIO} = \frac{(\text{OUTDOOR START} - \text{OUTDOOR DESIGN})}{(\text{BOILER DESIGN} - \text{BOILER START})}$$

For example, when using the default values, the RR is:

$$\text{RR} = (70 - 10) / (180 - 70) = 0.55$$

Therefore, the RR is 0.55:1 (Outdoor:Water).

NOTE: The wiring diagrams in this manual show all standard options. Refer to the large wiring diagram provided with your heater for options installed on your specific unit(s).

START-UP

Pre Start-up

Filling System (Heating Boilers)

Fill system with water. Purge all air from the system. Open valves for normal system operation.

Air Purge (Domestic Hot Water Heaters)

Purge all air from system before lighting heater. This can be normally accomplished by opening a downstream valve.

Venting System Inspection

1. Check all vent pipe connections and flue pipe material.
2. Make sure vent terminations are installed per code and are clear of all debris or blockage.

For Your Safety

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

This appliance has a hot surface igniter. It is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.

BEFORE OPERATING, smell all around the appliance area for gas. Be sure to smell near the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any telephone in your building.
- Immediately call your gas supplier from a neighbor's telephone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

- Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not turn by hand, do not try to repair it, call a qualified service technician. Forced or attempted repair may result in a fire or explosion.
- Do not use this appliance if any part has been under water, immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.
- Check around unit for debris and remove combustible products, i.e. gasoline, etc.

Pre Start-up Check

1. Verify heater is filled with water.
2. Check system piping for leaks. If found, repair immediately.
3. Vent air from system. Air in system can interfere with water circulation.
4. Purge air from gas line up to heater.

Initial Start-up

Tools Needed

- (1) 12-0-12, 24" scale U-tube manometer
- (4) 6-0-6, 12" scale U-tube manometers (minimum)
- (1) Screwdriver
- (1) Multi-meter

NOTE: Digital manometers are not recommended.

Preparation

WARNING: Do not turn on gas at this time.

Check Power Supply

With multi-meter at incoming power, check voltage between:

Hot - Common (≈ 120 VAC)

Hot - Ground (≈ 120 VAC)

Common - Ground (< 1 VAC)

WARNING: If Common - Ground is > 1 VAC, STOP: Contact electrician to correct ground failure. Failure to do this may burn out 120V-24V transformer, or may cause other safety control damage or failure.

Attach Manometers to Measure Pressures

1. Turn off main gas valve.
2. Attach 24" scale manometer to the first main gas shut-off valve pressure tapping.
3. Attach (1) 12" scale manometer to the outlet side of the second main gas shut-off valve pressure tapping.
4. Attach (1) 12" scale manometer near the fan-proving switch. Pull black cap from air pressure switch tee and connect the manometer.

NOTE: Retain caps for reinstallation later.

Check Gas Supply Pressure

1. Slowly turn on main gas shut-off valve.
2. Read the gas supply pressure from the manometer; minimum supply pressure for natural gas is 5.6 in. WC, recommended supply is 7.0 in. WC, minimum supply pressure for propane gas is 11.0 in. WC (dynamic readings, all stages firing).
3. If the pressure is > 14.0 in. WC, turn off the valve.
4. Check if the service regulator is installed and/or adjust the service regulator.

Start-Up

Blower Adjustment

1. Turn off power.
2. Unplug cap at pressure switches and connect manometer(s) to the tee.
3. Close all manual firing valves.
4. Turn power on.
5. Check manometers attached to fan pressure switch. The reading should be $1.4 \pm .1$ in. WC for propane gas and natural gas. If not, adjust the air shutter on the blowers to attain the correct value.
6. Turn power off.
7. Reconnect this cap.

Main Burner Adjustment

1. Turn off unit.
2. Open manual firing valves.
3. Turn on the unit, wait 15 seconds, and the igniter should glow. Look into sight glass located at each end of the heater to check igniter operation. Gas valves should open in 45-60 seconds.
4. If burner does not light on first trial, it will retry up to three times for the standard module.
5. Main burner ignition: Check manifold gas pressure at gas valve outlet pressure tap. This should read 3.5 ± 0.1 in. WC for natural gas and 10.5 ± 0.1 in. WC for propane gas.
6. If the pressure reading differs by more than ± 0.1 in. WC, remove screw cover from the gas pressure regulator and adjust main burner manifold pressure. Replace the screw cover. Repeat steps 3 to 5 on other valves as necessary.

CAUTION: Special manifold and air settings may be required. Verify rating plate and blower housing.

Safety Inspection

1. Check all thermostats and high limit settings.
2. During the following safety checks leave manometers hooked up, check and record.
3. If other gas-fired appliances in the room are on the same gas main, check all pressures on the Hi Delta with all other equipment running.
4. Check thermostats for ON-OFF operation.
5. Check high limits for ON-OFF operation.
6. While in operation, check flow switch operation.
7. Check the low gas pressure switch. (For proper adjustment, use the attached manometers, if available, to set pressure. The scales on the switch are approximate only.) Low gas pressure switch must be set at 5.0 in. WC for natural gas and 10.0 in. WC for propane gas.
8. Make sure that the high gas pressure switch (Sales order option S-2) is set to 5.0 in. WC for natural gas and 11.5 in. WC for propane gas.

Follow-Up

Safety checks must be recorded as performed.

Turn heater on. After main burner ignition:

1. Check manometer for proper reading.
2. Cycle heater several times and re-check readings.
3. Remove all manometers and replace caps and screws.
4. Replace all gas pressure caps.
5. Check for gas leaks one more time.

User Test

Set DIP switch #1 on the VERSA IC control to "ON". Set USER TEST = ON in the 'ToolBox' Menu to start the user test function.

- USER TEST is displayed in the Title Field.
- UP keystrokes are used to advance through the user test.
- The Boil MIN/MAX steps for burner operation are only run for enabled boilers.

- Local Heat/DHW/EMS demands **must** be present for burner operation.

Number Field	Output Action
SYS	System Pump relay turns on.
DHW	DHW Pump relay turns on.
PMP 1	System and Boiler Pump relays turn on.
CWP	CWP proportional output
Boil 1	Ignite Boiler Burner.
Min 1	Hold Boiler at Min Fire.
Max 1	Ramp Boiler to Max Fire and hold.

Table T: User Test Fields

- On the first press of the Up button, the test step is held and "HOLD" is flashed at 1Hz.
- On the second press of the Up button, the test step is incremented.
- If boiler outlet temperature reaches the PIM Hi-Limit, the boiler will be ramped down to keep the temperature in a safe range.
- Press of the Up button from Boiler Max will End the User Test function.
- When CWP is enabled (VERSA DIP #3) VALV will become available during USER TEST.

Leak Test Procedure: Dual-Seat Gas Valves

Proper leak testing requires three pressure test points in the gas train. Refer to Fig. 49. The numbers on the diagram refer to the steps below:

Test point A is upstream of the automatic gas valve. On the first automatic valve, this is a bleedle valve. On the other valves, this is a plugged port. The bleedle valve on the first valve may be used for all the other valves as well.

Test point B is a bleedle valve located between the two automatic gas valve seats.

Test point C is located downstream of both automatic gas valve seats and upstream of the manual valve. On the manual valve, this is a bleedle valve. Identical readings will be found at the plugged port labeled as Alternate C.

These tests are to be conducted with the electrical power to the heater turned off.

1. Manually close the downstream leak test valve.

2. Open test point A and connect a manometer to it. Verify that there is gas pressure and that it is within the proper range (NOTE: must not exceed 14.0 in. WC).
3. Open test point B and connect a rubber tube to it. Connect the other end of the tube to a manometer and look for a build-up of pressure. Increasing pressure indicates a leaking gas valve.
4. Next, close the upstream manual gas valve and remove the manometer from test point A and from test point B. Connect a rubber tube from test point A to test point B and open the upstream manual gas valve. Make sure that test points A & B have been opened so as to allow gas to flow. This will bring pressure to the second valve seat.
5. Open test point C and connect a second rubber tube to it. Connect the other end of the tube to a manometer and look for a build-up of pressure. Increasing pressure indicates a leaking gas valve.
6. Remove rubber tube and manometers. Close each test point valve as the tubes are removed.
7. Connect a manometer to each test point (one at a time) and look for a build-up of pressure. If a build-up of pressure is detected, check each test point valve to see if it is tightly closed. If leak persists, replace test point valve(s).
8. After no leakage has been verified at all valve seats and test valves, open downstream leak tests valve and restore electrical power to heater.

This completes leak testing for a single Hi Delta manifold riser. Repeat steps 1-8 for each riser.

Post Start-Up Check

Check off steps as completed:

1. Verify that the heater and heat distribution units or storage tank are filled with water.
2. Confirm that the automatic air vent (if used) was opened two full turns during the venting procedure.
3. Verify that air has been purged from the system.
4. Verify that air has been purged from the gas piping, and that the piping has been checked for leaks.
5. Confirm that the proper start-up procedures were followed.
6. Inspect burner to verify flame.
7. Test safety controls: If heater is equipped with a low water cut-off or additional safety controls, test for operation as outlined by manufacturer. Burner should be operating and should go off when controls are tested. When safety devices are restored, burners should re-ignite after pre-purge time delay.
8. Test fixed high limit function: When the PIM DIP switch #8 is turned to the ON position, a Commission Test Mode is activated. The PIM lights the amber Alarm/Test LED. This mode activates certain functions to assist initial commission testing of the system. The configured high limit temperature is overridden to match the setpoint potentiometer position. The high limit can then be adjusted by the potentiometer to assist commission testing and verification. The operating setpoint is automatically set to 20°F (11°C) above the high limit (stand-alone mode), or it can be controlled by the VERSA IC Control.
9. Test ignition system safety device:
 - a. Turn on manual gas valve. Turn power on.
 - b. Set thermostat to call for heat.
 - c. When the heater is in operation, pull cap off of tee in air switch hose. The burner should go off immediately.

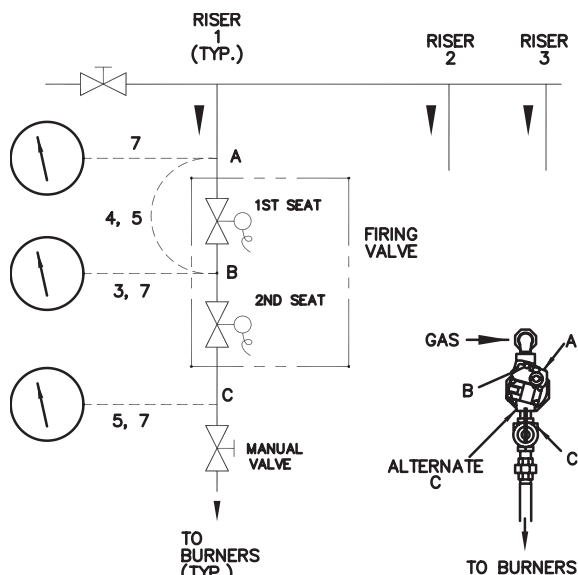


Fig. 49: Leak Test

- d. Wait 5 minutes.
 - e. Reattach cap on tee. Burner should re-ignite after pre-purge time delay.
10. To restart system, follow lighting instructions in the Operation section.
 11. Check to see that the adjustable high limit control, if provided, is set above the design temperature requirements of the system.

For multiple zones: Check to make sure the flow is adjusted as required in each zone.

12. Check that the heater is cycled with the thermostat. Raise to the highest setting and verify that the heater goes through the normal start-up cycle. Reduce to the lowest setting and verify that the heater goes off.
13. Observe several operating cycles for proper operation.
14. Set the room thermostat or tankstat to desired temperature.
15. Review all instructions shipped with this heater with owner or maintenance person, return to envelope and give to owner or place the instructions inside front panel on heater.

OPERATION

Lighting Instructions

1. Before lighting, make sure you have read all of the safety information in this manual.
2. Set the thermostat to the lowest setting.
3. Turn off all electrical power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Remove upper front panel.
6. Turn on main manual gas valve.
7. Wait 5 minutes to clear out any gas. Then smell for gas, especially near the floor. If you then smell gas, **STOP!** Follow the steps in the safety informa-

tion on the front cover of this manual. If you do not smell gas, go to next step.

8. Turn on all electrical power to the appliance.
9. Provide contact closure across the Enable/Disable terminals at the field wiring block.
10. Set thermostat to desired setting. The appliance will operate. The igniter will glow after the pre-purge time delay (15 seconds). After igniter reaches temperature (45 seconds) the main valve will open. System will try for ignition three times with standard ignition module. If flame is not sensed, lockout will commence.
11. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance," and call your service technician or gas supplier.
12. Replace access panel.
13. If heater fails to start, verify the following:
 - a. There are no loose connections or that the service switch is off.
 - b. Adjustable high temperature limit switch is set above water temperature (if provided).
 - c. Thermostat is set above room temperature.
 - d. Gas is on at the meter and the heater.
 - e. Incoming gas pressure to the gas valve is NOT less than 5.0 in. WC for natural gas, 11.0 in. WC for propane gas.

To Turn Off Gas To Appliance

1. Set the thermostat to lowest setting.
2. Turn off all electrical power to the appliance if service is to be performed.
3. Remove upper front panels.
4. Turn off main manual gas valve.
5. Replace access panel.

MAINTENANCE

Suggested Minimum Maintenance Schedule

Regular service by a qualified service agency and maintenance must be performed to ensure maximum operating efficiency.

Maintenance as outlined below may be performed by the owner.

Daily

1. Check that the area where the heater is installed is free from combustible materials, gasoline, and other flammable vapors and liquids.
2. Check for and remove any obstruction to the flow of combustion or ventilation air to heater.

Monthly

1. Check for piping leaks around circulators, mixing valves, relief valves, and other fittings. If found, repair at once. DO NOT use petroleum-based stop-leak compounds.
2. Visually inspect burner flame.
3. Visually inspect venting system for proper function, deterioration or leakage.
4. Check air vents for leakage.

Periodically

1. Check relief valve. Refer to manufacturer's instructions on valve.
2. Test low water cut-off, if used. Refer to manufacturer's instructions.
3. Clean intake screen and air filter.

Yearly (Beginning Of Each Heating Season)

Schedule annual service call by qualified service agency.

1. Visually check top of vent for soot. Call service person to clean. Some sediment at bottom of vent is normal.

2. Visually inspect venting system for proper function, deterioration or leakage.
3. Check that area is free from combustible materials, gasoline, and other flammable vapors and liquids.
4. Check for and remove any obstruction to the flow of combustion or ventilation air to heater.
5. Follow pre-start-up check in the Start-up section.
6. Visually inspect burner flame. It should be light blue. Remove and replace hot surface igniter and sensor.
7. Check operation of safety devices. Refer to manufacturers' instructions.
8. Follow oil-lubricating instructions on circulator if required. Over-oiling will damage circulator. Water-lubricated circulators do not need oiling.
9. To avoid potential of severe burn, DO NOT REST HANDS ON OR GRASP PIPES. Use a light touch; return piping will heat up quickly.
10. Check blower and blower motor.
11. Check for piping leaks around circulators, relief valves and other fittings. Repair, if found. DO NOT use petroleum-based stop-leak.
12. Clean air filter.
13. Conduct a combustion test at full fire. Carbon dioxide should be $8.2\% \pm 0.5\%$ at full fire for natural gas, and $9.4\% \pm 0.5\%$ for propane gas; Carbon monoxide should be < 150 ppm).

Preventive Maintenance Schedule

The following is required procedure in CSD-1 states and good practice for all Hi Delta installations.

Daily

1. Check gauges, monitors and indicators.
2. Check instrument and equipment settings. (See "Post Start-Up Check" on page 54.)
3. Check burner flame. (Should see light blue flame).

Weekly

For low-pressure heaters, test low-water cut-off device. (With at least one stage of the appliance on, depress the low water cut-off test button, appliance should shut-off and ignition fault light should come on. Depress reset button to reset).

Monthly

1. Check flue, vent, stack, or outlet dampers.
2. Test fan air pressure. (See "Blower Adjustment" on page 52.)
3. Test high and low gas pressure interlocks (if equipped). (See "Safety Inspection" on page 53.)

Semi-Annually

1. Recalibrate all indicating and recording gauges.
2. Check flame failure detection system components. (See "Pilot Turn-Down Test Procedure," page 53.)
3. Check firing rate control by checking the manifold pressure. (See "Main Burner Adjustment" on page 52.)
4. Check piping and wiring of all interlocks and shut-off valves.

Annually

1. Test flame failure detection system and pilot turn-down. (See "Pilot Turn-Down Test Procedure," page 53.)
2. Test high limit and operating temperature. (See "Post Start-Up Check," page 54.)
3. Check flame sensors.
4. Conduct a combustion test at full fire. Carbon dioxide should be $8.2\% \pm 0.5\%$ at full fire for natural gas, and $9.4\% \pm 0.5\%$ for propane gas; Carbon monoxide should be < 150 ppm).
5. Check coils for 60 cycle hum or buzz. Check for leaks at all valve fittings using a soapy water solution. Test other operating parts of all safety shut-off and control valves and increase or decrease settings (depending on the type of control) until the safety circuit opens. Reset to original setting after each device is tested.

6. Perform leakage test on gas valves. (See Fig. 47.)
7. Test air switch in accordance with manufacturer's instructions. (Turn panel switch to the "On" position until blower is proven, then turn the switch to "Off".)
8. Inspect and clean burners as necessary.

As Required

1. Recondition or replace low water cut-off device (if equipped).
2. Check drip leg and gas strainers.
3. Perform flame failure detection and pilot turn-down tests.
4. Check igniter. Amp draw should be 3.2 amps or greater during ignition.
5. Check flame signal strength. (Flame signal should be greater than 1 microamp).
6. Test safety/safety relief valves in accordance with ASME Heater and Pressure Vessel Code Sections VI and VII.

APPENDIX

Inside Air Contamination

All heaters experience some condensation during start-up. The condensate from flue gas is acidic. Combustion air can be contaminated by certain vapors in the air which raise the acidity of the condensate. Higher acidity levels attack many materials including stainless steel, which is commonly used in high efficiency systems. The heater can be supplied with corrosion-resistant, non-metallic intake air vent material. You may, however, choose to use outside combustion air for one or more of these reasons:

1. Installation is in an area containing contaminants listed below which will induce acidic condensation.
2. You want to reduce infiltration into your building through openings around windows and doors.
3. You are using stainless steel vent pipe, which is more corrosion-resistant than standard metallic vent pipe. In extremely contaminated areas, this may also experience deterioration.

Products causing contaminated combustion air:

- spray cans containing chloro/fluorocarbons
- permanent wave solutions
- chlorinated waxes/cleaners
- chlorine-based swimming pool chemicals
- calcium chloride used for thawing
- sodium chloride used for water softening
- refrigerant leaks
- paint or varnish removers
- hydrochloric acid/muriatic acid
- cements and glues
- antistatic fabric softeners used in clothes dryers
- chloride-type bleaches, detergents, and cleaning solvents found in household laundry rooms
- adhesives used to fasten building products
- similar products

Areas where contaminated combustion air commonly exists:

- dry cleaning/laundry areas
- metal fabrication plants
- beauty shops
- refrigeration repair shops
- photo processing plants
- auto body shops
- plastic manufacturing plants

- furniture refinishing areas and establishments
- new building construction
- remodeling areas
- open pit skimmers

Check for areas and products listed above before installing heater. If found:

- remove products permanently, OR
- install TruSeal direct vent



**LIMITED PARTS WARRANTY
HI DELTA – TYPES H AND WH
MODELS 992C–2342C**

SCOPE

Raypak, Inc. ("Raypak") warrants to the original owner that all parts of this heater which are actually manufactured by Raypak will be free from failure under normal use and service for the specified warranty periods and subject to the conditions set forth in this Warranty. Labor charges and other costs for parts removal or reinstallation, shipping and transportation are not covered by this Warranty but are the owner's responsibility.

HEAT EXCHANGER WARRANTY

Domestic Hot Water

Five (5) years from date of heater installation. Includes copper heat exchanger with bronze and cast iron waterways.

Ten (10) years from date of heater installation. Includes only cupro-nickel heat exchanger with bronze or cast iron waterways.

Space Heating (Closed Loop System)

Ten (10) years from date of heater installation. Includes both cupro-nickel and copper heat exchanger with bronze or cast iron waterways.

Thermal Shock Warranty

Twenty (20) years from date of heater installation against "Thermal Shock" (excluded, however, if caused by heater operation at large changes exceeding 150°F between the water temperature at intake and heater temperature, or operating at heater temperatures exceeding 230°F).

ANY OTHER PART MANUFACTURED BY RAYPAK

One (1) year warranty from date of heater installation, or eighteen (18) months from date of factory shipment based on Raypak's records, whichever comes first.

SATISFACTORY PROOF OF INSTALLATION DATE, SUCH AS INSTALLER INVOICE, IS REQUIRED. THIS WARRANTY WILL BE VOID IF THE HEATER RATING PLATE IS ALTERED OR REMOVED.

ADDITIONAL WARRANTY EXCLUSIONS

This warranty does not cover failures or malfunctions resulting from:

1. Failure to properly install, operate or maintain the heater in accordance with our printed instructions provided;
2. Abuse, alteration, accident, fire, flood and the like;
3. Sediment or lime build-up, freezing, or other conditions causing inadequate water circulation;
4. High velocity flow exceeding heater design rates;
5. Failure of connected systems devices, such as pump or controller;
6. Use of non-factory authorized accessories or other components in conjunction with the heater system;
7. Failing to eliminate air from, or replenish water in, the connected water system;
8. Chemical contamination of combustion air or use of chemical additives to water.

PARTS REPLACEMENT

Under this Warranty, Raypak will furnish a replacement for any failed part. The failed part must first be returned to Raypak if requested, with transportation charges prepaid, and all applicable warranty conditions found satisfied. The replacement part will be warranted for only the unexpired portion of the original warranty. Raypak makes no warranty whatsoever on parts not manufactured by it, but Raypak will apply any such warranty as may be provided to it by the parts manufacturer.

TO MAKE WARRANTY CLAIM

Promptly notify the original installer, supplying the model and serial numbers of the unit, date of installation and description of the problem. The installer must then notify his Raypak distributor for instructions regarding the claim. If either is not available, contact Service Manager, Raypak, Inc., 2151 Eastman Avenue, Oxnard, CA 93030 or call (805) 278-5300. In all cases proper authorization must first be received from Raypak before replacement of any part.

EXCLUSIVE WARRANTY - LIMITATION OF LIABILITY

This is the only warranty given by Raypak. No one is authorized to make any other warranties on Raypak's behalf. THIS WARRANTY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. RAYPAK'S SOLE LIABILITY AND THE SOLE REMEDY AGAINST RAYPAK WITH RESPECT TO DEFECTIVE PARTS SHALL BE AS PROVIDED IN THIS WARRANTY. IT IS AGREED THAT RAYPAK SHALL HAVE NO LIABILITY, WHETHER UNDER THIS WARRANTY, OR IN CONTRACT, TORT, NEGLIGENCE OR OTHERWISE, FOR ANY SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGE, INCLUDING DAMAGE FROM WATER LEAKAGE. Some states do not allow limitations on how long an implied warranty lasts, or for the exclusion of incidental or consequential damages. So the above limitation or exclusion may not apply to you.

This Limited Warranty gives you specific legal rights. You may also have other rights which may vary from state to state. We suggest that you complete the information below and retain this certificate in the event warranty service is needed. Reasonable proof of the effective date of the warranty (date of installation) must be presented, otherwise, the effective date will be based on the rate of manufacture plus thirty (30) days.

Original Owner

Model Number

Mailing Address

Serial Number

Date of Installation

City State Zip Code

Installation Site

Daytime Telephone Number

Contractor/Installer

RAYPAK, INC • 2151 Eastman Avenue • Oxnard, CA 93030-9786 • (805) 278-5300 • Fax (800) 872-9725 • www.raypak.com

LIMITED WARRANTY
HI DELTA PROFESSIONAL SERIES POOL HEATER
Models: P0302C thru P2342C

SCOPE OF WARRANTY

Raypak, Inc. (Raypak) warrants to the original owner that the above model gas pool and spa heater (the "Heater") when installed in the 50 states of the United States of America with a pool or spa by a properly licensed installer will be free from defects in materials and workmanship under normal use and service for the Applicable Warranty Period. Under this Limited Warranty, Raypak will, at its option, repair or furnish a replacement for any defective part of the HEATER. The repair or replacement will be warranted for only the unexpired portion of the original Applicable Warranty Period.

EFFECTIVE DATE

The Effective Date of Warranty coverage is the date of original installation if properly documented; otherwise it is the date of manufacture plus 30 days. All Applicable Warranty Periods specified in this Limited Warranty are measured from the Effective Date.

APPLICABLE WARRANTY PERIOD

If the HEATER is installed with a pool or spa, the Applicable Warranty Period is one (1) year from the Effective Date, parts and labor, for the HEATER and component parts, except that the cupro-nickel heat exchanger will have an Applicable Warranty Period of five (5) years from the Effective Date, with no labor coverage in the second thru fifth years.

LABOR AND SHIPPING COSTS

This Limited Warranty covers the reasonable cost of labor for repairs or replacements covered by this Limited Warranty up to \$1000 per heater, provided that said repairs or replacements are performed by a Raypak designated service provider during the Applicable Warranty Period and Raypak has pre-authorized said repair or replacement. This Limited Warranty does not cover any travel time or other labor costs. Furthermore, this Limited Warranty does not cover any shipping costs to and from the service provider or to or from the installation site. All of the foregoing costs and expenses are your responsibility.

WARRANTY EXCLUSIONS

This Limited Warranty does **NOT** apply;

1. if the Heater has been moved from its original place of installation, or if the original owner no longer owns the property where the original installation was made;
2. if the Heater is not properly installed with a pool or spa by a qualified licensed installer in accordance with applicable local codes and ordinances, good trade practices, and the manufacturer's installation instructions. Not to be installed in a closed loop hydronic heating, or potable water heating application;
3. if the rating plate(s) or serial number(s) are altered or removed;
4. if the Heater is modified in any way, or non-factory authorized accessories or other components are used in conjunction with the Heater;
5. to damage, malfunctions or failures resulting from failure to properly install, operate or maintain the Heater in accordance with the manufacturer's instructions;
6. to damage, malfunctions or failures resulting from abuse, act of nature, accident, fire, flood, freeze, lightning or the like;
7. to damage, malfunctions or failures resulting from connected system control devices;
8. performance problems caused by improper sizing of the Heater or electric service voltage, wiring or fusing;
9. use of any attachment, including without limitation, any energy saving device not authorized by the manufacturer;
10. to damage, malfunctions or failures resulting from misuse or neglect, including but not limited to, freeze-ups, operating the Heater with the cabinet door off, having flow restrictions or obstructions between the Heater outlet and the pool/spa, electrolysis due to an improperly installed salt chlorine generator, or not maintaining a proper chemical balance (PH level must be between 7.4 and 7.8 and total alkalinity between 100 and 150 PPM. Total dissolved solids (TDS) must be no greater than 3000 PPM. In salt water chlorinated pools, TDS must be no greater than 6000 PPM).

HOW TO MAKE A WARRANTY CLAIM

You should immediately notify your dealer and provide proof of purchase model number serial number and date of installation. Your dealer will contact Raypak for instructions regarding the claim and to determine the location of the nearest authorized service center. If the dealer is not available, please contact Raypak warranty service at 805-278-5300. When making a claim please be ready to supply the model number, serial number, date of original installation and a description of the problem. **Proper authorization MUST be obtained PRIOR to any repairs for the Limited Warranty to apply. This Limited Warranty is VOID if the Heater is repaired or altered in any way by ANY persons or agencies other than those authorized by Raypak.** Raypak reserves the right at all times to inspect, or require the return of, the defective Heater or component part and to verify warranty coverage at its factory.

EXCLUSIVE WARRANTY-LIMITATION OF LIABILITY

THE LIMITED WARRANTY IS THE ONLY WARRANTY GIVEN BY RAYPAK IN CONNECTION WITH THE HEATER AND ITS COMPONENT PARTS. NO ONE IS AUTHORIZED TO MAKE ANY OTHER WARRANTIES ON RAYPAK'S BEHALF. ANY IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, SHALL NOT EXTEND BEYOND THE APPLICABLE WARRANTY PERIOD SPECIFIED ABOVE. RAYPAK'S SOLE LIABILITY WITH RESPECT TO ANY DEFECT SHALL BE AS SET FORTH IN THIS LIMITED WARRANTY. IT IS AGREED THAT RAYPAK SHALL HAVE NO LIABILITY WHETHER UNDER THIS LIMITED WARRANTY OR IN CONTRACT, TORT OR NEGLIGENCE OR OTHERWISE FOR CLAIMS FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING NO LIABILITY FOR DAMAGE FROM WATER LEAKAGE), ALL OF WHICH ARE EXPRESSLY EXCLUDED. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, OR FOR THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

We suggest you immediately record the model and serial number and date of original installation and retain this Limited Warranty Certificate in the event warranty service is needed.

DO NOT RETURN THIS DOCUMENT TO RAYPAK. KEEP IT WITH YOUR POOL HEATER OR BUSINESS RECORDS.

Name of Owner	Name of Installer
Owners Address	Installers Address
Date of Pool Heater Installation	Telephone Number of Installer
Model Number of Your Pool Heater	Serial Number of Your Pool Heater

RAYPAK, INC., 2151 Eastman Avenue, Oxnard, CA 93030 • (805) 278-5300 FAX (800) 872-9725

p/n 241640

START-UP CHECKLIST FOR FAN-ASSISTED RAYPAK PRODUCTS

This start-up checklist is to be completely filled out by the service technician starting up the Raypak Boiler or Heater for the first time. All information may be used for warranty purposes and to ensure that the installation is correct. Additionally this form will be used to record all equipment operation functions and required settings.

GAS SUPPLY DATA

Regulator Model & Size _____ / _____ CFH
 Gas Line Size (in room) _____ In. NPT
 Length of Gas Line _____ Eq Ft
 Low Gas Pressure Setting _____ In. WC
 High Gas Pressure Setting _____ In. WC
 Gas Shut-Off Valve Type _____
 (Ball, Lube cock)
 Sediment Trap _____ Y/N
 Port _____ Std _____ Full

VISUAL INSPECTION OF COMPONENTS

Verify inspection was done and condition of components are in good working order with a "yes"

Wiring Harness _____ Y/N
 Burner/s (flame) _____ Y/N
 Refractory (visual) _____ Y/N
 Remote flame sense _____ Y/N
 Covers in place for outdoor _____ Y/N

VENTING

Vent Size: _____ Stack Height: _____
 Category: _____ sketch vent on reverse side ***
 Vent Material: _____
 Vent Termination Type: _____
 Combustion Air Openings: Low _____ in2
 Ventilation air High _____ in2

EMISSIONS SETTINGS AND TEST INFORMATION (AT FULL FIRE)

Blower Pressure Setting _____ In. WC
 Supply Gas Pressure _____ In. WC
 Verify stable pressure static & dynamic condition
 Pilot Gas Pressure _____ In. WC
 Manifold Gas Pressure _____ In. WC

The following measurements must be obtained with a Combustion Analyzer.

NOX _____ PPM
 Free Oxygen _____ %
 CO _____ PPM
 CO2 _____ %

Model Number: _____

*** Note: draw venting with details, such as extractors, barometric dampers, blast dampers or draft inducers

Job Name _____

Address _____

Physical Location of Boiler: Indoors _____; Outdoors _____; Ground Level _____; Roof _____; Below Grade _____

Mechanical Contractor / Installer _____

Date and Time of Start-up _____ Print Name and Signature of Start-up Technician _____

CLEARANCES

Front Clearance _____ In.
 Right Side Clearance _____ In.
 Left Side Clearance _____ In.
 Rear Clearance _____ In.
 Overhead Clearance _____ In.

ELECTRICAL

Voltage Supply (VAC) No Load _____ Load _____
 Voltage -24 VAC _____ VAC
 Voltage Com to Ground _____ VAC
 Hot Surface Igniter _____ Ohms
 Auto High Limit Setting _____ deg F
 Manual Reset High Limit Setting _____ deg F
 Operating Control Setting _____ deg F

Sketch plumbing on reverse side

WATER SUPPLY

Flow Rate in GPM or Delta T _____ If Avail
Measure flow rate at full fire
 Pump Economaster setting _____ Minutes
 Low Water Cutoff _____ Test
 Number of Tanks and Size Qty _____ Gallons
 Plumbing Size _____
 Pump Size: _____ (boiler) Pump HP: _____
 Impeller trim _____ Pump Model _____
 Louvers _____ Screens _____

Nominal Factory Recommended Settings

See manual or card tag
 See manual or card tag
 See manual or card tag
 See manual or card tag

Information must be faxed to: (805) 278-5496 in order to ensure warranty consideration Attn: Service Manager



www.raypak.com

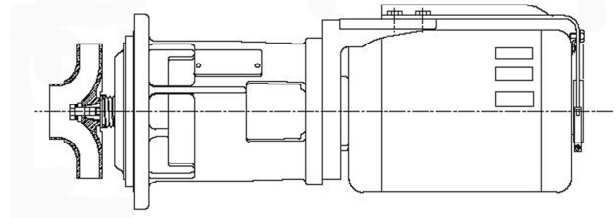
Raypak, Inc., 2151 Eastman Avenue, Oxnard, CA 93030 (805) 278-5300 Fax (805) 278-5468
Litho in U.S.A.


Job: _____
 Engineer: _____
 Contractor: _____
 Prepared By: _____ Date: _____
 Model: _____ Indoor/Outdoor: _____

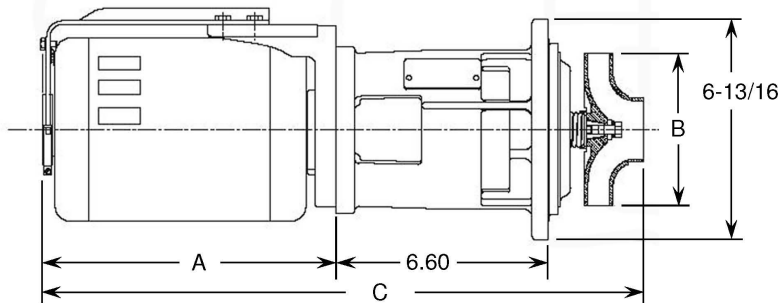
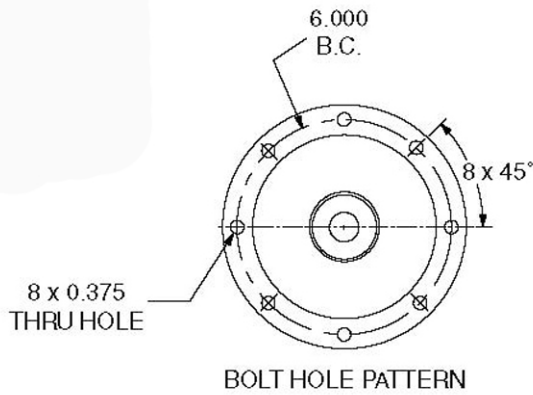
Raypak Header Mounted Pumps

Boilers, Water Heaters & Pool Heaters
 Raytherm™ & Hi Delta™

- One Piece Low Lead Cast Bronze Impeller
- Cast Iron Pump Body
- 100% Factory Tested
- 5/8" Steel Alloy Shaft
- Ceramic Mechanical Seal
- Permanently Lubricated Ball Bearings
- Resilient Mount Motor
- 175 PSI Max Pressure Rating
- 250°F Maximum Temperature Rating



 Proudly Assembled in the USA



Part Number	HP	Speed RPM	Volts	Hz	Ph	Service Factor	Ambient Temp.	A	B	C	Amps
004844F	1/2	1725	115	60	1	1.00	60°C/140°F	8.92	4.25	18.45	7.9
004845F	1/2	1725	115	60	1	1.25	60°C/140°F	9.67	4.70	19.20	7.3
009296F	1/2	1725	115	60	1	1.00	60°C/140°F	8.92	4.00	18.45	7.9



Raypak Header

Mounted Pumps

Part Number _____

Raytherm Configuration		
Model	004844F	004845F
514	<input type="checkbox"/>	<input type="checkbox"/>
624	<input type="checkbox"/>	<input type="checkbox"/>
724	<input type="checkbox"/>	<input type="checkbox"/>
824	<input type="checkbox"/>	<input type="checkbox"/>
926/962	<input type="checkbox"/>	<input type="checkbox"/>
1083/1125	<input type="checkbox"/>	<input type="checkbox"/>
1287/1336	<input type="checkbox"/>	<input type="checkbox"/>
1414/1468	<input type="checkbox"/>	<input type="checkbox"/>
1571/1631	<input type="checkbox"/>	<input type="checkbox"/>
1758/1826	<input type="checkbox"/>	<input type="checkbox"/>

Hi Delta Configuration			
Model	004844F	004845F	009296F
302	N/A	<input type="checkbox"/>	N/A
402	N/A	<input type="checkbox"/>	N/A
502	N/A	<input type="checkbox"/>	<input type="checkbox"/>
652	N/A	<input type="checkbox"/>	<input type="checkbox"/>
752	<input type="checkbox"/>	N/A	N/A
902	N/A	<input type="checkbox"/>	<input type="checkbox"/>
992	<input type="checkbox"/>	N/A	<input type="checkbox"/>
1262	N/A	N/A	<input type="checkbox"/>
1532	N/A	<input type="checkbox"/>	N/A

Pump selection is based on a maximum 75 equivalent feet of tubing equal to the connection size of the appliance. Refer to the product I&O manual for allowable water hardness when used on Domestic Hot Water systems.

SECTION 260010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Table of Contents, Division 26 - Electrical:

<u>SECTION NO.</u>	<u>SECTION TITLE</u>
260010	BASIC ELECTRICAL REQUIREMENTS
260090	ELECTRICAL DEMOLITION
260519	BUILDING WIRE AND CABLE
260526	GROUNDING AND BONDING
260529	ELECTRICAL HANGERS AND SUPPORTS
260531	CONDUIT
260533	BOXES
260553	ELECTRICAL IDENTIFICATION
262416	PANELBOARDS
262716	CABINETS AND ENCLOSURES
262726	WIRING DEVICES
262816	OVERCURRENT PROTECTIVE DEVICES
262819	DISCONNECT SWITCHES
262900	MOTOR CONTROLS
265100	LIGHTING

B. Work included: This Section includes general administrative and procedural requirements for Division 26. The following administrative and procedural requirements are included in this Section to supplement the requirements specified in Division 01.

1. Quality assurance.
2. Definition of terms.
3. Submittals.
4. Coordination.
5. Record documents.
6. Operation and maintenance manuals.
7. Rough-in.
8. Electrical installation.
9. Cutting, patching, painting and sealing.
10. Field quality control.

11. Cleaning.
 12. Project closeout.
- C. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete and operable installation.
1. General and supplementary conditions: Drawings and general provisions of Contract and Division 01 of the Specifications, apply to all Division 26 & 28 Sections.
 2. Earthwork: Include trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, in-grade pull boxes, etc.
 3. Selective demolition: Nondestructive removal of materials and equipment for reuse or salvage as indicated. Also dismantling electrical materials and equipment made obsolete by these installations.
 4. Concrete Work: Include forming, steel bar reinforcing, cast-in- place concrete, finishing and grouting as required for under ground conduit encasement, light pole foundations, pull box slabs, vaults, housekeeping pads, etc. Also includes setting of floor boxes in existing concrete slabs, saw-cutting of existing slabs and grouting of conduits in saw-cut.
 5. Miscellaneous metal Work: Include fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, lighting fixtures, panelboards, distribution boards, switchboards, motor control centers, etc.
 6. Miscellaneous lumber and framing Work: Include wood grounds, nailers, blocking, fasteners and anchorage for support of electrical materials and equipment.
 7. Moisture protection and smoke barrier penetrations: Include membrane clamps, sheet metal flashing, counter flashing, caulking and sealant as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors, ceiling slabs and foundation walls. All penetrations through vapor barriers at slabs on grade shall be taped and made vaportight.
 8. Access panels and doors: Required in walls, ceilings and floors to provide access to electrical devices and equipment.
 9. Painting: Include surface preparation, priming and finish coating as required for electrical cabinets, exposed conduit, pull and junction boxes, etc. where indicated as field painted in this Division.
 10. Lighting fixture supports: Provide slack fixture support wire for lighting fixtures installed in acoustical tile or lay-in suspended ceilings.
- D. Work furnished and installed under another Division requiring connections under this Division includes but is not limited to:
1. Electric motors.

2. Package mechanical equipment: fans, fan coil units, pumps, boilers, compressors, etc.
3. Flow switches and valve monitors for sprinkler system.
4. Temperature control panel(s). (Line voltage only)
5. Irrigation controller(s). (Line voltage only)
6. Electric signage.
7. Electric door locks.
8. Door hold-open/release devices.
9. Variable frequency drive units.
10. Motorized roll down/sliding doors and grills.

1.2 QUALITY ASSURANCE

- A. Reference to Codes, Standards, Specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid. Such codes or standards shall be considered a part of this Specification as though fully repeated herein.
- B. When codes, standards, regulations, etc. allow Work of lesser quality or extent than is specified under this Division, nothing in said codes shall be construed or inferred authority for reducing the quality, requirements or extent of the Contract Documents. The Contract Documents address the minimum requirements for construction.
- C. Work shall be performed in accordance with all applicable requirements of the latest edition of all governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:
 1. California Electric Code (CEC).
 2. California Building Code (CBC).
 3. California Fire Code (CFC).
 4. California Mechanical Code (CMC).
- D. Standards: Equipment and materials specified under this Division shall conform to the following standards where applicable:

ACI	American Concrete Institute
ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
CBM	Certified Ballast Manufacturers
ETL	Electrical Testing Laboratories
FS	Federal Specification

IEEE	Institute of Electrical and Electronics Engineers, Inc.
IPCEA	Insulated Power Cable Engineer Association
NEMA	National Electrical Manufacturer's Association
UL	Underwriters' Laboratories

- E. All base material shall be ASTM and/or ANSI standards.
- F. All electrical apparatus furnished under this Section shall conform to NEMA standards and the NEC and bear the UL label where such label is applicable.
- G. Certify that each welder performing Work has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

1.3 DEFINITION OF TERMS

- A. The following list of terms as used in the Division 26 documents shall be defined as follows:
 - 1. "Provide": Shall mean furnish, install and connect unless otherwise indicated.
 - 2. "Furnish": Shall mean purchase and deliver to Project site.
 - 3. "Install": Shall mean to physically install the items in-place.
 - 4. "Connect": Shall mean make final electrical connections for a complete operating piece of equipment.
 - 5. "As directed": Shall be as directed by the Owner or their authorized Representative.
 - 6. "Utility Companies": Shall mean the company providing electrical, telephone or cable television services to the Project.

1.4 SUBMITTALS

- A. Format: Furnish submittal data neatly bound in an 8-1/2" x 11" folder or binder for each Specification Section with a table of contents listing materials by Section and paragraph number.
- B. Submittals shall consist of detailed Shop Drawings, Specifications, block wiring diagrams, "catalog cuts" and data sheets containing physical and dimensional information, performance data, electrical characteristics, materials used in fabrication and material finish. Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories which are included and those which are excluded. Furnish quantities of each submittal as noted in Division 01.
- C. Each submittal shall be labeled with the Specification Section Number and shall be accompanied by a cover letter or shall bear a stamp stating that the submittal has been thoroughly reviewed by the Contractor and is in full compliance with the requirements of the Contract Documents. Cover letters shall list in full the items and data submitted. Failure to comply with this requirement shall constitute grounds for rejection of data.

- D. The Contractor shall submit detailed Drawings of all electrical equipment rooms and closets if the proposed installation layout differs from the construction documents. Physical size of electrical equipment indicated on the Drawings shall match those of the electrical equipment that is being submitted for review, i.e.: switchboards, panelboards, transformers, control panels, etc. Minimum scale: 1/4" = 1'- 0". Revised electrical equipment layouts must be approved prior to release of order for equipment and prior to installation.
- E. As part of the equipment submittals, the Manufacturer shall provide anchorage calculations for floor and wall mounted electrical equipment so that it shall remain attached to the mounting surface after experiencing forces in conformance with CCR, Title 24, Table 23P, Part II and with Section 2312 "Earthquake Regulations" of the "Uniform Building Code" for Seismic Zone 4 Area, Importance Factor of 1.251.5. Structural Calculations shall be prepared and signed by a California Registered Structural Engineer. Specify proof loads for drilled-in anchors, if used.
- F. The Manufacturer shall recommend the method of anchoring the equipment to the mounting surface and shall provide the Contractor with the assembly dimensions, weights and approximate centers of gravity.
- G. All resubmittals shall include a cover letter that lists the action taken and revisions made to each Drawing and equipment data sheet in response to Submittal Review Comments. Resubmittal packages will not be reviewed unless accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the resubmittal package.
- H. Shop Drawings for the following systems must be prepared via a computer aided drafting (CAD) system for submission by the Contractor. The Engineer can provide files of the electrical Contract Documents to the Contractor.
1. Fire alarm system, Section 283100.
 2. Security System, card readers.
- I. Substitutions:
1. All requests for substitutions shall conform to the general requirements and procedure outlined in Division 01.
 2. Where items are noted as "or equal," a product of equal design, construction and performance will be considered. Contractor must submit to the Engineer all pertinent test data, catalog cuts and product information required substantiating that the product is in fact equal to that specified. Only one substitution will be considered for each product specified.
 3. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the Contract Documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment, which in the opinion of the Engineer is equal in quality, utility and appearance, will be approved as substitutions to that specified.
 4. Whenever any material, process or equipment is specified in accordance with a Federal specification, an ASTM standard, an ANSI specification, UL rating or other association standard, the Contractor shall present an affidavit from the Manufacturer certifying that

the product complies with the particular standard specification. When requested by the Engineer, support test data to substantiate compliance shall be submitted by the Contractor at no additional cost.

5. Substitutions shall be equal, in the opinion of the Architect/Engineer, to the specified product. The burden of proof of such shall rest with the Contractor. When the Architect/Engineer in writing accepts a substitution, it is with the understanding that the Contractor guaranteed the substituted article or material to be equal to the one specified and dimensioned to fit within the construction. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the Work or from any provisions of the Specifications.
6. The Contractor shall be responsible for all expenses in connection with the substitution materials, processes and equipment, including the effect of the substitution on the Contractor, Subcontractor's or other Contractor's Work. No substitution of material, processes or equipment shall be permitted without written authorization of the Architect/Engineer. Any assumptions on the acceptability of a proposed substitution prior to acceptance by the Engineer are at the sole risk of the Contractor.

1.5 COORDINATION

A. Discrepancies:

1. In the event of discrepancies within the Contract Documents, the Engineer shall be so notified, within sufficient time, as delineated in Division 01, prior to the Bid Opening to allow the issuance of an Addendum.
2. If, in the event that time does not permit notification or clarification of discrepancies prior to the Bid Opening, the following shall apply: The Drawings govern in matters of quantity and the Specifications govern in matters of quality. In the event of conflict within the Drawings involving quantities or within the Specifications involving quantities or within the Specifications involving quality, the greater quantity and higher quality shall apply. Such discrepancies shall be noted and clarified in the Contractor's Bid. No additional allowances will be made because of errors, ambiguities or omissions that reasonably should have been discovered during the preparation of the Bid.

B. Project conditions:

1. Examination of Project site: The Contractor shall visit the Project site and thoroughly review the locale, working conditions, conflicting utilities and the conditions in which the Electrical Work will take place. Verify all existing conditions in the field. No allowances will be made subsequently for any costs that may be incurred because of any error or omission due to failure to examine the Project site and to notify the Engineer of any discrepancies between Contract Documents and actual Project site conditions.
2. Protection: Keep conduits, junction boxes, outlet boxes and other openings closed to prevent entry of foreign matter. Cover fixtures, equipment, devices and apparatus and protect them against dirt, paint, water, chemical or mechanical damage, before and during construction period. Prior to final acceptance, restore to original condition any fixture, apparatus or equipment damaged including restoration of damaged factory applied

painted finishes. Protect bright finished surfaces and similar items until in service. No rust or damage will be permitted.

3. Supervision: Contractor shall personally or through an authorized and competent representative constantly supervise the Work from beginning to completion and, within reason, keep the same foreman and workmen on the Project throughout the Project duration.

C. Preparation:

1. Drawings:

- a. Layout: General layout indicated on the Drawings shall be followed except where other Work may conflict with the Drawings.
 - b. Accuracy: Drawings for the Work under this Section are essentially diagrammatic within the constraints of the symbology applied.
2. Design-Build systems approach: The Drawings do not fully represent the entire installation for the systems indicated below. The Contractor is required to complete the design for these systems as specified herein and as indicated on the Drawings and submit with record documents.
- a. Lighting system branch circuiting: Drawings indicate homeruns, circuiting at each box and local control means. Corresponding circuit numbers are indicated adjacent to lighting fixtures. Wiring to all fixtures, control devices, etc. is not indicated.
 - b. Power system branch circuiting: Drawings indicate homeruns and circuit numbers at each device. Wiring to all devices. is not indicated.
 - c. Security system: Drawings indicate the layout and location of control console(s) components, as well as location of all security devices, i.e. card readers, door locks and contacts. Conduits, wire and cabling between all system components, equipment, devices, etc. are not indicated

1.6 RECORD DOCUMENTS

A. Provide Project Record Drawings as described herein:

1. Drawings shall fully represent installed conditions including actual locations of outlets, true panelboard connections following phase balancing routines, correct conduit and wire sizing as well as routing, revised fixture schedule listing Manufacturers and products actually installed and revised panel schedules. Contractor shall record all changes in the Work during the course of construction on blue or black line prints. These prints shall be made subject of monthly review by the Owner's Representative to ascertain that they are current. If not, current monthly payments may be withheld.
2. Record Drawings shall be the transfer of information on these prints to AutoCad files of the original Drawings by a professional draftsman. The construction documents will be provided for the Contractor's use in reproducing at their cost.the construction

documents via computer aided drafting (CAD) process. A set of CAD files of the electrical documents will be provided to the Contractor in Autocad format.

3. Record drawing submissions shall be provided to the Engineer to review upon the completion of the following phases of Work:
 - a. Final electrical installation.
4. Include in the record drawing submission the following shop drawing submission with all updated installation information:
 - a. Fire alarm system.
 - b. Security system.
5. A single set of half size prints of the Record Drawings shall be submitted for review. Upon receipt of the Engineer's review comments, corrections shall be made and the Contractor shall provide the following:
 - a. One set of full size prints.
 - b. One set of half size prints.
 - c. PDF files of Drawings.

1.7 OPERATION AND MAINTENANCE MANUALS

- A. Prior to Project closeout furnish to the Owner, six (6) hard back 3-ring binders containing all bulletins, operation and maintenance instructions, part lists, service telephone numbers and other pertinent information as noted in each Section all equipment furnished under Division 26. Binders shall be indexed into Division Sections and labeled for easy reference. Bulletins containing more information than the equipment concerned shall be properly stripped and assembled.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 ROUGH-IN

- A. Contractor shall verify lines, levels and dimensions indicated on the Drawings and shall be responsible for the accuracy of the setting out of Work and for its strict conformance with existing conditions at the Project site.
- B. Verify final locations for rough-ins with field measurements and with the requirements for the actual equipment to be connected.

3.2 ELECTRICAL INSTALLATION

- A. Preparation, sequencing, handling and installation shall be in accordance with Manufacturer's written instructions and technical data particular to the product specified and/or accepted equal except as otherwise specified. Comply with the following requirements:
1. Shop Drawings prepared by Manufacturer.
 2. Verify all dimensions by field measurements.
 3. Install systems, materials and equipment to conform with approved submittal data, including coordination Drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are indicated only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
 4. Install systems, materials and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
 5. Install electrical equipment to facilitate servicing, maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
 6. Coordinate electrical systems, equipment and materials installations with other building components.
 7. Provide access panel or doors where devices or equipment are concealed behind finished surfaces.
 8. Install systems, materials and equipment giving right-of-way priority to other systems that are required to maintain a specified slope.
 9. Conform to the National Electrical Contractor's Association "Standard of Installation" for general installation practice.

3.3 CUTTING, PATCHING, PAINTING AND SEALING

- A. Structural members shall in no case be drilled, bored or notched in such a manner that will impair their structural value. Cutting of holes, if required, shall be done with core drill and only with the approval of the Architect and Structural Engineer.
- B. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- C. Application of joint sealers:
1. General: Comply with joint sealer Manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.

2. Installation of fire-stopping sealant: Install sealant, including forming, packing and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire-stops and fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

3.4 FIELD QUALITY CONTROL

A. General testing requirements:

1. The purpose of testing is to ensure that all tested electrical equipment, both Contractor and Owner supplied, is operational and within industry and Manufacturer's tolerances and is installed in accordance with design Specifications.
2. Tests and inspections shall determine suitability for energization.
3. Perform tests in presence of the Owner's Representative and furnish test equipment, facilities and technical personnel required to perform tests.
4. Tests shall be conducted during the construction period and at completion to determine conformity with applicable codes and with these Specifications.

B. Tests: In addition to specific system test described elsewhere, tests shall include:

1. Equipment operations: Test motors for correct operation and rotation.
2. Lighting control circuits: Test lighting circuits for correct operation through their control devices.
3. Alarm and interlock systems: Produce malfunction symptoms in operating systems to test alarm and interlock systems. In addition, all specific tests described in the **fire alarm system** shall be performed.
4. Circuit numbering verification: Select on a random basis various circuit breakers in the panelboards and cycle them on and off to verify compliance of the typed panel directories with actual field wiring.

C. Testing safety and precautions:

1. Safety practices shall include the following requirements:
 - a. Applicable State and Local safety operating procedures.
 - b. OSHA.
 - c. NSC.
 - d. NFPA 70E.
2. All tests shall be performed with apparatus de-energized and grounded except where otherwise specifically required ungrounded by test procedure.

F. Coordinate with General Contractor regarding testing schedule and availability of equipment ready for testing.

- D. Coordinate with General Contractor regarding testing schedule and availability of equipment ready for testing.
- E. Notify Owner and Engineer one week in advance of any testing.
- F. Any products which fail during the tests or are ruled unsatisfactory by the Owner's Representative shall be replaced, repaired or corrected as prescribed by the Owner's Representative at the expense of the Contractor. Tests shall be performed after repairs, replacements or corrections until satisfactory performance is demonstrated.
- G. Include all test results in the maintenance manuals.

3.5 CLEANING

- A. Prior to energizing of electrical equipment, the Contractor shall thoroughly clean the interior of enclosures from construction debris, scrap wire, etc. using Manufacturer's approved methods and materials.
- B. Upon completion of Project, prior to final acceptance, the Contractor shall thoroughly clean both the interior and exterior of all electrical equipment per Manufacturers approved methods and materials. Remove paint splatters and other spots, dirt and debris.
- C. Touch-up paint any marks, blemishes or other finish damage suffered during installation.

3.6 PROJECT CLOSEOUT

- A. Training: At the time of completion, a period of not less than 4 hours shall be allotted by the Contractor for instruction of building operating and maintenance personnel in the use of all systems. This 4 hours training is in addition to any instruction time called out in the Specifications for specific systems, i.e., ***Fire Alarm***, etc. All personnel shall be instructed at one time, the Contractor making all necessary arrangements with Manufacturer's Representative. The equipment Manufacturer shall be requested to provide product literature and application guides for the users' reference. Costs, if any, for the above services shall be paid by the Contractor.
- B. Special tools: Provide one of each tool required for proper operation and maintenance of the equipment provided under this Section. All tools shall be delivered to the Owner at the Project completion.
- C. Keying: Provide two keys for each lock furnished under this Section and turn over to Owner.

END OF SECTION 260010

SECTION 260090 - ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor and equipment necessary to complete the demolition required for the item specified under this Division, including but not limited to:
 - 1. Electrical demolition

1.2 SYSTEM DESCRIPTION

- A. Disconnection, removal and relocation of all wiring, light fixtures, outlets, conduit and all other types of electrical equipment as described on Drawings.
- B. Purpose is to remove, relocate and extend existing installations to accommodate new construction.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment necessary for patching and extending Work, as specified in other Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly review conditions in the area of demolition prior to commencing Work to ensure complete understanding of existing installation in relationship to demolition Work.

3.2 GENERAL REQUIREMENTS

- A. Remove all light fixtures, outlets, and all other types of electrical equipment indicated to be removed. Remove associated conduit and wire back to source. Devices that are to be removed may require reworking conduit and wiring in order to maintain service to other devices. If removed devices are on walls or ceilings that are to remain, box and conduit shall be removed and wall shall be patched.

- B. Where remodeling interferes with circuits in areas that are otherwise undisturbed, circuits shall be reworked as required.
- C. Existing devices and circuiting that are indicated are indicated only for informational purposes. Contractor shall visit the Project site and shall verify conditions as they exist and shall remove, relocate and/or rework any electrical equipment or circuits affected (whether indicated or not) due to removal of existing walls, ceilings, etc. Coordinate all Work with that of other trades.
- D. All equipment, fixtures, devices, etc., which are removed shall be legally removed from the Project site.
- E. Cutting and patching necessary for the removal of Electrical Work shall be included.

3.3 LIGHT FIXTURES

- A. Disconnect and remove abandoned light fixtures. Remove conduits, wiring, boxes, brackets, stems, hangers and other accessories.

3.4 OUTLETS

- A. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed.

3.5 CONDUIT

- A. Remove all abandoned conduit, including abandoned conduit above accessible ceiling finishes.

3.6 WIRING

- A. Removed abandoned wiring to source of supply.

3.7 PANELBOARDS

- A. Remove all panelboards and replace with new as noted. Maintain existing feed to building and reconnect to new panel. All other feeders within the building shall be new.

3.8 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that shall remain.

END OF SECTION 260090

SECTION 260519 - BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
 - 1. Building wire.
 - 2. Cable.
 - 3. Wiring connections and terminations.
- B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
 - 1. Federal Specifications (FS):
 - FS J-C-30A; Cable and Wire, Electrical (Power, Fixed Installation).
 - FS W-S-610C; Splice Conductor.
 - FS HH-I-595C; Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic.
 - 2. Underwriters Laboratories, Inc. (UL):
 - UL 44; Thermoset-Insulated Wires and Cables.
 - UL 83; Thermoplastic-Insulated Wires and Cables.
 - UL 310; Electrical Quick-Connect Terminals.
 - UL 486A & B; Wire Connectors.
 - UL 486C; Splicing Wire Connectors.
 - UL 486D; Insulated Wire Connector Systems for Underground Use or in Damp or Wet Locations.

- UL 493; Thermoplastic-Insulated Underground Feeder and Branch Circuit Cables.
- UL 510; Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.
- UL 1581; Reference Standard for Electrical Wires, Cables and Flexible Cords.

3. National Electrical Manufacturer Association (NEMA):

- NEMA WC-5; Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- NEMA WC-7; Cross-Linked Thermosetting Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

4. Institute of Electrical and Electronic Engineers (IEEE):

- IEEE 82; Test Procedure for Impulse Voltage Tests on Insulated Conductors.

1.3 SUBMITTALS

A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
3. Submit Manufacturer's installation instructions.
4. Final test results.

1.4 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.
- C. Independent Testing Agency qualifications: Refer to Section 260010: Basic Electrical Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Building wire:

- a. America Insulated Wire Corp.
- b. Rome Cable.
- c. Southwire Company.

2. Flexible Cords and Cables:

- a. Carol Cable Company.
- b. PWC Corp.
- c. ITT Royal Electric.

3. Wiring connectors and terminations:

- a. 3M Company.
- b. Ideal.
- c. Blackburn-Holub.
- d. Burndy.
- e. Thomas & Betts Corp.
- f. Beau Barrier.

B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 BUILDING WIRE

A. Conductor material:

- 1. Provide annealed copper for all wire, conductor and cable, unless otherwise indicated.
- 2. Wire AWG #8 and larger shall be stranded, unless otherwise indicated.
- 3. Wire AWG #10 and smaller may be solid or stranded as best suited for the installation.

B. Insulation material:

- 1. All insulated wire, conductor and cable shall be 600 volt rated unless otherwise noted on the Drawings.

2. Thermoplastic-insulated building wire: NEMA WC 5.
3. Rubber-insulated building wire: NEMA WC 3.
4. Feeders and branch circuits larger than 6 AWG: Type dual rated THHN/THWN.
5. Feeders and branch circuits 6 AWG and smaller: Type or dual rated THHN/THWN.
6. Control Circuits: Type dual rated THHN/THWN.
7. Identify system conductors as to voltage and phase connections by means of color-impregnated insulation.

2.3 METAL-CLAD CABLE (MC)

- A. MC cable shall not be used on this project

2.4 WIRING CONNECTIONS AND TERMINATIONS

- A. Bolted pressure connectors: Provide wide range-taking connectors with cast bronze compression bolts, designed for parallel taps, tees, crosses or end-to-end connections.
- B. Electrical spring wire connectors:
 1. Provide multi-part construction incorporating a non-restricted, zinc coated square cross-section steel spring enclosed in a steel sheet with an outer jacket of plastic and insulating skirt.
 2. Self-striping pigtail and tap U-contact connectors shall not be used.
- C. Push-in wire connectors:
 1. Multi-port push-in wire connectors for a maximum of 8-wires, as required for specific application. Connectors are manufactured to accommodate a wide range of sizes with either solid or stranded conductors, up to a maximum wire size of #10 AWG. Low insertion force required for ease of installation.
 2. Housing shall be 105 degrees C and transparent for visual connection verification.
 3. 600 volt maximum rating with copper contacts.
 4. UL Listed to 486C and UL 467 Listed for grounding and bonding applications.
- D. Compression type terminating lugs:
 1. Provide tin-plated copper high-compression type lugs for installation with hand or hydraulically operated circumference-cripping tools and dies as stipulated by the lug Manufacturer or as indicated on Drawings. Notch or single point type crimping is NOT acceptable.

2. Two hole, long barrel lugs shall be provided for size (4/0) and larger wire where terminated to bus bars. Use minimum of three crimps per lug, on sizes where possible.
- E. Splicing and insulating tape: Provide black, ultraviolet proof, self-extinguishing, 7 mil thick vinyl general purpose electrical tape with a dielectric strength of 10,000 volts suitable for temperatures from minus 18 degrees C to 105 degrees C. Federal Spec. HH-I-595, Scotch 33+ or equal minimum.
- F. Insulating putty:
1. Provide pads or rolls of non-corrosive, self-fusing, one-eighth inch thick rubber putty with PVC backing sheet. Scotch vinyl mastic pads and roll or equal.
 2. Use putty suitable for temperatures from minus 17.8 degrees C to 37.8 degrees C with a dielectric strength of 570-volts/mil minimum.
- G. Insulating resin:
1. Provide two-part liquid epoxy resin with resin and catalyst in pre-measured, sealed mixing pouch. Scotchcast 4 or equal for wet or underground vaults, boxes, etc. splices or terminations.
 2. Use resin with a set up time of approximately 30 minutes at 21.1 degrees C and with thermal and dielectric properties equal to the insulating properties of the cables immersed in the resin.
- H. Terminal strips:
1. Provide box type terminal strips in the required quantity plus 25% spare. Install in continuous rows in terminal cabinets.
 2. Use the box type terminal strips with barrier open backs and with ampere ratings as required.
 3. Identify all terminals with numbering sequence being used for a particular system.
- I. Crimp type connectors:
1. Provide insulated fork or ring crimp terminals with tinned electrolytic copper-brazed barrel with funnel wire entry and insulation support
 2. Fasten crimp type connectors or terminals using a crimping tool recommended by the connector Manufacturer.
 3. Provide insulated overlap splices with tinned seamless electrolytic copper barrel with funnel wire entry and insulation support.
 4. Provide insulated butt splices with tinned seamless electrolytic copper barrel with center stop, funnel wire entry and insulation support.

- J. Cable ties: Provide harnessing and point-to-point wire bundling with nylon cable ties. All cable ties shall be installed using tool supplied by Manufacturer of ties.
- K. Wire lubricating compound:
 - 1. UL listed for the wire insulation and conduit type and shall not harden or become adhesive.
 - 2. Shall not be used on wire for isolated type electrical power systems.
- L. Bolt termination hardware:
 - 1. Bolts shall be plated, medium carbon steel heat-treated, quenched and tempered equal to ASTM A-325 or SAE grade 5; or silicon bronze alloy ASTM B-9954 Type B.
 - 2. Nuts shall be heavy semi-finished hexagon, conforming to ANSI B18.2.2, threads to be unified coarse series (UNC), class 2B steel or silicon bronze alloy.
 - 3. Flat washers shall be steel or silicon bronze, Type A plain standard wide series, conforming to ANSI B27.2. SAE or narrow series shall not be used.
 - 4. Belleville conical spring washers shall be hardened steel, cadmium plated or silicon bronze.
 - 5. Each bolt connecting lug(s) to a terminal or bus shall not carry current exceeding the following values:
 - a. 1/4" bolt - 125 amps
 - b. 5/16" bolt - 175 amps
 - c. 3/8" bolt - 225 amps
 - d. 1/2" bolt - 300 amps
 - e. 5/8" bolt - 375 amps
 - f. 3/4" bolt - 450 amps

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of wire and cable installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 APPLICATION

- A. All wire, conductor and cable with their respective connectors, fittings and supports shall be UL listed for the installed application and ambient condition.
- B. Feeders and branch circuits in wet locations shall be rated 75 degree C.
- C. Feeders and branch circuits in dry locations shall be rated 90 degree C.
- D. Minimum conductor size:
 - 1. Provide minimum AWG #12 for all power and lighting branch circuits.
 - 2. Provide minimum AWG #14 for all line voltage signal and control wiring unless otherwise indicated.
- E. Color coding:
 - 1. For 120/208 volt, 3 phase, 4 wire systems:
 - a. Phase A - Black
 - b. Phase B - Red
 - c. Phase C - Blue
 - d. Neutral - White
 - e. Ground - Green

3.3 WIRING METHODS

- A. Install wires and cables in accordance with Manufacturer's written instructions, as indicated on Drawings and as specified herein.
- B. Install all single conductors in raceway system, unless otherwise noted.
- C. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than #10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.
- D. 20 amp power and lighting branch circuit containing no more than four (4) current carrying conductors (phases and neutrals). Use #10 AWG conductor for 120/208 volt circuits located outside a 75 foot radius of panel source, unless otherwise noted.
- E. 20 amp power and lighting branch circuits containing no more than eight (8) current carrying conductors (phases and neutrals). Use #10 AWG conductors for 120/208 volt circuits located outside a 65 foot radius of panel
- F. Provide #10 AWG pig tails on all 20A and 30A wiring devices served by #8 AWG conductors and larger.

- G. Splice cables and wires only in outlet boxes, junction boxes, pull boxes, manholes or handholes. Group and bundle with tie wrap each neutral with it's associated phase conductor where more than one neutral is present in a conduit.
- H. Install cable supports for all vertical feeders in accordance with the NEC Article 300. Provide split wedge type fittings, which firmly clamp each individual cable and tighten due to cable weight.
- I. Neatly form, train and tie the cables in individual circuits. For panelboards, cabinets, wireways, switches and equipment assemblies.
- J. Seal cable or wire, entering a building from underground, between the wire or cable and conduit, where it exits the conduit, with a non-hardening approved compound, i.e. duct seal or equal.
- K. Provide UL-listed factory-fabricated, solderless metal connectors of size, ampacity rating, material, type and class for applications and for services indicated. Use connectors with temperature ratings equal to or greater than the wires that are being terminated.
- L. Stranded wire shall be terminated using fitting, lugs or devices listed for the application. However, in no case shall stranded wire be terminated solely by wrapping it around a screw or bolt.
- M. Flexible cords and cables supplied, as part of a pre-manufacturer fixture or unit assembly shall be installed according to Manufacturers published installation instructions.

3.4 WIRING INSTALLATION IN RACEWAYS

- A. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical Work likely to injure conductors has been completed. Pull all conductors into a raceway at the same time. Exercise care in pulling conductors so that insulation is not damaged. Use UL listed, non-petroleum base and insulating type pulling compound as needed.
- B. Completely mandrel all underground or concrete encased conduits prior to installing conductors.
- C. Completely and thoroughly swab raceway system before installing conductors.
- D. Do not use block and tackle, power driven winch or other mechanical means for pulling conductors of size smaller than AWG #1.
- E. Wire pulling:
 - 1. Provide installation equipment that will prevent the cutting or abrasion of insulation during pulling of cables.
 - 2. Use rope made of nonmetallic material for pulling feeders.

3. Attach pulling lines for feeders by means of either woven basket grips or pulling eyes attached directly to the conductors.
 4. Pull in together multiple conductors or cables in a single conduit.
- F. Install and test all cables in accordance with Manufacturer's instructions and warranty.

3.5 WIRE SPLICES, JOINTS AND TERMINATION

- A. Join and terminate wire, conductors and cables in accordance with UL 486A, C, NEC and Manufacturer's instructions.
- B. Thoroughly clean wires before installing lugs and connectors.
- C. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- D. Splices and terminations shall be made mechanically and electrically secure.
- E. Where it's determined that unsatisfactory splice or terminations have been installed, remove the devices and install approved devices at no addition cost.
- F. Terminate wires in Terminal Cabinets, relay and contactor panels, etc. using terminal strip connectors.
- G. Insulate spare conductors with electrical tape and leave sufficient length to terminate anywhere in the panel or cabinet.
- H. Install cable ties and maintain harnessing.
- I. Encapsulate splices in exterior outlets, pullboxes and junction boxes using specified insulating resin kits. Make all splices watertight for exterior equipment and equipment in pump rooms.
- J. Make up all splices and taps in accessible junction or outlet boxes with connectors as specified herein. Pigtails and taps shall be the same color as the feed conductor. Form conductor prior to cutting and provide at least six (6) inches of tail and neatly packed in box after splice is made up.
- K. Branch circuits (#10 AWG and smaller):
 1. Connectors: Solderless, screw-on, reusable spring pressure cable type, 600 volt, 105-degree C. with integral insulation, approved for copper conductors.
 2. The integral insulator shall have a skirt to completely cover the stripped wires.
 3. The number, size and combination of conductors as listed on the Manufacturers
- L. Feeder circuits: (#6 to 750 MCM)

1. Join or tap conductors from #6 AWG to 750 MCM using bolted pressure connectors or insulate mechanical compression (hi-press) taps with pre-molded, snap-on insulating boots or specified conformable insulating pad and over wrapped with two half-lapped layers of vinyl insulating tape starting and ending at the middle of the joint.
2. Terminate conductors from size #6 AWG to 750 MCM copper using bolted pressure or mechanical compression lugs in accordance with Manufacturer recommendation or as specified elsewhere.
3. Field installed compression connectors for cable sizes 250 MCM and larger shall have not less than two clamping elements or compression indents per wire.
4. Insulate splices and joints with materials approved for the particular use, location, voltage and temperature. Insulate with not less than that of the conductor level that is being joined.

M. Termination hardware assemblies:

1. AL/CU lugs connected to aluminum plated or copper buss, shall be secured using a steel bolt, flat washer (two per bolt), Belleville washer and nut.
2. Copper lugs connected to copper bus, shall be secured using silicon bronze alloy bolt, flat washer (two per bolt), Belleville washer and nut.
3. The crown of Belleville washers shall be under the nut.
4. Bolt assemblies shall be torque to Manufacturer recommendation. Where manufacture recommendation are not obtainable, the following values shall be used:
 - a. 1/4" - 20 bolt at 80-inch pounds torque.
 - b. 5/16" - 18 bolt at 180-inch pounds torque.
 - c. 3/8" - 16 bolt at 20-foot pounds torque.
 - d. 1/2" - 13 bolt at 40-foot pounds torque.
 - e. 5/8" - 11 bolt at 55-foot pounds torque.
 - f. 3/4" - 10 bolt at 158-foot pounds torque.

3.6 IDENTIFICATION

- A. Refer to Section 260553: Electrical Identification for additional requirements.
- B. Securely tag all branch circuits. Mark conductors with specified vinyl wrap-around markers. Where more than two conductors run through a single outlet, mark each conductor with the corresponding circuit number.
- C. Color code conductors size #8 and larger using specified phase color markers and identification tags.

- D. Provide all terminal strips with each individual terminal identified using specified vinyl markers.
- E. In manholes, pullboxes and handholes, provide tags of the embossed brass type and also show the cable type and voltage rating. Attach the tags to the cables with slip-free plastic cable lacing units.

3.7 FIELD QUALITY CONTROL

A. Prefunctional testing:

1. Visual and mechanical inspection:

- a. Compare cable data with Contract Documents.
- b. Inspect exposed sections of wires and cables for physical damage and proper connections.
- c. Verify tightness of accessible bolted connections with calibrated torque wrench in accordance with Manufacturer's published data.
- d. Inspect compression applied connectors for correct cable match and indentation.
- e. Verify visible cable bend meet or exceed ICEA and Manufacturer's minimum allowable bending radius.
- f. If cables are terminated through window type current transformers, make an inspection to verify neutral and ground conductors are correctly placed for operation of protective devices.
- g. Ensure wire and cable identification has been installed as specified herein.

B. Electrical testing:

- 1. Contractor shall perform feeder and branch circuit insulation test after installation and prior to connection to utilization devices such as fixtures, motors or appliances. Testing shall be as follows:
 - a. 100% of all feeders 100 amp rated and above.
 - b. 50% of all feeders smaller than 100 amps.
 - c. 10% of all branch circuits at each individual panelboard.
- 2. Perform insulation-resistance test using megohm meter with applied potential of 1000V DC for a continuous duration of 60 seconds. Test conductors phase-to-phase and phase-to-ground. Conductors shall test free from short-circuit and ground faults.
- 3. Perform continuity test of all feeder and branch circuits to ensure correct cable connections. Test all neutrals for improper grounds.

4. Contractor shall furnish instruments, materials and labor for these tests.
- C. Test values: Investigate resistance values less than 50 megohms.
- D. Furnish test results in typewritten report form for review and inclusion in the operation and maintenance

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
 - 1. Power system grounding.
 - 2. Electrical equipment and raceway grounding and bonding.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
 - 1. Underwriters Laboratories, Inc. (UL):
 - UL 467; Grounding and Bonding Equipment.
 - 2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - IEEE No. 142; Recommended Practice for Grounding of industrial and Commercial Power Systems.
 - IEEE No. 81 Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

1.3 SYSTEM DESCRIPTION

- A. Ground the electrical service system neutral at service entrance equipment as described herein and indicated on Drawings.
- B. Except as otherwise indicated, the complete electrical installation including the neutral conductor, metallic conduits and raceways, boxes, cabinets and equipment shall be completely and effectively grounded in accordance with all code requirements, whether or not such connections are specifically indicated or specified.
- C. Resistance:
 - 1. Resistance from the main switchboard ground bus through the ground electrode to earth shall not exceed 5 OHMS unless otherwise noted.
 - 2. Resistance from the farthest panelboard, switchboard, etc. ground bus through the ground electrode to earth shall not exceed 20 OHMS

1.4 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
 - 1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
 - 2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 - 3. Submit Manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
 - 1. Ground Bushings, Connectors, Jumpers and Bus:
 - a. O-Z/Gedney.
 - b. Thomas & Betts Corp.
- B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 GROUND CONDUCTORS

- A. Refer to Specification Section 260519: Building Wire and Cable for conductor specifications.
- B. General purpose insulated:
 - 1. UL approved and code sized copper conductor, with dual rated THHN/THWN insulation, color identified green.
 - 2. Where continuous color-coded conductors are not commercially available, provide a minimum 4" long color band with green, non-aging, plastic tape in accordance with NEC/CEC.

- C. Bare conductors in direct contact with earth or encased in concrete: #2/0 AWG copper minimum, U.O.N.
- D. Bonding pigtails: Insulated copper conductor, identified green, sized per code and provide with termination screw or lug. Provide solid conductors for #10 AWG or smaller and stranded conductors for #8 AWG or larger.

2.3 INSULATED GROUNDING BUSHINGS

- A. Plated malleable iron or steel body with 150 degree Centigrade molded plastic insulating throat and lay-in grounding lug.

2.4 CONNECTIONS TO PIPE

- A. For cable to pipe: UL and NEC/CEC approved bolted connection.

2.5 CONNECTIONS TO STRUCTURAL STEEL, GROUND RODS OR SPLICES

- A. Where required by the Drawings, grounding conductors shall be spliced together, connected to ground rods or connected to structural steel using exothermic welds or high pressure compression type connectors.
 - 1. Exothermic welds shall be used for cable-to-cable and cable-to-ground rod and for cable to structural steel surfaces. Exothermic weld kits shall be as manufactured by Cadweld or equal. Each particular type of weld shall use a kit unique to that type of weld.
 - 2. High-pressure compression type connectors shall be used for cable-to-cable and cable-to-ground rod connections.

2.6 EXTRA FLEXIBLE, FLAT BONDING JUMPERS

- A. Where required by Code, indicated on the Drawing, and specified herein.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of grounding system installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 INSTALLATION

- A. Grounding electrode conductor: Provide grounding electrode conductor as indicated on the Drawings or sized per NEC/CEC Article 250, whichever is greater.

B. Equipment bonding/grounding:

1. Provide a NEC/CEC sized insulated copper ground conductor in all 120VAC through 600 VAC feeder and branch circuit distribution conduits and cables.
2. Provide a separate grounding bus at panelboards. Connect all metallic enclosed equipment so that with maximum fault current flowing, shall be maintained at not more than 35 volts above ground.
3. Conduit terminating in concentric, eccentric or oversized knockouts at panelboards, cabinets, gutters, etc. shall have grounding bushings and bonding jumpers installed interconnecting all such conduits.
4. Provide bonding jumpers across expansion and deflection couplings in conduit runs, pipe connections to water meters, dielectric couplings in metallic cold water piping system.
5. Provide internal ground wire in flexible conduit connected at each end via grounding bushing.
6. Provide external ground wire wrapped around flexible conduit and terminate to connectors designed for the purpose.

3.3 FIELD QUALITY CONTROL

A. Prefunctional testing:

1. Visual and mechanical inspection:
 - a. Verify installation complies with the intent of the Contract Documents
2. Obtain and record ground resistance measurements both from electrical equipment ground bus to the ground electrode and from the ground electrode to earth. Furnish and install additional bonding and add grounding electrodes as required complying with resistance limits specified under this Section of the Specification.
3. A typewritten record of measured resistance values shall be submitted for review and included with the operation and maintenance manual furnished to the Owner at the time of Project closeout and before certificate of final payment is issued.

END OF SECTION 260526

SECTION 260529 - ELECTRICAL HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
 - 1. Conduit supports.
 - 2. Equipment supports.
 - 3. Fastening hardware.
- B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.
 - 1. Division 03: Cast-in-place concrete. Concrete equipment pads.
 - 2. Division 05: Miscellaneous metals. Hangers for electrical equipment.
 - 3. Division 09: Ceiling suspension systems. Slack fixture support wires.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
 - 1. Underwriters Laboratories, Inc. (UL):
 - UL 2239; Hardware for the Supports of Conduit, Tubing and Cable.

1.3 SYSTEM DESCRIPTION

- A. Provide devices specified in this Section and related Sections for support of electrical equipment furnished and installed under Division 26.
- B. Provide support systems that are adequate for the weight of equipment, conduit and wiring to be supported.

1.4 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:

1. Data/catalog cuts for each product and component specified herein.
2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
3. Submit Manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
 1. Concrete fasteners:
 - a. Phillips "Red-Head".
 - b. Remington.
 - c. Ramset.
 2. Concrete inserts and construction channel:
 - a. Unistrut Corp.
 - b. GS Metals "Globe Strut."
 - c. Thomas & Betts "Kindorf" Corp.
 3. Conduit straps:
 - a. O-Z/Gedney.
 - b. Erico "Caddy" Fastening Products.
 - c. Thomas & Betts "Kindorf" Corp.
- B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 CONCRETE FASTENERS

- A. Provide expansion-shield type concrete anchors.
- B. Provide powder driven concrete fasteners with washers. Obtain approval by Architect and Structural Engineer prior to use.

2.3 CONCRETE INSERTS

- A. Provide pressed galvanized steel, concrete spot insert, with oval slot capable of accepting square or rectangular support nuts of $\frac{1}{4}$ inch to $\frac{1}{2}$ inch diameter thread for rod support.

2.4 THREADED ROD

- A. Provide steel threaded rod, sized for the load unless otherwise noted on the Drawings or in the Specifications.

2.5 CONSTRUCTION CHANNEL

- A. Provide 1-1/2 inch by 1-1/2 inch, 12 gauge galvanized steel channel with $\frac{17}{32}$ -inch diameter bolt holes and 1-1/2 inch on center in the base of the channel.

2.6 CONDUIT STRAPS

- A. One hole strap, steel or malleable iron, with malleable iron clamp-back spacer for surface mounted wall and ceiling applications.
 - 1. Use malleable strap with spacers for exterior and wet locations.
 - 2. Use steel strap without spacers for interior locations.
- B. Steel channel conduit strap for support from construction channel.
- C. Steel conduit hanger for pendant support with threaded rod
- D. Steel wire conduit support strap for support from independent #12 gauge hanger wires.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of supporting device installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

- A. Coordinate size, shape and location of concrete pads with Division 03, Cast-in-place concrete.
- B. Layout support devices to maintain headroom, neat mechanical appearance and to support the equipment loads.
- C. Where indicated on the Contract Documents, install freestanding electrical equipment on concrete pads.

3.3 INSTALLATION

- A. Furnish and install supporting devices as noted throughout Division 26.
- B. Electrical device and conduit supports shall be independent of all other system supports that are not structural elements of the building, unless otherwise noted.
- C. Fasten hanger rods, conduit clamps, outlet and junction boxes to building structure using precast inserts, expansion anchors, preset inserts or beam clamps.
- D. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster or gypsum board partitions and walls.
- E. Use expansion anchors or preset inserts in solid masonry walls.
- F. Use self-drilling anchors, expansion anchor or preset inserts on concrete surfaces.
- G. Use sheet metal screws in sheet metal studs and wood screws in wood construction.
- H. Do not fasten supports to piping, ductwork, mechanical equipment, conduit or acoustical ceiling suspension wires.
- I. Do not drill structural steel members unless first approved in writing by the Architect or Structural Engineer.
- J. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- K. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide additional support backing in stud walls prior to sheet rocking as required to adequately support cabinets and panels.
- L. Bridge studs top and bottom with channels to support flush mounted cabinets and panelboards in stud walls.

3.4 ERECTION OF METAL SUPPORTS

- A. Cut, fit and place miscellaneous metal fabrications accurately in location, alignment and elevation to support and anchor electrical materials and equipment.

- B. Field Welding: Comply with AWS "Structural Welding Code."

3.5 WOOD SUPPORTS

- A. Cut, fit and place wood grounds, nailers, blocking and anchorage accurately in location, alignment and elevation to support and anchor electrical materials and equipment.

3.6 ANCHORAGE

- A. All floor mounted, free standing electrical equipment etc. shall be securely fastened to the floor structure.
- B. Anchorage of electrical equipment shall comply with the seismic requirements as outlined in Section 260010: Basic Electrical Requirements.

END OF SECTION 260529

SECTION 260531 - CONDUIT

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
1. Rigid steel conduit and fittings.
 2. PVC insulated rigid steel conduit and fittings.
 3. Electrical metallic tubing and fittings.
 4. Rigid non-metallic conduit and fittings.
 5. Flexible metallic conduit and fittings.
 6. Liquidtight flexible metallic conduit and fittings.
 7. Miscellaneous conduit fittings and products.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
1. Federal Specifications (FS):
 - FS WW-C-563; Electrical Metallic Tubing.
 - FS WW-C-566; Specification for Flexible Metal Conduit.
 - FS WW-C-581; Specification for Galvanized Rigid Conduit.
 - FS W-C-1094A; Conduit and Conduit Fittings Plastic, Rigid.
 2. American National Standards Institute, Inc. (ANSI):
 - ANSI C80.1; Rigid Steel Conduit, Zinc-Coated.
 - ANSI C80.3; Electrical Metallic Tubing, Zinc Coated.
 - ANSI C80.5; Rigid Aluminum Conduit.
 3. Underwriters Laboratories, Inc. (UL):

- | | |
|----------|---------------------------------------|
| UL 1; | Flexible Metal Conduit. |
| UL 6; | Rigid Metal Conduit. |
| UL 360; | Liquid-Tight Flexible Steel Conduit. |
| UL 514B; | Conduit, Tubing and Cable Fittings. |
| UL 635; | Insulating Bushings. |
| UL 651; | Schedule 40 and 80 Rigid PVC Conduit. |
| UL 797; | Electrical Metallic Tubing - Steel. |
| UL 1242; | Intermediate Metal Conduit - Steel. |
4. National Electrical Manufacturer Association (NEMA):
- | | |
|------------|---|
| NEMA RN1; | PVC Externally coated Galvanized Rigid Steel Conduit. |
| NEMA TC 2; | Electrical Plastic Tubing and Conduit. |
| NEMA TC 3; | PVC Fittings for use with Rigid PVC Conduit. |

1.3 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements the following items:
1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
 2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 3. Submit Manufacturer's installation instruction. Provide written instructions for raceway products requiring glues, special tools or specific installation techniques.

1.4 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted and approved.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.

1. Metal conduit:

- a. Allied Tube and Conduit Co.
- b. Triangle PWC, Inc.
- c. Western Tube and Conduit Corp.
- d. Spring City Electrical Manufacturing Co.
- e. Occidental Coating Co. (OCAL).
- f. Alflex Corp.
- g. American Flexible Metal Conduit Co.
- h. Anaconda.

2. Nonmetallic conduit:

- a. Carlon.
- b. PW Pipe.

3. Fittings:

- a. Appleton Electric Co.
- b. OZ/Gedney.
- c. Thomas & Betts Corp.
- d. Spring City Electrical Manufacturing Co.
- e. Occidental Coating Co. (OCAL).
- f. Carlon.

B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 GALVANIZED RIGID STEEL CONDUIT (GRS)

A. Conduit: Full weight, threaded, hot-dip galvanized steel, conforming to ANSI C80.1 and UL 6.

- B. Standard threaded couplings, locknuts, bushings and elbows: Only materials of steel or malleable iron are acceptable. Locknuts shall be bonding type with sharp edges for digging into the metal wall of an enclosure.
- C. Three piece couplings: Electroplated, cast malleable iron.
- D. Insulating bushings: Threaded polypropylene or thermosetting phenolic rated 150 degree C minimum.
- E. Insulated grounding bushings: Threaded cast malleable iron body with insulated throat and steel "lay-in" ground lug with compression screw.
- F. Insulated metallic bushings: Threaded cast malleable iron body with plastic insulated throat rated 150 degrees C.
- G. All fittings and connectors shall be threaded.

2.3 PVC INSULATED GALVANIZED RIGID STEEL CONDUIT (PVC GRS)

- A. Conduit: Full weight, threaded, hot-dip galvanized steel, conforming to ANSI C80.1 and NEMA RN-1 with nominal 20 or 40 mil thermoplastic vinyl coating, heat fused and bonded to the exterior of the conduit.
- B. Fittings: Conduit couplings and connectors shall be as specified for galvanized rigid steel conduit and shall be factory PVC coated with an insulating jacket equivalent to that of the coated material.

2.4 ELECTRICAL METALLIC TUBING (EMT)

- A. Conduit: Shall be formed of cold rolled strip steel, electrical resistance welded continuously along the longitudinal seam and hot dip galvanized after fabrication. Conduit shall conform to ANSI C80.3 Specifications and shall meet UL requirements.
- B. Set screw type couplings: Electroplated, steel or cast malleable iron, UL listed concrete tight. Use set screw type couplings with four setscrews each of conduit sizes over 2 inches. Setscrews shall be of case hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.
- C. Set screw type connectors: Electroplated steel or cast malleable iron UL listed concrete tight with male hub and insulated plastic throat, 150 degree C temperature rated. Setscrew shall be same as for couplings.
- D. Raintight couplings: Electroplate steel or cast malleable iron; UL listed raintight and concrete tight, using gland and ring compression type construction.
- E. Raintight connectors: Electroplated steel or cast malleable iron, UL listed raintight and concrete tight, with insulated throat, using gland and ring compression type construction.

2.5 RIGID NON-METALLIC CONDUIT (PVC)

- A. Conduit:
 - 1. Rigid polyvinyl chloride, Schedule 40 or 80 conforming to NEMA TC1 and UL 651, latest edition. UL listed for exposed and direct-burial applications and for 90 degrees C conductor insulation. Conduit shall include an integral bell fitting at one end.
- B. Fittings: Couplings, adaptors, transition fittings, etc., shall be molded PVC, slip on, solvent weld type conforming to NEMA TC3 for Schedule 40 or 80.

2.6 FLEXIBLE METALLIC CONDUIT (FMC)

- A. Conduit: Shall be fabricated in continuous lengths from galvanized steel strip, spirally wound and formed to provide an interlocking design and conforming to UL 1.
- B. Fittings: Connectors shall be of the single screw clamp variety with steel or cast malleable iron bodies and threaded male hubs with insulated throats. Exception: Pressure cast screw-in connectors shall be acceptable for fixture connection in suspended ceilings and cut-in outlet boxes within existing furred walls.

2.7 LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT (LFMC)

- A. Conduit: Shall be fabricated in continuous lengths from galvanized steel strips, interlocking spirally wound, covered with extruded liquidtight jacket of polyvinyl chloride (PVC) and conforming to UL 360. Provide conduit with a continuous copper-bonding conductor wound spirally between the convolutions.
- B. Fittings: Connector body and gland nut shall be of cadmium plated steel or cast malleable iron, with tapered, male, threaded hub; insulated throat and neoprene "O" ring gasket recessed into the face of the stop nut. The clamping gland shall be of molded nylon with an integral brass push-in ferrule.

2.8 MISCELLANEOUS CONDUIT FITTINGS AND PRODUCTS

- A. Watertight conduit entrance seals: Steel or cast malleable iron bodies and pressure clamps with PVC sleeve, neoprene sealing grommets and PVC coated steel pressure rings. Fittings shall be supplied with neoprene sealing rings between the body and PVC sleeve.
- B. Watertight cable sealing bushings: One piece, compression molded sealing ring with PVC coated steel pressure disks, stainless steel sealing screws and zinc plated cast malleable iron locking collar.
- C. Expansion fittings: Multi-piece unit comprised of a hot dip galvanized malleable iron or steel body and outside pressure bussing designed to allow a maximum of 4" conduit movement (2" in either direction). Furnish with external braid tinned copper bonding jumper. Unit shall be UL listed for wet or dry locations.

- D. Expansion/deflection couplings: Multi-piece unit comprised of a neoprene sleeve with internal flexible tinned copper braid attached to bronze end couplings with stainless steel bands. Coupling shall accommodate .75-inch deflection, expansion or contraction in any direction and allow 30-degree angular deflections. Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber jacket and stainless steel jacket clamps. Unit shall comply with UL467 and UL514. Manufacturer shall be OZ/Gedney Type DX, Steel City Type EDF or equal.
- E. Fire rated penetration seals:
 - 1. UL building materials directory classified.
 - 2. Conduit penetrations in fire rated separation shall be sealed with a UL classified fill, void or cavity material.
 - 3. The fire rated sealant material shall be the product best suited for each type of penetration and may be a caulk, putty, composite sheet or wrap/strip.
- F. Standard products not herein specified:
 - 1. Provide listing of standard electrical conduit hardware and fittings not herein specified for approval prior to use or installation, i.e. locknuts, bushings, etc.
 - 2. Listing shall include Manufacturers name, part numbers and a written description of the item indicating type of material and construction.
 - 3. Miscellaneous components shall be equal in quality, material and construction to similar items herein specified.
- G. Hazardous area fittings: UL listed for the application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of conduit system installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 APPLICATION

- A. Galvanized rigid steel conduit (GRS) shall be used in the following applications:
 - 1. For feeders and branch circuits located indoors, concealed or exposed above suspended ceilings, in damp/wet locations, in crawl spaces, in attics, chases, furred spaces, equipment rooms, loading docks or in hazardous locations in accordance with NEC and local Codes.
 - 2. For feeders and branch circuits concealed in concrete floors and walls when not in contact with earth.

- B. PVC insulated galvanized rigid steel conduit shall be used in the following applications:
 - 1. Use 40-mil coating for feeders and branch circuits in damp or wet locations.
 - 2. Use 20 or 40 mil for feeders and branch circuits concealed in concrete walls or slabs in contact with earth.
 - 3. Use 20 or 40-mil for runs beneath floor slabs on grade.
 - 4. Use 40-mil for all below grade penetrations through floor slabs on grade or exterior walls.
- C. Electrical metallic tubing (EMT): Shall be used exposed or concealed for interior electrical feeders 4" and smaller, interior power and lighting branch circuits and low tension distribution system where run above suspended ceilings, in concrete slabs and walls not in contact with earth; in stud walls, furred spaces and crawl spaces. EMT shall not be installed exposed below 6 feet above the finish floor except within electrical, communication or signal rooms or closets.
- D. Rigid non-metallic conduit (PVC): Shall be used in the following applications:
 - 1. Schedule 40 or 80 for exterior branch circuits directly buried in earth, 24" minimum below grade.
 - 2. PVC elbows shall be radius sweep type schedule 40 for bends 45° or less and large radius sweep type schedule 80 for bends 46° or greater.
 - 3. In general, PVC may not be run exposed in concrete walls or in floor slabs unless expressly indicated on the Drawings.
- E. Flexible metallic conduit (FMC): Shall be used only in dry locations for connections from an adjacent outlet box or conduit to all motors, transformers, vibrating equipment or machinery, controllers, solenoid valves, float and flow switches or similar devices and to lighting fixtures installed in suspended ceilings, minimum sizes shall be 3/8" for lighting fixtures and control wiring and 1/2" for motor and transformer connections. U.O.N.
- F. Liquidtight flexible metallic conduit (LFMC): Shall be used in wet or damp locations for connections from adjacent outlet box or conduit to all motors, transformers, vibrating equipment or machinery, controllers, solenoid valves, float and flow switches or similar devices. These areas are typically food preparation and dishwashing areas, sump wells, loading docks, pump rooms, exterior areas, etc. Minimum sizes shall be 1/2".

3.3 PREPARATION

- A. Locations of conduit runs shall be planned in advance of the installation and coordinated with ductwork, plumbing, ceiling and wall construction in the same areas and shall not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.
- B. Where practical, install conduits in groups in parallel vertical or horizontal runs and at elevations that avoid unnecessary offsets.

- C. All conduits shall be run parallel or at right angles to the centerlines of columns and beams, whether routed exposed, concealed above suspended ceiling or in concrete slabs.
- D. Conduits shall not be placed closer than 12 inches to a flue, parallel hot water, steam line or other heat producing source or three inches from such lines when crossing perpendicular to the runs.
- E. Exposed conduit installation shall not encroach into the ceiling height headroom of walkways or doorways. Where possible, install horizontal raceway runs above water and below steam piping.
- F. The largest trade size conduits in concrete floor and wall slabs shall not exceed 1/3 the floor or wall thickness and conduits shall be spaced a minimum of three conduit diameters apart unless otherwise noted on the Drawings. All conduits shall be installed in the center of concrete slabs or wall and shall not be placed between reinforcing steel and the bottom of floor slabs.
- G. In long runs of conduit, provide sufficient pull boxes inside buildings to facilitate pulling wires and cables, with spacing not to exceed 150 feet. Support pull boxes from structure independent of conduit supports. These pull boxes are not indicated on the Drawings.
- H. Provide all reasonably inferred standard conduits fitting and products required to complete conduit installation to meet the intended application whether noted, indicated or specified in the Contract Documents or not.
- I. Connect recessed lighting fixtures to conduit runs with maximum six feet of flexible metal conduit or MC cable extending from a junction box to the fixture or manufactured wiring system.

3.4 INSTALLATION

- A. Install conduit in accordance with Manufacturer's written instructions, as indicated on Drawings and as specified herein.
- B. Minimum Conduit Size: Unless otherwise noted herein or on Drawings, minimum conduit size shall be 1/2" for interior applications and 3/4" for exterior and underground applications.
- C. All conduit sizes indicated on the Drawings are sized for copper conductors with THHN/THWN insulation. If conductor type or size is changed the Contractor shall be responsible for resizing conduits upward to meet Code.
- D. In general, all conduit work shall be concealed where possible. Exceptions shall be electrical, communication and mechanical rooms, exposed ceiling areas, and parking garages.
- E. Conduit connections to motors and surface cabinets shall be concealed, with the exception of electrical, communication and mechanical rooms, or unless exposed Work is clearly called for on the Drawings.
- F. Install conduits in complete runs before pulling in cables or wires.

- G. Install conduit free from dents, bruises or deformations. Remove and replace any damaged conduits with new undamaged material.
- H. Conduits shall be well protected and tightly covered during construction using metallic bushings and bushing "pennies" to seal open ends.
- I. In making joints in rigid steel conduit, ream conduit smooth after cutting and threading. Coat all field-threaded joints with UL approved conductive type compound to ensure low resistance ground continuity through conduit and to prevent seizing and corrosion.
- J. Clean any conduit in which moisture or any foreign matter has collected before pulling in conductors. Paint all field-threaded joints to prevent corrosion.
- K. In all empty conduits or ducts, install a "True Tape" conduit measuring tape line to provide overall conduit length for determining length of cables/conductors for future use.
- L. Conduit systems shall be mechanically and electrically continuous throughout. Install code size, insulated, copper, green-grounding conductors in all conduit runs for branch circuits and feeders. This conductor is not indicated on the Drawings. Refer to Section 260526: Grounding and Bonding.
- M. Metallic conduit shall not be in contact with other dissimilar metal pipes (i.e. plumbing).
- N. Make bends with standard conduit bending hand tool or machines. The use of any item not specifically designed for the bending of electrical conduit is strictly prohibited.
- O. A run of conduit between terminations at wire pulling points shall not contain more than the equivalent of four quarter bends (360 degrees, total).
- P. Emergency power raceway system: Install entirely independent of other raceway systems, except where specifically allowed by NEC Article 517.
- Q. Conduit for conductors above 600 volts use rigid steel.

3.5 PENETRATIONS

- A. Cutting or holes:
 - 1. Cut holes through concrete, masonry block or brick floors and floors of structure with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted by the Architect as required by limited working space. Obtain the approval of the Architect prior to drilling through structural sections.
 - 2. Cut holes for conduit penetrations through non-concrete and non-masonry walls, partitions or floors with a hole saw. The hole shall be only as large as required to accommodate the size of the conduit.
 - 3. Provide single piece escutcheon plates around all exposed conduit penetrations in public places.

- B. Sealing:
 - 1. Non-rated penetrations: Pack opening around conduits with non-flammable insulating material and seal with gypsum wallboard taping compound.
 - 2. Fire stop: Where conduits, wireways and other electrical raceways pass through fire rated partitions, walls, smoke partitions or floor; install a UL classified fire stop material to provide an effective barrier against the spread of fire, smoke and gases. Completely fill and seal clearances between raceways and openings with the fire stop material.
- C. Waterproofing: At floor, exterior wall and roof conduit penetrations, completely seal clearances around the conduit and make watertight as specified in Division 07: Sealants and Caulking.
 - 1. Install specified watertight conduit entrance seals at all below grade wall and floor penetrations. Conduits penetrating exterior building walls and building floor slab shall be PVC coated rigid galvanized steel.
 - 2. For roof penetrations furnish and install roof flashing, counter flashing and pitch-pockets as specified under Roofing and Sheet Metal Sections of the Specifications.
 - 3. Provide membrane clamps and cable sealing fittings for any conduit that horizontally penetrates the waterproof membrane.
 - 4. Conduits that horizontally penetrate a waterproof membrane shall fall away from and below the penetration on the exterior side a minimum of two times the conduit diameters.

3.6 TERMINATIONS AND JOINTS

- A. Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings except as otherwise indicated.
- B. Raceways shall be joined using specified couplings or transition couplings where dissimilar raceway systems are joined.
- C. Conduits shall be securely fastened to cabinets, boxes and gutters using two locknuts and an insulating bushing or specified insulated connectors. Where joints cannot be made tight, use bonding jumpers to provide electrical continuity of the raceway system. Where terminations are subject to vibration, use bonding bushings or wedges to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors. Install grounding bushings or bonding jumpers on all conduits terminating at concentric or eccentric knockouts.
- D. Conduit terminations exposed at weatherproof enclosures and cast outlet boxes shall be made watertight using specified connectors and hubs.
- E. Stub-up connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit

may be used 6 inches above the floor. Where equipment connections are not made under this contract, install screwdriver operated threaded flush plugs with floor.

- F. Install specified cable sealing bushings on all conduits originating outside the building walls and terminating in switchgear, cabinets or gutters inside the building. Install cable sealing bushings or raceway seal for conduit terminations in all grade level or below grade exterior pull, junction or outlet boxes.
- G. Install expansion couplings where any conduit crosses a building separation or expansion joint as follows:
 - 1. Conduits three inches and larger, shall be rigidly secured to the building structure on opposite sides of a building expansion joint and provided with expansion or deflection couplings. Install the couplings in accordance with the Manufacturer's recommendations.
 - 2. Conduits smaller than three inches shall be rigidly secured to the building structure on opposite sides of a building expansion joint with junction boxes on both sides of the joint. Connect conduits to junction boxes with 15 inches of slack flexible conduit. Flexible conduit shall have a copper green ground-bonding jumper installed. For concrete embedded conduit, use expansion and deflection couplings as specified above for three inches and larger conduits.
- H. Use short length (maximum of 6ft) of the appropriate FMC or LFMC conduit for connections to motors and other electrical equipment subject to movement, vibration, misalignment, cramped quarters or noise transmission. Provide liquidtight flexible metal conduit for installation in exterior locations, moisture or humidity-laden atmosphere, corrosive atmosphere, water hose or spray wash-down operations and locations subject to seepage or dripping of oil, grease or water. Provide a green ground wire with FMC or LFMC conduit.

3.7 SUPPORTS

- A. Provide supports for raceways as specified in Section 260529: Electrical Hangers and Supports.
- B. All raceways systems shall be secured to building structures using specified fasteners, clamps and hangers spaced according to the NEC.
- C. Support single runs of conduit using one-hole pipe straps. Where run horizontally on walls in damp or wet locations, install "clamp backs" to space conduit off the surface.
- D. Multiple conduit runs shall be supported using "trapeze" hangers fabricated from specified construction channel, mounted to 3/8-inch diameter, threaded steel rods secured to building structures. Fasten conduit to construction channel with standard one-hole pipe clamps or the equivalent. Provide lateral seismic bracing for hangers.
- E. Individual 1/2" and 3/4" conduits installed above suspended ceilings may be attached to the ceiling's hanger wire using spring steel support clips provided that not more than two conduits are attached to any single support wire.
- F. Support exposed vertical conduit runs at each floor level, independent of cabinets or switches to which they run, by means of acceptable supports.

- G. Fasteners and supports in solid masonry and concrete:
 - 1. Use steel or malleable iron concrete inserts set in place prior to placing the concrete.
 - 2. After concrete installation:
 - a. Steel expansion anchors not less than $\frac{1}{4}$ inch bolt size and not less than 1-1/8 inch embedment.
 - b. Power set fasteners not less than $\frac{1}{4}$ inch diameter with depth of penetration not less than three inches.
 - c. Use vibration and shock resistant anchors and fasteners for attaching to concrete ceilings.
- H. Hollow masonry: Toggle bolts are permitted. Bolts supported only by masonry block are not acceptable.
- I. Metal structures: Use machine screw fasteners or other devices specifically designed and approved for the application.

END OF SECTION 260531

SECTION 260533 - BOXES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
 - 1. Wall and ceiling outlet boxes.
 - 2. Pull and junction boxes.
- B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.
 - 1. Division 08: Access doors. Wall and ceiling access doors.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified.
 - 1. American National Standards Institute/National Electrical Manufacturer Association:
 - ANSI/NEMA OS-1; Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.
 - ANSI/NEMA OS-2; Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
 - NEMA 250; Enclosures for Electrical Equipment (1000 volts maximum).
 - 2. Underwriters Laboratories (UL):
 - UL 50; Enclosures for Electrical Equipment.
 - UL 514A; Metallic Outlet Boxes.
 - UL 1773; Termination Boxes.

1.3 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:

1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
3. Submit Manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
 1. Outlet and junction boxes:
 - a. Spring City Electrical Manufacturing Co.
 - b. Thomas & Betts Corp.
 - c. Raco, Inc.
 2. Cast boxes:
 - a. Appleton Electric Co.
 - b. Crouse-Hinds.
 3. Pullboxes:
 - a. Circle AW Products.
 - b. Hoffman Engineering Co.
 4. Precast concrete boxes:
 - a. Christy Concrete Products, Inc.
 - b. Brooks Products, Inc.

c. Forni Corp.

- B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 OUTLET BOXES

A. Standard outlet box:

1. Provide galvanized, one-piece die formed or drawn steel, knockout type box of size and configuration best suited to the application indicated on the Drawings.
2. 4-inch square by 1-1/2 inch deep shall be minimum box size.
3. ANSI/NEMA OS 1.

B. Concrete box:

1. Provide galvanized steel, 4-inch octagon rings with mounting lugs, backplate and adapter ring as required.
2. Select height as necessary to position knockouts above concrete reinforcing steel.
3. ANSI/NEMA OS 1.

C. Tile box:

1. Provide outlet boxes for installation in tile or concrete block walls.
2. Standard outlet boxes with raised, square corners and device covers are acceptable.
3. ANSI/NEMA OS 1.

D. Cast metal outlet body:

1. Provide four inch round, galvanized cast iron alloy with threaded hubs and mounting lugs as required.
2. Provide boxes with cast cover plates of the same material as the box and neoprene cover gaskets.

- E. Conduit outlet body: Provide Cadmium plated cast iron alloy, oblong conduit outlet bodies with threaded conduit hubs and neoprene gasket, cast iron covers.

2.3 PULL AND JUNCTION BOXES

A. Sheet metal pull and junction box:

1. Provide standard outlet or concrete ring boxes wherever possible; otherwise use minimum 16 gauge galvanized sheet metal, NEMA 1 boxes, sized to Code requirements with covers secured by cadmium plated machine screws located 6 inches on centers.

2. ANSI/NEMA OS 1.

- B. Cast metal pull and junction box: Provide standard cast malleable iron outlet or device boxes wherever possible; otherwise use cadmium plated, cast malleable iron boxes with bolt-on, interchangeable conduit hub plates with neoprene gaskets.
- C. Flush mounted pullboxes and junction boxes: Provide overlapping covers with flush head cover retaining screws, prime coated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of box installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

- A. Install all outlet boxes flush with building walls, ceilings and floors except where boxes are installed in mechanical and electrical rooms, in cabinetry, above accessible ceilings or where exposed Work is called for on the Drawings.
- B. Locate pullboxes and junction boxes in concealed locations above removable ceilings or exposed in electrical rooms, utility rooms or storage areas.
- C. Install outlet boxes at the locations and elevations indicated on the Drawings or specified herein. Make adjustments to locations as required by structural conditions and to suit coordination requirements of other trades.
- D. Locate switch outlet boxes on the latch side of doorways unless otherwise indicated.
- E. Locate outlet boxes above hung ceilings having concealed suspension systems, adjacent to openings for removable recessed lighting fixtures.
- F. Do not install outlet boxes back-to-back, separate boxes by at least 6". In fire rated walls separate boxes by at least 24" and wall stud.
- G. Adjust position of outlet boxes in finished masonry walls to suit masonry course lines. Coordinate cutting of masonry walls to achieve neat openings for boxes.

3.3 INSTALLATION

- A. Install boxes in accordance with Manufacturer's written instructions, as indicated on Drawings and as specified herein.
- B. Locate electrical boxes as indicated on Drawings and as required for splices, taps, wire pulling, equipment connections and Code compliance.

- C. Install junction or pullboxes where required to limit bends in conduit runs to not more than 360 degrees or where pulling tension achieved would exceed the maximum allowable for the cable to be installed. Note that these boxes are not indicated on the Drawings.
- D. Install raised covers (plaster rings) on all outlet boxes in stud walls or in furred, suspended or exposed concrete ceilings. Covers shall be of a depth to suit the wall or ceiling finish.
- E. Leave no unused openings in any box. Install close-up plugs as required to seal openings.
- F. Provide cast metal boxes with gasketed cast metal cover plates where boxes are exposed in damp or wet locations.
- G. Provide precast concrete boxes in exterior planting areas, walkways, roads etc.
- H. Provide an access panel in permanent ceiling or wall where boxes are installed and will be inaccessible.
- I. For boxes mounted in exterior walls, make sure that there is insulation behind outlet boxes to prevent condensation in boxes.
- J. For outlets mounted above counters, benches or backsplashes, coordinate location and mounting heights with built-in units. Adjust mounting height to agree with required location for equipment served.
- K. Use conduit outlet bodies to facilitate pulling of conductors or to make changes in conduit direction only. Do not make splices in conduit outlet bodies.
- L. Add additional sheet rock as necessary to maintain original fire rating of walls where boxes are installed.
- M. Install galvanized steel coverplates on boxes in unfinished areas, above accessible ceilings and on surface mounted outlets.

3.4 SUPPORTS

- A. Provide boxes installed in metal stud walls with brackets designed for attaching directly to the studs or mount boxes on specified box supports.
- B. Mount boxes, installed in suspended ceilings of gypsum board or lath and plaster construction, to 16 gauge metal channel bars attached to main ceiling runners.
- C. Support boxes independently of conduit system.
- D. Support boxes, installed in suspended ceilings supporting acoustical tiles or panels, directly from the structure above wherever pendant mounted lighting fixtures are to be installed from the box.
- E. Support boxes, mounted above suspended acoustical tile ceilings, directly from the structure above.

END OF SECTION 260533

SECTION 26 0543 - UNDERGROUND DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct banks, and in single duct runs.
 - 2. Handholes and pull boxes.
 - 3. Manholes.
- B. Construct in accordance with Organization and Trade Standards of the authority having jurisdiction and in the presence of a representative of that agency.

1.3 REFERENCES

- A. Organization and Trade Standards
 - 1. State of California, Department of Transportation (CalTrans), Standard Specifications as adopted by local jurisdictional authority, latest edition, including amendments.
 - 2. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones" current edition.
 - 3. Local jurisdictional and agency engineering and public works regulations and standards.
 - 4. Conform to all requirements of Pacific Gas and Electric Company construction specifications, latest edition with amendments. **PG&E requirements shall govern over all other specifications for installation of public electric facilities.**
 - 5. **Conform to all requirements of AT&T requirements for telecommunications facilities. AT&T requirements shall govern over all other specifications for installation of public telephone facilities.**

1.4 DEFINITION

- A. RNC: Rigid nonmetallic conduit.

1.5 SUBMITTALS

- A. Product Data: For the following:

1. Duct-bank materials, including separators and miscellaneous components.
2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Accessories for manholes, handholes, pull boxes, and other utility structures.
4. Warning tape.
5. Warning planks.

- B. Shop Drawings for Precast or Factory-Fabricated Underground Utility Structures: Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Reinforcement details.
3. Frame and cover design and manhole frame support rings.
4. Ladder Step details.
5. Grounding details.
6. Dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
7. Joint details.

- C. Shop Drawings for Factory-Fabricated Handholes and Pull Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Cover design.
3. Grounding details.
4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

- D. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
2. Drawings shall be signed and sealed by a qualified professional engineer.

- E. Product Certificates: For concrete and steel used in precast concrete manholes , pull boxes and handholes, comply with ASTM C 858.

- F. Qualification Data: For qualified professional engineer and testing agency.

- G. Source quality-control reports.

- H. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Comply with IEEE C2.
- B. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.
- B. Store precast concrete and other factory-fabricated underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.
- C. Lift and support precast concrete units only at designated lifting or supporting points.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Construction Manager's written permission.

1.9 COORDINATION

- A. Coordinate layout and installation of ducts, manholes, handholes, and pull boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.
- B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and pull boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to 5 percent of quantity of each item installed.

PART 2 - PRODUCTS

2.1 CONDUIT

- A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.
- B. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. AFC Cable Systems.
 - 2. ARNCO Corporation.
 - 3. Beck Manufacturing.
 - 4. Cantex, Inc.
 - 5. CertainTeed Corp.
 - 6. Condux International, Inc.
 - 7. DCX-CHOL Enterprises, Inc.; ELECSYS Division.
 - 8. Electri-Flex Company.
 - 9. IPEX Inc.
 - 10. Lamson & Sessions; Carlon Electrical Products.
 - 11. Manhattan Wire Products; a Belden company.
- C. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type EB-20-PVC, ASTM F 512, UL 651A, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.
- D. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type DB-60-PVC and Type DB-120-PVC, ASTM F 512, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.
- E. Duct Accessories:
 - 1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and retained to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
 - 2. Warning Tape: Underground-line warning tape specified in Division 26 Section "Identification for Electrical Systems."
 - 3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000-psi concrete.
 - a. Color: Red dye added to concrete during batching.
 - b. Mark each plank with "ELECTRIC" in 2-inch- high, 3/8-inch- deep letters.

2.3 PRECAST CONCRETE HANDHOLES AND PULL BOXES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Christy Concrete Products.
 2. Cretex Concrete Products West, Inc.; Riverton Division.
 3. Elmhurst-Chicago Stone Co.
 4. Oldcastle Precast Group.
 5. Oldcastle Precast Inc.; Utility Vault Division.
 6. Utility Concrete Products, LLC.
 7. Wausau Tile Inc.
- B. Comply with ASTM C 858 for design and manufacturing processes.
- C. Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A153 and ASTM A123.
- D. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or pull box.
1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing stainless-steel bolts.
 2. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing stainless-steel bolts.
 3. Frame and Cover: Weatherproof steel frame, with hinged steel access door assembly with tamper-resistant, captive, cover-securing stainless-steel bolts.
 - a. Cover Hinges: Concealed, with hold-open ratchet assembly.
 - b. Cover Handle: Recessed.
 4. Frame and Cover: Weatherproof aluminum frame with hinged aluminum access door assembly with tamper-resistant, captive, cover-securing stainless-steel bolts.
 - a. Cover Hinges: Concealed, with hold-open ratchet assembly.
 - b. Cover Handle: Recessed.
 5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 6. Cover Legend: Molded lettering, "ELECTRIC." "TELEPHONE." As indicated for each service.
 7. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
 8. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
 - a. Extension shall provide increased depth of 6 inches.
 - b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
 9. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches vertically and horizontally to accommodate alignment variations.

- a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
 - b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
 - c. Window openings shall be framed with at least two additional No. 4 steel reinforcing bars in concrete around each opening.
10. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
- a. Type and size shall match fittings to duct or conduit to be terminated.
 - b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.
11. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.4 HANDHOLES AND PULL BOXES OTHER THAN PRECAST CONCRETE

A. Description: Comply with SCTE 77.

1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering,
 - a. "ELECTRIC." "TELEPHONE." As indicated for each service..
 - b. Tier level number, indicating that the unit complies with the structural load test for that tier according to SCTE 77.
6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, retained to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
7. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Polymer Concrete Handholes and Pull Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two. Handholes and pull boxes shall comply with the requirements of SCTE 7 Tier 5 loading in landscape areas and H20 loading in vehicle traffic areas

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

- a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. CDR Systems Corporation.
 - d. Hubbell Power Systems; Lenoir City Division.
 - e. NewBasis.
 - f. Jensen precast
- C. Fiberglass Handholes and Pull Boxes with Polymer Concrete Frame and Cover: Complying with SCTE 77 Tier 5 loading. Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. Christy Concrete Products.
 - d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast.
 - e. .
- D. Fiberglass Handholes and Pull Boxes: Molded of fiberglass-reinforced polyester resin, with covers of polymer concrete, complying with SCTE 77 Tier 5 loading.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Carson Industries LLC.
 - b. Christy Concrete Products.
 - c. Nordic Fiberglass, Inc.
- E. High-Density Plastic Pull Boxes: Injection molded of high-density polyethylene or copolymer-polypropylene, complying with SCTE 77 Tier 5 loading. Cover shall be polymer concrete.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Carson Industries LLC.
 - b. Nordic Fiberglass, Inc.
 - c. Pencil Plastics.

2.5 PRECAST MANHOLES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Christy Concrete Products.
2. Cretex Concrete Products West, Inc.; Riverton Division.
3. Elmhurst-Chicago Stone Co.
4. Oldcastle Precast Group.
5. Oldcastle Precast Inc.; Utility Vault Division.
6. Utility Concrete Products, LLC.
7. Wausau Tile Inc.
8. Jensen Precast.

B. Comply with ASTM C 858, with structural design loading as specified in "Underground Enclosure Application" Article, and with interlocking mating sections, complete with accessories, hardware, and features.

1. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches vertically and horizontally to accommodate alignment variations.
 - a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls.
 - b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
 - c. Window openings shall be framed with at least two additional No. 4 steel reinforcing bars in concrete around each opening.
2. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
 - a. Type and size shall match fittings to duct or conduit to be terminated.
 - b. Fittings shall align with elevations of approaching ducts and be located near interior corners of manholes to facilitate racking of cable.

C. Concrete Knockout Panels: 1-1/2 to 2 inches thick, for future conduit entrance and sleeve for ground rod.

D. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

2.6 CAST-IN-PLACE MANHOLES

A. Description: Underground utility structures, constructed in place, complete with accessories, hardware, and features. Include concrete knockout panels for conduit entrance and sleeve for ground rod.

B. Materials: Comply with ASTM C 858 and with Division 03 Section "Cast-in-Place Concrete."

1. Concrete shall have a minimum compressive strength of 3000 psi.

C. Structural Design Loading: As specified in "Underground Enclosure Application" Article.

2.7 UTILITY STRUCTURE ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Bilco Company (The).
 2. Campbell Foundry Company.
 3. Christy Concrete Products.
 4. Cretex Concrete Products West, Inc.; Riverton Division.
 5. East Jordan Iron Works.
 6. Elmhurst-Chicago Stone Co.
 7. Hubbell Power Systems; Lenoir City Division.
 8. McKinley Iron Works.
 9. Neenah Foundry Company.
 10. NewBasis.
 11. Oldcastle Precast Group.
 12. Oldcastle Precast Inc.; Utility Vault Division.
 13. Osburn Associates, Inc.
 14. Pennsylvania Insert Corporation.
 15. Underground Devices, Inc.
 16. Utility Concrete Products, LLC.
 17. Wausau Tile Inc.
 18. Jensen precast.
- B. Ferrous metal hardware, where indicated, shall be hot-dip galvanized complying with ASTM A 153 and A 123.
- C. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.
1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A 48/A 48M, Class 30B with milled cover-to-frame bearing surfaces; diameter, 26 inches.
 - a. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 - b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.
 2. Cover Legend: Cast in. Retained to suit system.
 - a. Legend: "ELECTRIC-LV" for duct systems with power wires and cables for systems operating at 600 V and less.
 - b. Legend: "ELECTRIC-HV" for duct systems with medium-voltage cables.
 - c. Legend: "SIGNAL" for communications, data, and telephone duct systems.
 3. Manhole Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.
 - a. Mortar for Chimney Ring and Frame and Cover Joints: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. where packaged mix complying with ASTM C 387/C 387M, Type M, may be used.
- D. Manhole Sump Frame and Grate: ASTM A 48/A 48M, Class 30B, gray cast iron.

- E. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch- diameter eye, and 1-by-4-inch bolt.
 - 1. Working Load Embedded in 6-Inch, 4000-psi Concrete: 13,000-lbf minimum tension.
- F. Pulling Eyes in Nonconcrete Walls: Eyebolt with reinforced fastening, 1-1/4-inch- diameter eye, rated 2500-lbf minimum tension.
- G. Pulling-In and Lifting Irons in Concrete Floors: 7/8-inch- diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.
 - 1. Ultimate Yield Strength: 40,000-lbf shear and 60,000-lbf tension.
- H. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch ID by 2-3/4 inches deep, flared to 1-1/4 inches minimum at base.
 - 1. Tested Ultimate Pullout Strength: 12,000 lbf minimum.
- I. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch bolt, 5300-lbf rated pullout strength, and minimum 6800-lbf rated shear strength.
- J. Cable Rack Assembly: Steel, hot-dip galvanized except insulators.
 - 1. Stanchions: T-section or channel; 2-1/4-inch nominal size; punched with 14 holes on 1-1/2-inch centers for cable-arm attachment.
 - 2. Arms: 1-1/2 inches wide, lengths ranging from 3 inches with 450-lb minimum capacity to 18 inches with 250-lb minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.
 - 3. Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.
- K. Cable Rack Assembly: Nonmetallic. Components fabricated from nonconductive, fiberglass-reinforced polymer.
 - 1. Stanchions: Nominal 36 inches high by 4 inches wide, with minimum of 9 holes for arm attachment.
 - 2. Arms: Arranged for secure, drop-in attachment in horizontal position at any location on cable stanchions, and capable of being locked in position. Arms shall be available in lengths ranging from 3 inches with 450-lb minimum capacity to 20 inches with 250-lb minimum capacity. Top of arm shall be nominally 4 inches wide, and arm shall have slots along full length for cable ties.
- L. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.
- M. Fixed Manhole Ladders: Arranged for attachment to wall of manhole. Ladder and mounting brackets and braces shall be fabricated from hot-dip galvanized steel.

2.8 SOURCE QUALITY CONTROL

- A. Test and inspect precast concrete utility structures according to ASTM C 1037.
- B. Nonconcrete Handhole and Pull Box Prototype Test: Test prototypes of manholes and pull boxes for compliance with SCTE 77. Strength tests shall be for specified Tier ratings of products supplied.
 - 1. Testing Agency: Engage a qualified testing agency to evaluate nonconcrete handholes and pull boxes.
 - 2. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 CORROSION PROTECTION

- A. Aluminum shall not be installed in contact with earth or concrete.

3.2 UNDERGROUND DUCT APPLICATION

- A. Ducts for Electrical Cables over 600 V: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.
- B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.
- C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.
- D. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.
- E. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, installed in direct-buried duct bank unless otherwise indicated.
- F. Underground Ducts for Telephone, Communications, or Data Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.
- G. Underground Ducts for Telephone, Communications, or Data Circuits: RNC, NEMA Type EB-20-PVC, in concrete-encased duct bank unless otherwise indicated.

3.3 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Pull Boxes for 600 V and Less, Including Telephone, Communications, and Data Wiring:
 - 1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. H-20 structural load rating.

2. Units Subject to Light-Duty Pedestrian Traffic Only: High-density plastic, structurally tested according to SCTE 77 with 3000-lbf "Light-Duty" vertical loading.

B. Manholes: Precast or cast-in-place concrete.

1. Units Located in Roadways and Other Deliberate Traffic Paths by Heavy or Medium Vehicles: H-20 structural load rating.
2. Units Not Located in Deliberate Traffic Paths by Heavy or Medium Vehicles: H-10 load rating.

3.4 EARTHWORK

- A. Excavation and Backfill: Comply with Division 31 Section "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restore surface features at areas disturbed by excavation and reestablish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Division 32 Sections "Turf and Grasses" and "Plants."
- D. Cut and patch existing pavement in the path of underground ducts and utility structures according to Division 01 Section "Cutting and Patching."

3.5 DUCT INSTALLATION

- A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.
- B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 12.5 ft. 25 ft., both horizontally and vertically, at other locations unless otherwise indicated.
- C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- D. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.
 1. Begin change from regular spacing to end-bell spacing 10 ft. from the end bell without reducing duct line slope and without forming a trap in the line.
 2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole.
 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- E. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 ft. outside the building wall without reducing duct line slope away from the building and

without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Division 26 Section "Common Work Results for Electrical."

- F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- G. Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.
- H. Concrete-Encased Ducts: Support ducts on duct separators.
 - 1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 ft. of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 - 2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
 - a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
 - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope.
 - 3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
 - 4. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
 - 5. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
 - 6. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.
 - 7. Depth: Install top of duct bank at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
 - 8. Stub-Ups: Use manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor unless otherwise indicated. Extend concrete encasement throughout the length of the elbow.
 - 9. Stub-Ups: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.

- b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.
 10. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.
- I. Direct-Buried Duct Banks:
1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
 2. Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 ft. of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
 3. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Division 31 Section "Earth Moving" for pipes less than 6 inches in nominal diameter.
 4. Install backfill as specified in Division 31 Section "Earth Moving."
 5. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
 6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
 7. Depth: Install top of duct bank at least 36 inches below finished grade unless otherwise indicated.
 8. Set elevation of bottom of duct bank below the frost line.
 9. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
 10. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
 - b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
 11. Warning Planks: Bury warning planks approximately 12 inches above direct-buried ducts and duct banks, placing them 24 inches o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional planks 12 inches apart, horizontally.

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND PULL BOXES

A. Cast-in-Place Manhole Installation:

1. Finish interior surfaces with a smooth-troweled finish.
2. Windows for Future Duct Connections: Form and pour concrete knockout panels 1-1/2- to 2- inches- thick, arranged as indicated.
3. Cast-in-place concrete, formwork, and reinforcement are specified in Division 03 Section "Cast-in-Place Concrete."

B. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevations:

1. Manhole Roof: Install with rooftop at least 15 inches below finished grade.
2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch above finished grade.
3. Install handholes with bottom below the frost line, Insert depth of frost line below grade at Project site below grade.
4. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
5. Where indicated, cast handhole cover frame integrally with handhole structure.

D. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

E. Manhole Access: Circular opening in manhole roof; sized to match cover size.

1. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
2. Install chimney, constructed of precast concrete collars and rings to support frame and cover and to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for cast-iron frame to chimney.

F. Waterproofing: Apply waterproofing to exterior surfaces of manholes after concrete has cured at least three days. Waterproofing materials and installation are specified in Division 07 Section "Elastomeric Sheet Waterproofing." After ducts have been connected and grouted, and before backfilling, waterproof joints and connections and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.

G. Dampproofing: Apply dampproofing to exterior surfaces of manholes after concrete has cured at least three days. Dampproofing materials and installation are specified in Division 07 Section "Bituminous Dampproofing." After ducts have been connected and grouted, and before backfilling, dampproof joints and connections and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.

- H. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms, as required for installation and support of cables and conductors and as indicated.
- I. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.
- J. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches for manholes and 2 inches for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.
- K. Warning Sign: Install "Confined Space Hazard" warning sign on the inside surface of each manhole cover.

3.7 INSTALLATION OF HANDHOLES AND PULL BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and pull boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use pull box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.
- B. Unless otherwise indicated, support units on a level 6-inch- thick bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: Set so cover surface will be flush with finished grade.
- D. Install handholes and pull boxes with bottom below the frost line, 18" below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Retain arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.
- F. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.8 GROUNDING

- A. Ground underground ducts and utility structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
 - 2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.

3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

C. Prepare test and inspection reports.

3.10 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 26 05 43

SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
 - 1. Electrical equipment nameplates.
 - 2. Panelboard directories.
 - 3. Wire and cable identification.
 - 4. Buried electrical line warnings.
 - 5. Junction box identification.
 - 6. Inscribed device coverplates.
- B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.
 - 1. Division 09: Painting.

1.2 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
 - 1. Data/catalog cuts for each product and component specified herein.
 - 2. Schedules for nameplates to be furnished.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
 - 1. Conduit and wire markers:
 - a. Thomas & Betts Corp.

- b. Brady.
- c. Griffolyn.
- 2. Inscription Tape:
 - a. Kroy.
 - b. Merlin.
- B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 NAMEPLATES

- A. Type NP: Engraved, plastic laminated labels, Signs and Instruction Plates. Engrave stock melamine plastic laminate 1/16-inch minimum thickness for signs up to 20 square inches or 8 inches in length; 1/8 inch thick for larger sizes. Engraved nameplates shall have white letters and be punched for mechanical fasteners.
- B. Color and letter height as specified in Part 3: Execution.

2.3 PANELBOARD DIRECTORIES (400 AMP OR LESS)

- A. Directories: A 6" x 8" minimum size circuit directory frame and card with clear plastic covering shall be provided inside the inner panel door.
- B. Circuit numbering: Starting at the top, odd numbered circuits in sequence down the left hand side and even numbered circuits down the right hand side. Multi-section panelboards shall have continuous consecutive circuit numbers, i.e. Section 1 (circuit numbers 1-42), Section 2 (circuit numbers 43-84), Section 3 (circuit numbers 85-126).

2.4 WIRE AND TERMINAL MARKERS

- A. Provide self-adhering, pre-printed, machine printable or write-on, self-laminating vinyl wrap around strips. Blank markers shall be inscribed using the printer or pen recommended by Manufacturer for this purpose.

2.5 CONDUCTOR PHASE MARKERS

- A. Colored vinyl plastic electrical tape, 3/4" wide, for identification of phase conductors. Scotch 35 Brand Tape or equal.

2.6 UNDERGROUND CONDUIT MARKER

- A. 6-inch wide, yellow polyethylene tape, with continuous black imprinting reading "Caution - Buried Electric Line Below".

2.7 INSCRIBED DEVICE COVERPLATES

- A. Coverplate material shall be as specified in Section 262726: Wiring Devices.
- B. Methods of inscription: (Unless otherwise noted)
 - 1. Type-on-tape:
 - a. Imprinted or thermal transfer characters onto tape lettering system.
 - b. Tape trimmer.
 - c. Matte finish spray-on clear coating.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of identification device installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 NAMEPLATES

- A. Installation:
 - 1. Degrease and clean surfaces to receive nameplates.
 - 2. Install nameplates parallel to equipment lines.
 - 3. Secure nameplates to equipment fronts using machine screws.
- B. Provide type 'NP' color coded nameplates that present, as applicable, the following information:
 - 1. Equipment or device designation:
 - 2. Amperage, KVA or horsepower rating, where applicable.
 - 3. Voltage or signal system name.
 - 4. Source of power or control.
- C. Nameplates for power system distribution equipment and devices are to be black.
- D. Nameplates for signal systems equipment and devices are to be black except as follows:
 - 1. Fire alarm and life safety - Red.
 - 2. Security/card access/CCTV systems - Green.

3. Clock, intercom, sound, MATV, CATV - Blue.

E. Minimum letter height shall be as follows:

1. For panelboards, etc.: ½ inch letters to identify equipment designation. Use ¼ inch letters to identify voltage, phase, wires, etc.
2. For individual circuit breakers, switches and motor starters in switchboards use 3/8-inch letters to identify equipment designation. Use 1/8-inch letters to identify all other.
3. For individual mounted circuit breakers, disconnect switches, enclosed switches and motor starters use 3/8-inch letters to identify equipment designation. Use 1/8" letters to identify all other.
4. For transformers use 1/2 inch letters to identify equipment designation. Use ¼ inch letters to identify primary and secondary voltages, etc.
5. For equipment cabinets, terminal cabinets, control panels and other cabinet enclosed apparatus use 3/8-inch letters to identify equipment designation.

3.3 PANELBOARD DIRECTORIES (400 AMP OR LESS)

- A. Provide typewritten directories arranged in numerical order denoting loads served by room number or area for each circuit.
- B. Verify room numbers or area designation with Project Manager.
- C. Mount panelboard directories in a minimum 6" x 8" metal frame under clear plastic cover inside every panelboard.

3.4 WIRE AND CABLE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboards, pull boxes, outlet and junction boxes and at load connection. Identify with branch circuit or feeder number for power and lighting circuits and with control wire number as indicated on equipment Manufacturer's Shop Drawings for control wiring.
- B. Provide colored phase markers for conductors as noted in Section 260519: Building Wire and Cable. Apply colored, pressure sensitive plastic tape in half-lapped turns for a distance of 3 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Do not cover cable identification markings by taping.

3.5 UNDERGROUND CONDUIT MARKERS

- A. During trench backfilling, for exterior underground power, signal and communications lines, install continuous underground plastic line marker, located directly above line at 6 to 8 inches

below finished grade. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.

3.6 JUNCTION BOX IDENTIFICATION

- A. The cover of junction, pull and connection boxes for both power and signal systems, located above suspended ceilings and below ceilings in non-public areas, shall be clearly marked with a permanent ink felt pen. Identify the circuit(s) (panel designation and circuit numbers) contained in each box, unless otherwise noted or specified.

3.7 INSCRIBED DEVICE COVERPLATE

A. General:

1. Lettering type: Helvetica, 12 point or 1/8" high.
2. Color of characters shall be black.
3. Locate the top of the inscription 1/2" below the top edge of the coverplate.
4. Inscription shall be centered and square with coverplate.

B. Application:

1. Provide inscribed coverplates for devices as outlined below:
 - a. Receptacles.
 - b. Multi-ganged (four or more) switch arrangement.
 - c. Special purpose switches, i.e. projection screens, shades, exhaust fans, etc.
 - d. Telecommunication outlets.
2. Type-on-tape installation:
 - a. Tape shall be trimmed to the height of the letters.
 - b. Trim tape length to 1/4 inch back from each edge of coverplate.
 - c. Contractor hands shall be clean or covered with surgical type glove prior to application of tape. Tape installations with visible fingerprints or smudges will not be acceptable.

END OF SECTION 260553

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
 - 1. Branch circuit panelboards.
- B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified.
 - 1. Federal Specifications (FS):
 - FS W-C-375; Circuit Breakers, Molded Case, Branch Circuit and Service.
 - FS W-P-115; Power Distribution Panel.
 - 2. National Electrical Manufacturers Association (NEMA):
 - NEMA AB 1; Molded Case Circuit Breakers.
 - NEMA PB 1; Panelboards.
 - NEMA PB 1.1; Instructions for safety instruction, operation and maintenance of panelboard rated 600 volts or less.
 - 3. Underwriters Laboratories, Inc. (UL):
 - UL 67; Panelboards.
 - UL 486E; Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors.
 - UL 489; Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
 - UL 870; Wireways, Auxiliary Gutters and Associated Fittings.

1.3 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
 - 1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards
 - 2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 - 3. Shop Drawings: Include elevations, cabinet dimensions, gutter sizes, layout of contactors, relays, time clocks, lug sizes, bussing diagrams; make, location and capacity of installed equipment; mounting style; finish and panelboard nameplate inscription.
 - 4. Furnish structural calculations for equipment anchorage as described in Section 260010: Basic Electrical Requirements.
 - 5. Submit Manufacturer's installation instructions.
 - 6. Complete bill of material listing all components.
 - 7. Warranty.
- B. Dimensions and configurations of panelboards shall conform to the spaces allocated on the Drawings for their installation. The Contractor shall include with the submittal a layout of the electrical room if it differs from construction documents for review and approval by the Engineer prior to release of order.

1.4 OPERATION AND MAINTENANCE MANUAL

- A. Supply operation and maintenance manuals in accordance with the requirements of Section 260010: Basic Electrical Requirements, to include the following:
 - 1. A detailed explanation of the operation of the system.
 - 2. Instructions for routine maintenance.
 - 3. Pictorial parts list and parts number.
 - 4. Telephone numbers for authorized parts and service distributors.
 - 5. Final testing reports.

1.5 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.

- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Panelboard components shall not be delivered to the Project site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipment shall be replaced and returned to Manufacturer at no cost to Owner.
- B. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris and traffic. Provide heat where required to prevent condensation.
- C. Handling: Handle in accordance with NEMA PB1.1 and Manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.7 WARRANTY

- A. Units and components offered under this Section shall be covered by a 1 year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.

1.8 EXTRA MATERIAL

- A. Turn over two (2) sets of panelboard keys to the Owner at completion of Project. All panelboards shall be keyed alike.
- B. Provide one spray can of matching finish paint for touching up damaged surfaces after installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
 - 1. Eaton Electrical/Cutler-Hammer.
 - 2. General Electric.
 - 3. Siemens/I-T-E.
 - 4. Square D.

- B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 PANELBOARDS - GENERAL

A. Enclosure:

1. Cabinets shall be NEMA Type 1 enclosure, door and trim of code gauge galvanized steel.
2. Panelboard covers shall be door-in-door construction such that inner door exposes the overcurrent protective devices and the outer door exposes the complete panelboard interior (i.e. branch circuit conductors, lugs, neutral and ground bus, overcurrent protective devices, etc.). Outer door shall have full-length piano hinge and inner door shall have two-point hinges.
3. Provide combination spring catch and lock on inside edge of the inner door trims with flush fitting joint between door and trim. Locks on all panelboards shall be keyed alike. Doors 36 inches and over in height shall be provided with three-point catch and lock. Provide quarter-turn captive bolts on the outer door.

B. Bus assembly and terminations:

1. Bus shall be bolted copper with taps arranged for distributed phase connections to branch circuit devices
2. Cross connectors shall be copper, drilled and tapped for bolt-on device connections, arranged for double row placement of device and designed to permit removal or addition of overcurrent protection devices without disturbing adjacent devices or removing main bus connections.
3. Neutral bus shall be 100 percent rated of phase bus bars and shall have lugs for each outgoing branch circuit or feeder requiring a neutral connection unless otherwise noted.
4. Ground bus shall be full size with lugs for each outgoing branch circuit and feeder.
5. Refer to panelboard schedules on Drawings for bus rating. Bus rating shall match or be greater than main device or main lug rating.
6. As a minimum, bus bars shall be rated 10,000 AIC for 120/208 volt panelboards, unless otherwise noted.
7. Provide full sized bussing in all sections of multi-section panelboards.
8. No panelboard section shall have greater than 84 poles.
9. Termination Lugs: Rated for use with aluminum/copper conductors.
10. All "SPACES" shall be ready for installation of future overcurrent protective device.

C. Miscellaneous requirements:

1. Circuit numbering: Starting at the top, indicate odd numbered circuits in sequence down the left hand side and even numbered circuits down the right hand side. Multi-section panelboards shall have continuous consecutive circuit numbers, i.e. Section 1 (circuit numbers 1-42), Section 2 (circuit numbers 43-84), Section 3 (circuit numbers 85-126). Provide metal embossed circuit identification of panelboards.
2. Directories: A 6" x 8" minimum size circuit directory frame and card with clear plastic covering shall be provided inside the inner panelboard door to reflect conditions at completion of Work. Directory shall be typewritten denoting loads served by room number or area for each circuit.
3. Nameplates: Provide engraved nameplate for each panelboard. See Section 260533: Electrical Identification for requirements.

D. Refer to Panelboard Schedules for the following:

1. Mounting style; service voltage; terminal lug size, location and quantity; bus ampacity; interrupting capacity of bus and breakers; quantity, poles and rating of overcurrent protective devices.

E. Overcurrent protective devices:

1. Refer to Section 262816: Overcurrent Protection Devices.
2. Overcurrent protective devices shall be molded case circuit breakers.
3. Main devices shall be hard bus connected to the panelboard bus bars.
4. In all cases, panelboards fed directly from a transformer shall have a main overcurrent protective device. If not indicated on the Drawings or Panelboard Schedules, provide this device sized to provide the full capacity of the transformer rating.
5. Main devices shall be vertically mounted and shall have their operating handle in the up position when energized. Main devices that are mounted in the same manner as the branch devices are NOT acceptable; i.e. main devices shall be individually mounted at the top or bottom of the phase bus bars.
6. Panelboards overcurrent protective devices layout shall conform to the layout indicated on the panelboard schedules.
7. Provide handle ties for single pole circuit breakers that share a neutral conductor.

F. Finish: Five step zinc phosphate pre-treatment, one coat of rust inhibiting dichromate primer and one coat of baked-on enamel finish, ANSI 61 (light gray).

2.3 BRANCH CIRCUIT PANELBOARDS

- A. Enclosure shall be 20" wide x 5-3/4" deep, surface or flush mounted and shall comply with NEMA PB 1 and FS W-P-115.

- B. Flush panelboards mounted adjacent to each other shall be same physical size.
- C. Where "SPACE" is indicated on panelboard schedules or Drawings, install minimum 100-ampere branch circuit cross connectors and mounting hardware. For future device spaces larger than 100 amps, cross connectors shall match the frame size ampere rated noted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of panelboard installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 INSTALLATION

- A. Install panelboards in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.
- B. Set panels plumb and symmetrical with building lines in conformance with PB1.1. Furnish and install all construction channel bolts, angles, etc., required to mount the equipment furnished under this Section.
- C. Mounting height shall be 6 feet.
- D. Panelboards shall be anchored and braced to withstand seismic forces as calculated per Section 260010: Basic Electrical Requirements.
- E. Provide mounting hardware brackets, busbar drillings and filler pieces for all unused spaces.
- F. "Train" interior wiring; bundle and clamp, using specified plastic wire wraps specified under Section 260519: Building Wire and Cable.
- G. Replace panel pieces, doors or trim exhibiting dents, bends, warps or poor fit that may impede ready access, security or integrity.
- H. Conduits terminating in concentric, eccentric or oversized knockouts at panelboards shall have ground bushings and bonding jumpers installed interconnecting all such conduits and the panelboard.
- I. Check and tighten all bolts and connections with a torque wrench using Manufacturer's recommended values.
- J. Visually inspect panelboard for rust and corrosion. If signs of rust and corrosion are present, restore or replace panelboard to new condition.
- K. In damp and wet locations, mount panelboards with a minimum one inch of air space between cabinet and the wall or other support material.

- L. Provide close up plugs in all unused openings in the cabinet.
- M. Field install handle ties on single pole circuit breakers that share a neutral conductor.

3.3 FIELD QUALITY CONTROLS

- A. Contractor shall perform all quality control electrical testing, calibration and inspection required herein. Testing objectives shall be to:
 - 1. Assure panelboard installation conforms to specified requirements and operates within specified tolerances.
 - 2. Field test and inspect to ensure operation in accordance with Manufacturer's recommendations and Specifications.
 - 3. Prepare final test report including results, observations, failures, adjustments and remedies.
 - 4. Apply label on panelboards upon satisfactory completion of tests and results.
 - 5. Verify ratings and settings and make final adjustments.
- B. Testing of overcurrent protective devices shall be done only after all devices are installed and system is energized.
- C. Prefunctional testing:
 - 1. Visual and mechanical inspection:
 - a. Inspect for physical damage, defects alignment and fit.
 - b. Perform mechanical operational tests in accordance with Manufacturer's instructions.
 - c. Compare nameplate information and connections to Contract Documents.
 - d. Check tightness of all power connections.
 - e. Check that all covers, barriers and doors are secure.
 - 2. Electrical tests:
 - a. Insulation resistance: 1000 volt DC tests for one minute on all 600 volt and lower rated equipment, components, buses, feeder and branch circuits and control circuits. Test phase-to-phase and phase-to-ground circuits showing less than 10 megohms resistance to ground shall be repaired or replaced.
 - b. Circuit continuity: All feeders shall be tested for continuity. All neutrals shall be tested for improper grounds.
 - c. Ground resistance: Test resistance to ground of system and equipment ground connection.

- d. Test overcurrent protection devices per Section 262816: Overcurrent Protective Devices.
- D. In the event that the system fails to function properly during the testing as a result of inadequate pretesting or preparation. The Contractor shall bear all costs incurred by the necessity for retesting including test equipment, transportation, subsistence and the Engineer's hourly rate.
- E. Contractor shall replace at no costs to the Owner all devices which are found defective or do not operate within factory specified tolerances.
- F. Contractor shall submit the Testing Agency's final report for review prior to Project closeout and final acceptance by the Owner. Test report shall indicate test dates, devices tested, results, observation, deficiencies and remedies. Test report shall be included in the operation and maintenance manuals.

3.4 CLEANING

- A. Prior to energizing of panelboards the Contractor shall thoroughly clean the interior of enclosure of all construction debris, scrap wire, etc. using Manufacturer's approved methods and materials.
- B. Upon completion of Project prior to final acceptance the Contractor shall thoroughly clean both the interior and exterior of panelboards per Manufacturers approved methods and materials. Remove paint splatters and other spots, dirt and debris.
- C. Touch-up paint any marks, blemishes or other finish damage suffered during installation.

END OF SECTION 262416

SECTION 262716 - CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
 - 1. Hinged cover enclosures.
 - 2. Cabinets.
 - 3. Terminal blocks and accessories.
- B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
 - 1. National Electrical Manufacturer's Association (NEMA):
 - NEMA 250; Enclosures for Electrical Equipment.
 - NEMA ICS 1; Industrial Control and Systems.
 - NEMA ICS 4; Terminal Blocks and Industrial use.
 - NEMA ICS 6; Enclosures for Industrial Controls and Systems.
 - 2. Underwriters Laboratories (UL):
 - UL 50; Enclosures for Electrical Equipment.
 - UL 65; Standards for Wired Cabinets.
 - UL 1059; Terminal Blocks.
 - UL 1773; Termination Boxes.

1.3 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
 - 1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
 - 2. Describe Project construction, material, finish and any specific features of each component.
 - 3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 - 4. Submit Manufacturer's installation instructions.
 - 5. Shop Drawings: Indicating wiring diagrams and equipment arrangement within cabinets.
 - 6. Furnish structural calculations for equipment anchorage as described in Section 260010: Basic Electrical Requirements.

1.4 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
 - 1. Hoffman Engineering Co.
 - 2. Circle AW Products.
- B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 CABINETS AND ENCLOSURES

- A. Construction: Shall be code gauge galvanized steel with standard concentric knockouts for conduit terminations. Size shall be as indicated on Drawings. Cabinet shall be NEMA 250 Type 1 or 3R.
- B. Finish: Manufacturer's standard gray baked enamel finish.

- C. Covers: Continuous hinged steel door, lockable and keyed to match panelboard locks.
- D. Mounting:
 - 1. Flush cabinets shall be furnished with concealed trim clamps and shall be not less than 4 inches deep.
 - 2. Surface cabinets shall be furnished with screw cover trim, flush hinged door and shall not be less than 6 inches deep.

2.3 BACKBOARDS

- A. Furnish cabinet with 3/4-inch fire retardant plywood mounting backboard on interior unless otherwise indicated on Drawings.

2.4 TERMINAL BLOCKS AND ACCESSORIES

- A. Terminal blocks: NEMA ICS 4; UL listed.
- B. Power terminals: Unit construction type, closed-back with tubular pressure screw connections, rated 600 volts.
- C. Signal and control terminals: See terminal strips in Section 260519: Building Wire and Cable.
- D. Identification: Identify terminal strips with permanent numbers.
- E. Wiring diagram: Provide wiring diagram in protective pocket on inside front cover of cabinet. Diagram shall indicate control wiring, connections and layout of components within enclosure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of cabinets and enclosures installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 INSTALLATION

- A. Set cabinets and enclosures plumb and symmetrical with building lines. Furnish and install all construction channel bolts, angles, etc. required to mount all equipment furnished under this Section of the Specifications.
- B. Cabinets and enclosures shall be anchored and braced to withstand seismic forces calculated in accordance with that referenced in Section 260010: Basic Electrical Requirement.
- C. "Train" interior wiring, bundle and clamp using specified plastic wire wraps.

- D. Replace doors or trim exhibiting dents, bends, warps or poor fit that may impede ready access, security or integrity.
- E. Terminate conduit in cabinet with lock nut and grounding bushing.
- F. Terminate wiring on terminal blocks and identify each with heat shrink tags.

3.3 CLEANING

- A. Touch-up paint any marks, blemishes or other finish damage suffered during installation.
- B. Vacuum clean cabinet on completion of installation.

END OF SECTION 262716

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
1. Wall switches.
 2. Occupancy sensor switches.
 3. Receptacles.
 4. Coverplates.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified.
1. Federal Specification (FS):
 - FS W-P-455A; Plate, Wall Electrical.
 - FS W-C-596; Electrical Power Connector, Plug, Receptacle and Cable Outlet.
 - FS W-S-896; Switch, Toggle.
 2. National Electrical Manufacturer's Association (NEMA):
 - NEMA WD-1; General-Purpose Wiring Devices.
 - NEMA WD-5; Specific-Purpose Wiring Devices.
 3. Underwriter's Laboratories (UL):
 - UL 20 General-Use Snap Switches.
 - UL 231; Power Outlets.
 - UL 310; Electrical Quick-Connect Terminals.
 - UL 498; Attachment Plugs and Receptacles.
 - UL 514A; Metallic Outlet Boxes.

UL 514D;	Cover Plates for Flush-Mounted Wiring Devices.
UL 943;	Ground-Fault Circuit-Interruptioners.
UL 1681;	Wiring Device Configurations.

1.3 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
 - 1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
 - 2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 - 3. Provide color finishes for Architect to select from.
 - 4. Submit Manufacturer's installation instructions.
- B. Where inscribed device coverplates are noted on the Drawings or in the Specifications, conform to the requirements of Section 260553: Electrical Identification.

1.4 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

1.5 WARRANTY

- A. Occupancy sensors offered under this Section shall be covered by a 1 one year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
 - 1. Switches, receptacles and coverplates:

- a. Hubbell.
 - b. Pass & Seymour.
 - c. Leviton.
2. Occupancy sensors switches:
- a. Cooper Controls “Greengate”
 - b. WattStopper
 - c. Leviton
 - d. SensorSwitch, Inc.
 - e. Hubbell Building Automation, Inc.

B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 WALL SWITCHES

- A. Standards: Provide general-purpose 120/277 VAC switches that conform to NEMA WD-1 Specifications.
- B. Color: Device color shall as selected by the Architect, unless otherwise noted.
- C. Wall switches:
 1. Provide twenty ampere, 120/277 volt, Specification grade, toggle handle style, quick-make slow-break, quiet type snap switch with silver cadmium alloy contacts, binding head terminal screws, back and side wired with totally enclosed case.
 2. Single pole, single throw switches: Hubbell #1221 series, Pass & Seymour #20AC1 series or Leviton #1221 series.
 3. Three way switches: Hubbell #1223 series, Pass & Seymour #20AC3 series or Leviton #1223 series.

2.3 OCCUPANCY SENSOR SWITCHES

- A. General:
 1. Occupancy sensors shall comply with the latest edition of the California Building Energy Efficiency Standards, California Building Code, Part 6 and be certified by The California Energy Commission. All sensors shall be listed in the most current directory of Certified Occupancy Sensing Devices or be on file with the CEC.
 2. Occupancy sensors shall be dual-technology type infrared/ultrasonic as specified herein with voltage and wattage rating equal to the lights being controlled.

3. All sensors shall have an adjustable time delay for turning off lights and a sensitivity adjustment.
 4. Ceiling mounted sensors shall operate on low voltage as supplied by control unit. Control unit shall contain power supply and relays for switching loads.
 5. Units shall be furnished to cover the areas being controlled. No allowance shall be given for providing sensors improperly sized for the square footage of the controlled area.
- B. Color: Device color shall be as selected by Architect, unless otherwise noted.
- C. Wall mounted single level control sensors:
1. Sensor shall be dual-technology infrared/ultrasonic type with single level switching capability and coverage up to 900 square feet.
 2. Operation shall be manual "ON" and manual or automatic "OFF".
 3. Time delay adjustment from 30 seconds to 30 minutes. Set adjustment at 4 minutes.
 4. Load capacity of 0 to 1800 watts at connected voltage.
 5. For use in small utility closets where dual level switching is not indicated.
- D. Wall mounted dual level control sensors:
1. Sensor shall be dual-technology infrared/ultrasonic type with dual level switching capability and coverage up to 1000 square feet.
 2. Operation shall be manual (in two levels) "ON" and manual (in two levels) or automatic (full) "OFF".
 3. Time delay adjustment from 30 seconds to 30 minutes. Set adjustment at 10 minutes. Set sensitivity adjustment at maximum.
 4. Load capacity of 50 to 1000 watts at connected voltages.
 5. Integral photocell, 2 circuit, compatible with electronic bi-level switching ballast. Provide with ambient light control adjustment.
 6. For use in offices where dual level switching is indicated.
- E. Ceiling mounted single-directional sensors:
1. Sensor shall be dual-technology infrared/ultrasonic type single-directional with coverage up to 900 square feet.
 2. Operation shall be automatic "ON" and automatic "OFF". Provide with a manual override switch.
 3. Time delay adjustment from 30 seconds to 30 minutes. Set adjustment at 10 minutes. Set sensitivity adjustment at maximum.

4. Load capacity of 20 amps per power or slave pack at connected voltage.
5. Power pack consisting of Class 2, 24V output transformer and relay in single housing, capable of powering up 2 sensors and mounted inside standard 4 inch square box.
6. For use in small office areas.

F. Ceiling mounted omnidirectional sensors:

1. Sensor shall be dual-technology infrared/ultrasonic type omnidirectional with coverage up to 1000 square feet.
2. Operation shall be automatic "ON" and automatic "OFF". Provide with a manual override switch.
3. Time delay adjustment from 30 seconds to 15 minutes. Set adjustment at 10 minutes. Set sensitivity adjustment at maximum.
4. Load capacity of 15 amps per power or slave pack at connected voltage.
5. Power pack consisting of Class 2, 24V output transformer and relay in single housing, capable of powering up to 2 sensors and mounted inside standard 4-inch square box.

2.4 RECEPTACLES

A. Standards:

1. Provide general purpose 20 ampere, 125/250 VAC receptacles that conform to NEMA WD-1 Specifications. Specialty receptacles shall conform to NEMA WD-5 Specifications as applicable.
2. Provide NEMA 5-20R, industrial (heavy-duty) specification grade as noted herein, 20 amp, 125 VAC, 2 pole, 3 wire grounding type receptacles.
3. Receptacles shall be the standard conventional style device.

B. Color:

1. Device color shall be as selected by the Architect, unless otherwise noted.

C. General purpose single outlets:

1. Provide self-grounding back and side wired with binding head staked terminal screw.
2. Use Hubbell #5361 series, Pass & Seymour #5361 series Leviton #5361 series.

D. General purpose duplex receptacles:

1. Provide self-grounding, back and side wired with binding head staked terminal screws and break-off strip for two-circuit wiring.

2. Use Hubbell #5362 series, Pass & Seymour #5362 series or Leviton #5362 series.
- E. Ground fault circuit interrupting (GFCI) receptacles:
1. Provide 20 amp, 125 VAC, receptacles consisting of NEMA 5-20R duplex device with integral solid state sensing and signaling circuitry capable of detecting and interrupting a maximum 5 milli-amp line-to-ground fault current in approximately 1/40th of a second.
 2. Provide visual device with trip indication, manual reset and test mechanisms and with point of use and multi-outlet protection.
 3. Use Pass & Seymour #2091-S series, Hubbell GF-5362 series, Leviton #6898 series, for Specification grade GFCI receptacles.
- F. Special purpose receptacles: Provide Specification grade devices with the NEMA configuration, voltage and current rating, number of poles and ground provisions as noted on the Drawings.

2.5 COVERPLATES

- A. General:
1. Provide all coverplates with rounded edges and corners, smooth and free of grooves, embossing or other embellishment.
 2. Provide mounting screws to match the plate finish.
 3. Provide gang type coverplates where two or more devices are installed at one location. Individual gangable coverplates are not acceptable.
 4. Provide plates of one design, standard conventional style, throughout the Project unless otherwise specified.
- B. Metal coverplates:
1. Provide smooth, type 430 stainless steel coverplates, 0.035" thick with rounded edges and corners.
 2. Provide openings to accommodate the devices indicated on the Drawings and in the Specifications.
 3. Provide removable plastic film to protect coverplates during installation. Remove film at time of final acceptance.
- C. Weatherproof coverplates:
1. Non-public areas:
 - a. Provide horizontal mounted, weatherproof in-use coverplate for one duplex or one GFCI receptacle. Provide gasketed, spring loaded, vertically self-closing covers

suitable for use in damp and wet locations as described in UL 514 and NEC 406. Covers shall allow the use of the device with the cover closed.

- b. Furnish base plates, covers, hinge pins, spring and screws of corrosion resistant type 302 stainless steel.
2. Public area receptacles:
 - a. Provide horizontal mounted weatherproof in-use coverplate for one duplex or one GFCI receptacle. Provide gasketed, spring loaded, lockable, vertically self-closing covers suitable for use in damp and wet locations as described in UL 514 and NEC 406. Covers shall allow the use of the device with the cover closed.
 - b. Furnish base plates, covers, hinge pins, spring and screws of corrosion resistant type 302 stainless steel.
 - c. Provide two (2) keys for each locking type coverplate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of wiring device installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

- A. Coordinate device heights in vending, kitchen and utility areas with benches and counters.
- B. Coordinate switch mounting location with Architectural details. Unless otherwise noted, locate switches on latch side of door.

3.3 INSTALLATION

- A. Install wiring devices in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.
- B. Install devices with the vertical centerline plumb and with all edges of the device flush against the adjacent wall surfaces.
- C. Mount switches at 42 inches to center above finished floor unless otherwise noted.
- D. Mount receptacles vertically with the centerline 18 inches above finished floor and with grounding slot at bottom.
- E. Mount receptacles horizontally when mounting above counters, mount with grounding slot to the left.

- F. Mount GFCI receptacles in the following locations, whether indicated as GFCI type or not on the drawings:
 - 1. In bathrooms.
 - 2. Where receptacles are installed within 6'0" from edge of sinks.
 - 3. In kitchens above counters.
 - 4. On rooftops.
 - 5. Outdoors.
 - 6. Where serving vending machines.
 - 7. Where serving electric drinking fountains.
- G. Provide coverplates for all outlet boxes, switches, receptacles, etc.
- H. Install blank coverplates on all outlet boxes in which no device is required or installed.
- I. Provide coverplates that completely cover wall opening and seat against wall.
- J. Provide stainless steel coverplates for all devices.

3.4 OCCUPANCY SENSOR SWITCHES

- A. Set time delays in sensors in accordance with Owner's directions.
- B. Where substituted occupancy sensors are used, it shall be the responsibility of the Contractor to place sensors in the proper place and with proper alignment to cover to all the area intended in the Contract Documents.
- C. Provide one power pack with each ceiling mounted occupancy sensor, whether indicated or not on plans, unless wiring details or plans indicate otherwise.
- D. Where Drawings indicate ceiling mounted slave units, provide 3 #14 in 1/2" conduit from power pack to slave unit and connect so that input from either master or slave sensor will turn lights on.
- E. Install wall mounted devices with the vertical centerline plumb and alleges of device flush against adjacent wall surfaces. Mount devices at 42 inches to center above finished floor unless otherwise noted.

3.5 FIELD QUALITY CONTROL

- A. Electrical testing:
 - 1. Test proper polarity of all receptacles.

2. Test ground continuity of all wiring devices.
3. Test ground fault interrupting device operation.

B. Visual and mechanical inspection:

1. Check proper operation of all switches.
2. Visually inspect and replace damaged or defective devices.

3.6 CLEANING

- A. Clean interior of all boxes from dirt and paint prior to installation of devices.
- B. Clean wiring devices and coverplates from dirt and paint over spray.

END OF SECTION 262726

SECTION 262816 - OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
 - 1. Fuses.
 - 2. Molded case circuit breakers.
- B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
 - 1. Federal Specification (FS):
 - FS W-C-375; Circuit Breakers, Molded Case, Branch Circuit and Service.
 - 2. Underwriters Laboratories, Inc. (UL):
 - UL 248(1-16); Low-Voltage Fuses.
 - UL 489; Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
 - 3. National Electrical Manufacturer Association (NEMA):
 - NEMA AB 1; Molded Case Circuit Breakers.

1.3 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
 - 1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
 - 2. Describe product operation, equipment and dimensions and indicate features of each component.

3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
4. Provide factory certification of trip characteristics for each type and rating of circuit breaker.
5. Provide current let-through and melting time information for each type and rating of fuses.
6. Confirmation in writing of compliance with Arc Energy Reduction per NEC Article 240.87.
7. Submit Manufacturer's installation instructions.
8. Complete bill of material listing all components.
9. Warranty.

1.4 OPERATION AND MAINTENANCE MANUAL

- A. Supply operation and maintenance manuals in accordance with the requirements of Section 260010: Basic Electrical Requirements, to include the following:
 1. A detailed explanation of the operation of the system.
 2. Instructions for routine maintenance.
 3. Parts list and part numbers.
 4. Telephone numbers for authorized parts and service distributors.
 5. Final testing reports.

1.5 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Overcurrent Protective Device components shall not be delivered to the Project site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipment shall be replaced and returned to Manufacturer at no cost to Owner.

- B. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris and traffic. Provide heat where required to prevent condensation.
- C. Handling: Handle in accordance with Manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.7 WARRANTY

- A. Units and components offered under this Section shall be covered by a 1 year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
 - 1. Fuses:
 - a. Bussmann Division, Cooper Industries.
 - b. Gould Shawmut Co.
 - 2. Circuit breakers:
 - a. Eaton Electrical/Cutler-Hammer.
 - b. General Electric.
 - c. Siemens/I-T-E.
 - d. Square D.
- B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 FUSES

- A. General: All power fuses shall be time-delay, high interrupting (300 K AIC), current limiting type, unless otherwise noted on the Drawings. All fuses shall be the product of a single Manufacturer and shall be selectively coordinated when applied in 2:1 ratios. Types of fuses shall be as follows:
 - 1. Motor branch circuit fuses (0-600 amperes): UL Class J dual element, time delay type fuse. Motor branch circuit fuses shall be sized for Type 2 coordination for the motor

controller and back-up motor overload protection and shall be coordinated with motor starter overload relay heaters. See Section 262900: Motor Controls.

- B. Control and instrument fuses shall be suitable for installing in blocks or fuseholders. Exact type and rating shall be as recommended by the Manufacturer of the equipment being protected.

2.3 MOLDED CASE CIRCUIT BREAKERS

- A. Branch and feeder circuit breakers shall be molded case, bolt on and trip indicating.
- B. Where stationary molded case circuit breakers are indicated on the Drawings to be current limiting type, they shall be current limiting as defined by UL 489 and shall not employ any fusible elements.
- C. Circuit breakers shall have interrupting capacity not less than that indicated on the Drawings or if not indicated, not less than 14,000 RMS symmetrical amps for 480 volt systems and 10,000 RMS symmetrical amps for 208 volt systems.
- D. Covers shall be sealed on non-interchangeable breakers and trip unit covers shall be sealed on interchangeable trip breakers to prevent tampering. Circuit breaker ratings shall be clearly visible after installation or engraved nameplates shall be provided stating the rating. All ferrous parts shall be plated to minimize corrosion.
- E. Circuit breakers shall be toggle, quick-make and quick-break operating mechanisms with trip-free feature to prevent contacts being held closed against overcurrent conditions in the circuit. Trip position of the breakers shall be clearly indicated by operating handles moving to a center position.
- F. Multipole breakers shall have a single handle to open and close all contacts simultaneously in both manual operation and under automatic tripping. Interpole barriers shall be provided inside the breaker to prevent any phase-to-phase flashover. Each pole of the breaker shall have means for Arc extinguishing.
- G. All terminals shall be dual rated for aluminum or copper wire.
- H. Circuit breakers with frame ratings 100 amp and smaller shall be ambient temperature compensated, thermal magnetic type unless otherwise noted. Breakers shall be of full size, 1" per pole type. Panels with more than one branch breaker larger than 100 amps shall be installed in distribution type panels.
- I. Circuit breakers with frame ratings between 100 amps and 400 amps shall have solid state electronic trips with true RMS reading through the 13th harmonic with 1% accuracy, interchangeable trip via front accessible current plug, adjustable instantaneous and short time be rated as indicated on Drawings at the voltage indicated.
- J. Accessories: Provide accessories as noted on the Drawings, i.e. shunt-trip, auxiliary contacts, undervoltage trip, alarm switch, etc.

- K. Spaces in the boards shall be able to accept any combination of 1, 2 or 3 pole circuit breakers as indicated. Provide all necessary bus, device supports and mounting hardware sized for frame, not trip rating.
- L. Series rated breakers are not acceptable unless specifically noted on the Drawings.
- M. Breaker shall be rated to operate in an ambient temperature of 40 degrees C.
- N. For circuit breakers rated or can be adjusted to 1200 amps (or higher), provide zone selective interlocking (ZSI) with downstream protective devices, if indicated on the drawings. If ZSI is not indicated on the drawings, provide a key interlock maintenance mode switch and blue LED indicating lamp in the same section, which shall allow an operator to manually enable temporary protective device maintenance settings to reduce the arc flash energy level. Key shall be held captive when maintenance mode signal is disabled and removable when maintenance mode signal is enabled. Maintenance mode switch positions shall be labeled "Enabled" and "Disabled". Blue indicating lamp shall be push-to-test type.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of overcurrent protective device installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 INSTALLATION

- A. Install overcurrent protective devices in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.
- B. Tighten electrical connectors and terminals; including screws and bolts, in accordance with equipment Manufacturers published torque-tightening values for equipment connectors. Where Manufacturers torque requirements are not indicated tighten connectors and terminals to comply with tightening torque specified in UL Standard 486A.
- C. Install overcurrent protective devices and accessories in accordance with Manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. All devices shall be installed in accordance with applicable NEC and NEMA standards for installation.

3.3 FIELD QUALITY CONTROL

- A. Contractor shall perform all quality control electrical testing, calibration and inspection required herein. Testing objectives shall be to:
 - 1. Assure overcurrent protective device installation conforms to specified requirements and operates within specified tolerances.

2. Field test and inspect to ensure operation in accordance with Manufacturer's recommendations and Specifications.
 3. Prepare final test report including results, observations, failures, adjustments and remedies.
 4. Verify ratings and settings and make final adjustments.
- B. The Contractor shall supply a suitable and stable source of electrical power to each test site. The Testing Agency shall specify the specific power requirements.
- C. Prefunctional testing:
1. Visual and mechanical inspection:
 - a. Inspect for physical damage, defects alignment and fit.
 - b. Perform mechanical operational tests in accordance with Manufacturer's instructions.
 - c. Compare nameplate information and connections to Contract Documents.
 - d. Check tightness of all control and power connections.
 - e. Check that all covers, barriers and doors are secure.
 2. Electrical tests:
 - a. Circuit continuity: All feeders shall be tested for continuity. All neutrals shall be tested for improper grounds.
 - b. Test all circuit breakers with frame size 225 amps and larger in each panelboard, distribution board, switchboard, etc. unless otherwise noted via primary current injection testing. Testing shall verify the following:
 - 1) Determine that circuit breaker will trip under overcurrent conditions, with tripping time in conformance with NEMA AB 1 requirements.
 - 2) Circuit breaker pickup and delay measurements are within the manufacturers published tolerances for long time, short time, instantaneous, and ground fault.
 - 3) For circuit breakers rated or can be adjusted to 1200 amps (or higher), confirm ZSI protection is acceptable or the maintenance mode switch is operational (enabled and disabled) with reduced pickup and delay measurements when enabled.
- D. Contractor shall replace at no costs to the Owner all devices which are found defective or do not operate within factory specified tolerances.
- E. Contractor shall submit the Testing Agency's final report for review prior to Project closeout and final acceptance by the Owner. Test report shall indicate test dates, devices tested, results, observation, deficiencies and remedies. Test report shall be included in the operation and maintenance manuals.

3.4 ADJUSTING

- A. Adjust circuit breaker trip settings for coordination with other overcurrent protective devices in system.
- B. Adjust circuit breaker trip settings for adequate protection from overcurrent and fault currents.

3.5 CLEANING

- A. Upon completion of Project prior to final acceptance the Contractor shall thoroughly clean overcurrent protective devices per Manufacturer's approved methods and materials. Remove paint splatters and other spots, dirt and debris.

END OF SECTION 262816

SECTION 262819 - DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
 - 1. Disconnect Switches.
- B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated on specified:
 - 1. Federal Specifications (FS):
 - FS W-F-870; Fuseholders (for plug and enclosed cartridge fuses).
 - FS W-S-865; Switch, Box (enclosed), Surface-Mounted.
 - 2. National Electrical Manufacturer Association (NEMA):
 - NEMA KS 1; Enclosed Switches.
 - 3. Underwriters Laboratories, Inc. (UL):
 - UL 512; Fuseholders.

1.3 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
 - 1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
 - 2. As a minimum the following characteristics shall be indicated:
 - a. NEMA types.
 - b. Current rating.

- c. Number of poles.
 - d. Fuse provisions.
 - e. Enclosure dimensions.
 - f. Voltage.
 - g. Horsepower rating (if applicable).
 - h. Short circuit rating.
3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 4. Submit Manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
 1. Eaton Electrical/Cutler-Hammer.
 2. General Electric.
 3. Siemens/I-T-E.
 4. Square D.
- B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 DISCONNECT SWITCHES

- A. Description: Provide NEMA heavy-duty type switches with dead front construction and padlock provisions for up to three locks in the "OFF" position.

- B. Switch interior: Provide switch with switchblades that are fully visible in the “OFF” position when the door is open. Provide UL listed lugs for copper conductors, lugs to be front removable. Provide plated current carrying part.
- C. Switch mechanism: Provide switches with a quick-make, quick-break, position indicating, operating handle and mechanism and a dual cover interlock to prevent unauthorized opening of the switch door in the “ON” position or closing of the switch mechanism with the door open. Furnish an electrical interlock to de-energize control wiring when the disconnect switch is opened.
- D. Enclosures: Provide switches with hinged cover in NEMA 1 general purpose, sheet steel enclosure for dry locations and NEMA 3R weatherproof galvanized enclosures for exterior, damp or wet locations, unless otherwise noted on the Drawings. Provide an enclosure treated with a rust-inhibiting phosphate primer and finished in gray baked enamel.
- E. Ratings: Provide switches that are horsepower rated for 240 VAC or 600 VAC as required for the circuit involved and that meet “I-SQUARED-T” requirements. Fusible switches to have provisions for the types of fuses specified in Section 262816: Overcurrent Protective Devices. UL listed short circuit rating, when equipped with fuses to be 200,000 amperes RMS symmetrical. Furnish with provisions for RK-1 fuses for switches up to 600 amps. 800 amp switches and larger to have provisions for Class L fuses.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of disconnects switch installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

- A. Coordinate locations of switches and equipment in the field to provide code required clearances in front of switches and to ensure that switches are insight of the controller as described in NEC Article 430.

3.3 INSTALLATION

- A. Install disconnect switches where indicated on the Drawings.
- B. Install fuses in fusible disconnect switches.
- C. Include construction channel and mounting hardware as required to support disconnect switch.

3.4 IDENTIFICATION

- A. Provide engraved, machine screw retained type 'NP' nameplate on each disconnect switch. See Section 260553: Electrical Identification.

3.5 CLEANING

- A. Upon completion of Project prior to final acceptance the Contractor shall thoroughly clean both the interior and exterior of enclosure of all construction debris, scrap wire, paint splatters, dirt, etc.

END OF SECTION 262819

SECTION 262900 - MOTOR CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
1. Manual motor starters.
 2. Combination magnetic motor starters

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified.
1. Federal Specifications (FS):
 - FS W-C-375; Circuit Breakers, Molded Case; Branch Circuit and Service.
 - FS W-S-865; Switch, Box, (Enclosed) Surface-Mounted.
 2. Underwriters Laboratories, Inc. (UL):
 - UL 486E; Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors.
 - UL 489; Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
 - UL 508; Industrial Control Equipment.
 - UL 508A; Industrial Control Panels.
 3. National Electrical Manufacturer Association (NEMA):
 - NEMA ICS 2; Industrial Control Devices, Controllers and Assemblies.
 - NEMA ICS 6; Enclosures for Industrial Controls and Systems.
 - NEMA KS 1; Enclosed Switches.

1.3 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
 - 1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
 - 2. Describe system operation, equipment and dimensions and indicate features of each component.
 - 3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 - 4. Include detailed control wiring diagrams for each starter.

1.4 OPERATION AND MAINTENANCE MANUAL

- A. Supply operation and maintenance manuals in accordance with the requirements of Section 260010: Basic Electrical Requirements, to include the following:
 - 1. A detailed explanation of the operation of the system.
 - 2. Instructions for routine maintenance.
 - 3. Pictorial parts list and part numbers.
 - 4. Final testing reports.

1.5 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Motor control components shall not be delivered to the Project site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipment shall be replaced and returned to Manufacturer at no cost to Owner.
- B. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris and traffic. Provide heat where required to prevent condensation.
- C. Handling: Handle in accordance with Manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.7 WARRANTY

- A. Units and components offered under this Section shall be covered by a 1 year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.

1.8 EXTRA MATERIAL

- A. Provide one spray can of matching finish paint for touching up damaged surfaces after installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
 - 1. Eaton Electrical/Cutler-Hammer.
 - 2. General Electric.
 - 3. Siemens/I-T-E.
 - 4. Square D.
- B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 MANUAL MOTOR STARTERS

- A. Manual motor starter: AC general purpose Class A manually operated non-reversing full-voltage controller for induction motors rated in horsepower, with overload relay, red pilot light, auxiliary contacts when indicated on Drawings and pushbutton operator. Starter size and number of poles shall be as required for connections indicated on Drawings. Furnish in conformance with NEMA ICS 2.
- B. Fractional horsepower manual starters: AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit and toggle operator. Starter size and number of poles shall be as required for connections indicated on Drawings. Furnish in conformance with NEMA ICS 2.
- C. Enclosure: NEMA ICS 6; Type 1.

2.3 COMBINATION STARTER OVERCURRENT PROTECTIVE DEVICE

- A. Refer to Section 262816: Overcurrent Protective Devices.

- B. Overcurrent protective devices shall be motor circuit protectors type with frame and trip ratings as indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of motor control installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 GENERAL

- A. Install motor control equipment in accordance with Manufacturer's instructions, as indicated on the Drawings and as specified herein.
- B. Install equipment where indicated on the Drawings.

3.3 MOUNTING

- A. Include construction channel and mounting hardware as required to support motor control equipment.
- B. Coordinate locations of control equipment in the field to provide code clearances in front of devices.

3.4 IDENTIFICATION

- A. Provide engraved, machine screw-retained type 'NP' nameplate on each motor control device. Refer to Section 260553: Electrical Identification.

3.5 CLEANING

- A. Prior to energizing of motor controls the Contractor shall thoroughly clean the interior of enclosure of all construction debris, scrap wire, etc. using Manufacturer's approved methods and materials.
- B. Upon completion of Project prior to final acceptance the Contractor shall thoroughly clean both the interior and exterior of motor controls per Manufacturers approved methods and materials. Remove paint splatters and other spots, dirt and debris.
- C. Touch-up paint any marks, blemishes or other finish damage suffered during installation.

END OF SECTION 262900

SECTION 265100 - LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
1. Interior lighting fixtures.
 2. Lamps and diodes.
 3. Ballasts and LED drivers.
 4. Diffusers and louvers.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
1. Underwriters Laboratories, Inc. (UL):
 - UL 66; Fixture Wire.
 - UL 542; Lampholders, Starters and Starter Holders for Fluorescent Lamps.
 - UL 1598; Luminaires.
 2. Illumination Engineering Society of North America (IESNA):
 - IESNA LM-79-2008; Approved Method for Electrical and Photometric Measurements of Solid-State Lighting Products.
 - IESNA LM-80-2008; Approved Method for Measuring Lumen Maintenance of LED Light Sources.
 3. Restriction of Hazardous Substances in LED (RoHS):
 - EU RoHS; Directive 2002/95/EC Restriction of Hazardous Materials.

1.3 SYSTEM DESCRIPTION

- A. Provide and install a fully functional and operating lighting fixture system as indicated, complete with lamps, wiring, control and securely attached to support system to meet all seismic code requirements.
- B. Where catalog number and narrative or pictorial descriptions are provided, the written description shall take precedence and prevail.

1.4 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
 - 1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
 - 2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 - 3. Independent Testing Laboratories, Inc. or equal, photometric test report for each luminaire type and lamp combination listed on the fixture schedule. Test reports shall be based on Illuminating Engineering Society published test procedures and shall contain candlepower distribution curves in five lateral planes for fixtures with asymmetric distributions and fixture luminance data for vertical angles above 45 degrees from nadir.
 - 4. Shop Drawings:
 - a. Suspension details for fixtures recessed in, mounted on or suspended from hung ceilings. Details shall clearly illustrate proposed methods for complying with the requirements of CAC Title 24 and UBC Standard No. 47-18 requiring support independent of the suspended ceiling system.
 - 5. Submit Manufacturer's installation instructions.
 - 6. Complete bill of material listing all lighting fixtures, lamps and other components.
 - 7. Warranty.
 - 8. In addition to the requirements for Substitutions, under Section 260010: Basic Electrical Requirements, all requests for approval of non-specified products must be accompanied by the following:
 - a. A list of comparable buildings where the product is currently installed and can be observed. Buildings shall be within a 100 mile radius of Lighting Consultants office.
 - b. Furnish a working sample complete with housing, trim, 8' cord and plug, and specified lamp.

1.5 OPERATION AND MAINTENANCE MANUAL

- A. Supply operation and maintenance manuals in accordance with the requirements of in accordance with the requirements of Section 260010: Basic Electrical Requirements, to include the following:
 - 1. A detailed description and catalog cut of each lighting fixture type.
 - 2. Instructions for routine maintenance.
 - 3. Pictorial parts list and parts number.
 - 4. Telephone numbers for authorized parts and service distributors.

1.6 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Lighting fixtures shall not be delivered to the Project site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipment shall be replaced and returned to Manufacturer at no cost to Owner.
- B. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris and traffic. Provide heat where required to prevent condensation.
- C. Handling: Handle in accordance with Manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.8 WARRANTY

- A. Units and components offered under this Section shall be covered by a 1 year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.
- B. Ballast for fluorescent and high intensity discharge fixtures offered under this Section shall be covered by a 2 year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
 - 1. Lamps and diodes:
 - a. General Electric
 - b. Osram/Sylvania
 - c. North American Philips Lighting Co. (NAPLC)
 - d. Venture
 - e. Cree (LED)
 - f. Lumi-leds (LED)
 - 2. LED drivers:
 - a. Osram Sylvania
 - b. North American Philips Lighting Co. (NAPLC)
 - 3. Lighting fixtures: Refer to Fixture Schedule on Drawings.
- B. Substitutions: Under provisions of Section 260010: Basic Electrical Requirements.

2.2 GENERAL

- A. Ferrous mounting hardware and accessories shall be finished using either a galvanic or phosphate primer/baked enamel process to prevent corrosion and discoloration of adjacent materials.
- B. Fasteners shall be manufactured of galvanized steel.
- C. Fixtures shall be free of light leaks and shall be designed to provide sufficient ventilation of lamps and ballasts, including vent holes where required.
- D. All sheet metal Work shall be free from tool marks and dents and shall have accurate angles bent as sharp as compatible with the gauges of the required metal. All intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly. All surfaces shall be finished so as to eliminate all exposed sharp edges. All mitered corners or joints shall be accurately aligned with abutting intersecting members. Sheet metal Work shall be properly fabricated so that planes will not deform (i.e. become concave or convex) due to normal expected ambient and operating conditions.
- E. Lampholders shall hold lamps securely against normal vibrations and maintenance handling.
- F. Wiring channels and lampholder mountings shall be rigid and accurately constructed.

2.3 LAMPS

- A. Light emitting diodes (LED):
1. Refer to the Fixture Schedule for size and type of LED lamps required.
 2. All diodes shall come from the same manufacturer and carry the same bin number.
 3. All diodes shall be tested and tuned for the optimal Kelvin color point.
 4. Color correlated temperature: 3500K
 5. Minimum CRI (Color Rendering Index): 80
 6. LED fixture components shall be free of all toxic materials to include lead, cadmium and mercury, and shall be RoHS compliant.
 7. Groups of three or more diodes in a single housing shall be tested for even distribution.
 8. Standard lumen output shall meet or exceed the State of California Title 24 Energy Code for high efficiency luminaries.
 9. All LED fixtures shall have an IES formatted electronic photometric report.
 10. Diodes shall have a minimum life of 50,000 hours and maintain at least 70% of initial lamp lumens throughout this period.

2.4 BALLASTS

- A. LED Drivers:
1. LED drivers shall be integral to fixture housing or remotely located, when specified, within 15 feet of diode assembly.
 2. Drivers shall have a minimum life of 50,000 hours and maintain at least 70% of initial lamp lumens for that period.

2.5 LENSES

- A. Acrylic:
1. Lenses shall be injection molded crystal clear 100% virgin acrylic (except as indicated otherwise in the Fixture Schedule). For lenses with male pattern of pyramids or cones, specified minimum thickness refers to distance from flat surface to base of pyramids (cones) or thickness of undisturbed material. For lenses with female pattern, specified minimum thickness refers to overall thickness of material.
 2. Lenses shall fully eliminate lamp images when viewed from all directions within 45 to 90 degree angles from vertical, where the ratio of lamp spacing to the distance from lamp underside to top of lens does not exceed 1.50. Within the viewing angle from 0 to 45

degrees the ratio of maximum brightness (under a lamp) to minimum brightness (between lamps) shall not exceed 3 to 1.

3. Finishes (i.e. sandblasting, etching, polishing) shall be performed as described in the Fixture Schedule.
4. Plastic electrical light diffusers must meet the requirements of Section 2-5209, CAC, Flame Spread Rating.

2.6 FIXTURES

- A. Refer to the Fixture Schedule.
- B. The finish of all fixtures and trim shall be submitted to and approved by the Architect prior to ordering.
- C. All standard fixtures must bear UL label. Attaching of labels after delivery of fixtures is not acceptable.
- D. All labels affixed to the fixture shall be in a location not visible from normal viewing angles.

2.7 ARCHITECTURAL COORDINATION

- A. Consult Architectural Drawings for details of ceiling construction, finish, reflected ceiling plans and other applicable details and provide lighting fixtures suitable for the particular type of ceiling at each location.
- B. Where fixtures are mounted in architectural coves, soffits, valances or cabinets and are given an overall length, the Contractor shall verify all lengths in the field prior to releasing fixture order.
- C. Where fixtures are surface mounted or suspended to match the length of walls or other architectural elements, the Contractor shall verify all lengths in the field prior to releasing fixture order.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of lighting fixture installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

- A. Architectural Plans shall govern exact ceiling construction and mounting conditions for all fixtures. Contractor shall be responsible for coordination of fixture mounting and compatibility with ceiling construction.

- B. Fixtures in areas where exposed or concealed pipe and ductwork prevents direct access to the structural ceiling, shall be provided with appropriate support system to suspend fixture below obstructions to avoid conflicts with same.

3.3 INSTALLATION

- A. Install lighting fixtures in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.
- B. Contractor shall be responsible for all supports, hangers and hardware necessary for a complete installation.
- C. Fixtures shall be plumb, level, square, in straight lines and without distortion. Remedy light leaks that may develop after installation of recessed or enclosed fixtures.
- D. Turn over Project with all lamps in new and operating condition. Lamps that are burned less than 100 hours at Project closeout are considered new.

3.4 FIXTURE SUPPORTS

- A. Physical supports:
 - 1. Recessed fixtures in wood frame ceilings shall be supported by 2" x 4" hangers fastened to adjacent ceiling joists.
 - 2. Recessed downlights in wood frame ceilings shall be supported with Manufacturers supplied bar hangers and shall be installed according to the Manufacturers instructions.
 - 3. Surface mounted fixtures solely supported by recessed boxes in a gypsum board ceiling shall have a 1 1/8" steel bar screwed or welded to the back of the box. This steel bar must be long enough to span two ceiling support channels and shall be attached to the channels by twisting wire around the bar and the support channel. For fixtures weighing over 50 pounds, provide fixture studs in recessed box.
 - 4. Support surface mounted fixtures more than 18" wide at or near each corner or edge, in addition to support from outlet box.
 - 5. Twisting wire around the bracket and two adjacent ceiling support channel runners on either side of fixture shall support recessed downlights manufactured with built-in brackets.
 - 6. Where ceiling and/or wall construction or pipe and/or ductwork is such that mounting channels, strong-backs, trapezes, brackets, etc., are required to properly support fixtures, provide these supports under this Section, unless otherwise indicated.
 - 7. Support outlet boxes as specified in Section 260533: Boxes. Provide all boxes with grounding pigtail.
- B. Seismic supports:

1. Recessed fluorescent fixtures in suspended ceilings shall be supported by connecting two fixture support wires to the fixture at diagonal opposite corners for fixtures weighing 56 pounds or less. Connect four wires, one at each corner for fixtures weighing more than 56 pounds.
2. Surface mounted fixtures on suspended ceilings shall be attached to the main ceiling runner with at least two positive clamping devices and shall have a fixture support wire attached to each clamping device and to the structure above.
3. Recessed downlight fixtures in suspended ceilings shall be supported by connecting one fixture support wire to the fixture housing. Recessed H.I.D. fixtures shall have two fixture support wires attached to the housing.
4. All suspended fixtures shall be able to swing 45 degrees from vertical in any direction without obstruction. Furnish suspended fluorescent fixtures with universal joint type hanger canopy and longitudinal sway adapter at each stem, to permit 45-degree swivel on 360-degree circle at canopy and 45 degree longitudinal movement at sway adapter. Submit Drawings of hanger assembly for review prior to ordering. If suspended fixture is not free to swing 45 degrees in any direction, without obstructions, provide fixture seismic restraint to prevent contact in conformance with California Building Code, Section 2330, Seismic Design.
5. Unless fixtures are cable hung, Contractor shall, provide for all suspended fixtures a safety wire or cable attached to the fixture and structure at each support capable of supporting four times the supported load.
6. All recessed fluorescent fixtures shall be furnished with earthquake clips where installed in tee bar ceiling.

3.5 IDENTIFICATION SYSTEM

- A. All junction box coverplates for the lighting branch circuit system shall be clearly marked with a permanent black ink felt pen identifying the branch circuit (both panel designation and circuit number) contained in the box.

3.6 FIELD QUALITY CONTROL

- A. Visual and mechanical inspection.
 1. Inspect for physical damage, defects, alignment and fit.
 2. Perform operational test of each lighting fixture after installed, circuited and energized.
 3. Perform emergency operational test of all lighting fixtures connected to emergency circuiting by interrupting normal power source.
- B. Contractor shall replace at no cost to the Owner all equipment which is found defective or do not operate within factory specified tolerances.

3.7 CLEANING

- A. Clean lighting fixtures prior to Project closeout in accordance with Manufacturer's recommended materials and methods.

END OF SECTION 265100

SECTION 270010 - BASIC COMMUNICATIONS REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Table of Contents, Division 27 - Communications, Division 28 - Fire Life Safety:

<u>SECTION NO.</u>	<u>SECTION TITLE</u>
270010	BASIC COMMUNICATIONS REQUIREMENTS
270500	TELECOMMUNICATIONS PATHWAYS
270553	IDENTIFICATION
271500	HORIZONTAL CABLING

B. Work included: This Section includes general administrative and procedural requirements for Division 27 and Division 28. The following administrative and procedural requirements are included in this Section to supplement the requirements specified in Division 01.

1. Quality assurance.
2. Definition of terms.
3. Submittals.
4. Coordination.
5. Record documents.
6. Operation and maintenance manuals.
7. Rough-in.
8. Communications installation.
9. Cutting, patching, painting and sealing.
10. Field quality control.
11. Cleaning.
12. Project closeout.

C. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete and operable installation.

1. General and supplementary conditions: Drawings and general provisions of Contract and Division 01 of the Specifications, apply to all Division 27 Sections.
2. Earthwork: Include trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, in-grade pull boxes, vaults, etc. Refer to Division 31, Earthwork.
3. Selective demolition: Nondestructive removal of materials and equipment for reuse or salvage as indicated. Also dismantling communications materials and equipment made obsolete by these installations. Refer to Division 02, Selective Demolition.
4. Concrete Work: Include forming, steel bar reinforcing, cast-in-place concrete, finishing and grouting as required for underground conduit encasement, pull box slabs, vaults, etc. Also includes setting of floor boxes in existing concrete slabs, saw-cutting of existing slabs and grouting of conduits in saw-cut. Refer to Division 03, Concrete.
5. Miscellaneous metal Work: Include fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, cable trays, racks, etc. Refer to Division 05, Miscellaneous Metals.

6. Miscellaneous lumber and framing Work: Include wood grounds, nailers, blocking, fasteners and anchorage for support of communications materials and equipment. Refer to Division 06, Rough Carpentry.
 7. Moisture protection and smoke barrier penetrations: Include membrane clamps, sheet metal flashing, counter flashing, caulking and sealant as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors, ceiling slabs and foundation walls. All penetrations through vapor barriers at slabs on grade shall be taped and made vaportight. Refer to Division 07, Thermal and Moisture Protection.
 8. Access panels and doors: Required in walls, ceilings and floors to provide access to communications devices and equipment. Refer to Division 08, Access Doors also, Division 05, Metals.
 9. Painting: Include surface preparation, priming and finish coating as required for exposed conduit, pull and junction boxes, etc. where indicated as field painted in this Division. Refer to Division 09, Painting.
 10. Conduit: Include conduit and boxes for Interbuilding and Intrabuilding distribution of cabling. Refer to Division 26: 260531, 260533 and 260543.
- D. Work furnished and installed under another Division requiring connections under this Division includes but is not limited to:
1. Elevator controllers.
 2. Fire alarm control panel.
 3. Temperature control panel(s).
 4. Lighting control panels.
 5. Mechanical control panel
 6. Security alarm control panel(s)

1.2 QUALITY ASSURANCE

- A. Reference to Codes, Standards, Specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid. Such codes or standards shall be considered a part of this Specification as though fully repeated herein.
- B. When codes, standards, regulations, etc. allow Work of lesser quality or extent than is specified under this Division, nothing in said codes shall be construed or inferred authority for reducing the quality, requirements or extent of the Contract Documents. The Contract Documents address the minimum requirements for construction.
- C. Work shall be performed in accordance with all applicable requirements of the latest edition of all governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:
1. California Electric Code (CEC).
 2. California Building Code (CBC).
 3. California Fire Code (CFC).
 4. California Mechanical Code (CMC).
- D. Standards: Equipment and materials specified under this Division shall conform to the following standards where applicable:
- | | |
|------|---------------------------------------|
| ACI | American Concrete Institute |
| ANSI | American National Standards Institute |

ASTM	American Society for Testing Materials
BICSI	Building Industry Consulting Service International, Inc
EIA	Electronics Industries Alliance
ETL	Electrical Testing Laboratories
FCC	Federal Communications Commission
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers, Inc
NEMA	National Electrical Manufacturer's Association
NETA	National Electrical Testing Association
NFPA	National Fire Protection Association
TIA	Telecommunication Industry Association
UL	Underwriters' Laboratories

1.3 DEFINITIONS

- A. Adapter: Shall mean a connecting device joining two fiber connectors, either like or unlike.
- B. Cabling: A system comprised of cables, wires, cords, and connecting hardware.
- C. Channel: End-to-end transmission path, i.e. the entire portion of the horizontal cabling to each outlet consisting of the Permanent Link, line cord (at the workstation), patch cord, and, if a full crossconnection is implemented, the crossconnect termination/connecting apparatus and equipment cord.
- D. Connect: To install required patch cords, equipment cords, cross-connect wires, etc. to complete an electrical or optical circuit.
- E. Cord: Shall mean length of cordage having connectors at each end. The term “cord” is synonymous with the term “jumper” and “lead.”
- F. Identifier: A unique code assigned to an element of the telecommunication infrastructure that links it to its corresponding record.
- G. Passive link segment: Shall mean the cable, connectors, couplings, and splices between two fiber optic termination units.
- H. Permanent link: Test configuration for a horizontal cabling link excluding test cords, connections at the ends of the test cords, patch cords, equipment cords, line cords, etc. The “permanent” portion of the horizontal cabling to each outlet consisting of cable, consolidation point (if used), termination/connecting apparatus in equipment rooms, and the connectors at outlets.
- I. Abbreviations:
 - 1. BEP: Building Entrance Protection, for termination of OSP twisted pair cabling.
 - 2. CAT: Category, used when identifying the performance characteristics of twisted pair cabling.
 - 3. CMP: Communication Media Plenum, rating applied to ISP twisted pair cable.
 - 4. CMR: Communication Media Riser, rating applied to ISP twisted pair cable.

5. IDF: Intermediate Distribution Facilities, telecommunication equipment rooms housing network equipment and containing termination fields for backbone cabling from MDF and horizontal cabling from outlet devices.
6. ISP: Inside Plant, cable installation within building.
7. MDF: Main Distribution Facilities, telecommunication equipment room housing possible service entrance facilities for interbuilding backbone cabling, network equipment, house voice system equipment headend, backbone cabling distribution headend, termination fields for backbone and horizontal cabling.
8. MMF: Multimode, fiber cable.
9. MPOE: Minimum Point of Entry, for serving telecommunications utility terminations. House's service provider's termination field(s) and interfaces between utility's facilities and premises facilities.
10. NAM: Network Access Module, workstations.
11. OFN: Optical Fiber Non-conductive, general purpose indoor non-plenum rated.
12. OFNP: Optical Fiber Non-conductive Plenum, plenum rated cable.
13. OFNR: Optical Fiber Non-conductive Riser, non-plenum rated riser cable.
14. OSP: Outside Plant, cable installation outside of building.
15. PIC: Plastic Insulated Conductors.
16. PVC: Polyvinyl Chloride.
17. SMF: Singlemode, fiber cable.
18. UTP: Unshielded Twisted Pair, copper cable type.

1.4 SUBMITTALS

- A. Format: Furnish in format as noted in Division 01.
- B. Submittals shall consist of detailed Shop Drawings, Specifications, block wiring diagrams, "catalog cuts" and data sheets containing physical and dimensional information, performance data, electrical characteristics, materials used in fabrication and material finish. Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories which are included and those which are excluded. Furnish quantities of each submittal as noted in Division 01.
- C. Each submittal shall be labeled with the Specification Section Number and shall be accompanied by a cover letter or shall bear a stamp stating that the submittal has been thoroughly reviewed by the Contractor and is in full compliance with the requirements of the Contract Documents. Cover letters shall list in full the items and data submitted. Failure to comply with this requirement shall constitute grounds for rejection of data.
- D. The Contractor shall submit detailed Drawings of all telecommunications equipment rooms and closets if the proposed installation layout differs from the construction documents. Physical size of telecommunications equipment indicated on the Drawings shall match those of the telecommunications equipment that is being submitted for review, i.e.: equipment racks, cable ladder, fuse protectors, ground bars, etc. Minimum scale: 1/4" = 1'- 0". Revised telecommunications equipment layouts must be approved prior to release of order for equipment and prior to installation.
- E. The Manufacturer shall recommend the method of anchoring the equipment to the mounting surface and shall provide the Contractor with the assembly dimensions, weights and approximate centers of gravity.

- F. All re-submittals shall include a cover letter that lists the action taken and revisions made to each Drawing and equipment data sheet in response to Submittal Review Comments. Re-submittal packages will not be reviewed unless accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the re-submittal package.
- G. Substitutions:
1. All requests for substitutions shall conform to the general requirements and procedure outlined in Division 01.
 2. Where items are noted as "or equal," a product of equal design, construction and performance will be considered. Contractor must submit to the Engineer all pertinent test data, catalog cuts and product information required substantiating that the product is in fact equal to that specified. Only one substitution will be considered for each product specified.
 3. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the Contract Documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment, which in the opinion of the Engineer is equal in quality, utility and appearance will be approved as substitutions to that specified.
 4. Whenever any material, process or equipment is specified in accordance with a Federal specification, an ASTM standard, an ANSI specification, UL rating or other association standard, the Contractor shall present an affidavit from the Manufacturer certifying that the product complies with the particular standard specification. When requested by the Engineer, support test data to substantiate compliance shall be submitted by the Contractor at no additional cost.
 5. Substitutions shall be equal, in the opinion of the Architect/Engineer, to the specified product. The burden of proof of such shall rest with the Contractor. When the Architect/Engineer in writing accepts a substitution, it is with the understanding that the Contractor guaranteed the substituted article or material to be equal to the one specified and dimensioned to fit within the construction. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the Work or from any provisions of the Specifications.
 6. The Contractor shall be responsible for all expenses in connection with the substitution materials, processes and equipment, including the effect of the substitution on the Contractor, Subcontractor's or other Contractor's Work. No substitution of material, processes or equipment shall be permitted without written authorization of the Architect/Engineer. Any assumptions on the acceptability of a proposed substitution prior to acceptance by the Engineer are at the sole risk of the Contractor.

1.5 COORDINATION

- A. Discrepancies:
1. In the event of discrepancies within the Contract Documents, the Engineer shall be so notified, within sufficient time, as delineated in Division 01, prior to the Bid Opening to allow the issuance of an Addendum.
 2. If, in the event that time does not permit notification or clarification of discrepancies prior to the Bid Opening, the following shall apply: The Drawings govern in matters of quantity and the Specifications govern in matters of quality. In the event of conflict within the Drawings involving quantities or within the Specifications involving quantities or within the Specifications involving quality, the greater quantity and higher quality shall apply. Such discrepancies shall be noted and clarified in the Contractor's Bid. No

additional allowances will be made because of errors, ambiguities or omissions that reasonably should have been discovered during the preparation of the Bid.

B. Project conditions:

1. Examination of Project site: The Contractor shall visit the Project site and thoroughly review the locale, working conditions, conflicting utilities and the conditions in which the Telecommunications Work will take place. Verify all existing conditions in the field. No allowances will be made subsequently for any costs that may be incurred because of any error or omission due to failure to examine the Project site and to notify the Engineer of any discrepancies between Contract Documents and actual Project site conditions.
2. Protection: Keep conduits, junction boxes, outlet boxes and other openings closed to prevent entry of foreign matter. Cover fixtures, equipment, devices and apparatus and protect them against dirt, paint, water, chemical or mechanical damage, before and during construction period. Prior to final acceptance, restore to original condition any fixture, apparatus or equipment damaged including restoration of damaged factory applied painted finishes. Protect bright finished surfaces and similar items until in service. No rust or damage will be permitted.
3. Supervision: Contractor shall personally or through an authorized and competent representative constantly supervise the Work from beginning to completion and, within reason, keep the same foreman and workmen on the Project throughout the Project duration.

C. Preparation:

1. Drawings:
 - a. Layout: General layout indicated on the Drawings shall be followed except where other Work may conflict with the Drawings.
 - b. Accuracy: Drawings for the Work under this Section are essentially diagrammatic within the constraints of the symbology applied.

1.6 RECORD DOCUMENTS

A. Provide Project Record Drawings as described herein:

1. Drawings shall fully represent installed conditions including actual locations of telecom outlets, patch panels, termination blocks, security panels, security devices, fiber panels, fire alarm panels, intercom systems, clock system, video system, labeling of all components and systems, correct conduit and cabling as well as routing, revised fire alarm schedule listing Manufacturers and products actually installed. Contractor shall record all changes in the Work during the course of construction on black line prints. These prints shall be made subject of monthly review by the Owner's Representative to ascertain that they are current. If not current monthly payments may be withheld.
2. Record Drawings shall be the transfer of information on these prints to the construction documents via computer aided drafting (CAD) or Revit process. A set of electronic Cad or Revit files of the Telecommunications documents will be provided to the Contractor in the design format.
3. Record drawing submissions shall be provided to the Engineer to review upon the completion of the following phases of Work:
 - a. All underground installation.
 - b. Building communications rough-in.
 - c. Final communications installation.

4. A single set of half size prints of the Record Drawings shall be submitted for review. Upon receipt of the Engineer's review comments, corrections shall be made and the Contractor shall provide the following:
 - a. Two sets of full size prints.
 - b. Four sets of half size prints.
 - c. One electronic file of Cad or Revit
 - d. One electronic set in pdf.

1.7 OPERATION AND MAINTENANCE MANUALS

- A. Prior to Project closeout furnish to the Owner, six (6) hard back 3-ring binders containing all bulletins, operation and maintenance instructions, part lists, service telephone numbers and other pertinent information as noted in each Section all equipment furnished under Division 26. Binders shall be indexed into Division Sections and labeled for easy reference. Bulletins containing more information than the equipment concerned shall be properly stripped and assembled.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 ROUGH-IN

- A. Contractor shall verify lines, levels and dimensions indicated on the Drawings and shall be responsible for the accuracy of the setting out of Work and for its strict conformance with existing conditions at the Project site.
- B. Verify final locations for rough-ins with field measurements and with the requirements for the actual equipment to be connected.
- C. Refer to equipment specification in Divisions 22 through 33 for rough-in requirements.

3.2 INSTALLATION

- A. Preparation, sequencing, handling and installation shall be in accordance with Manufacturer's written instructions and technical data particular to the product specified and/or accepted equal except as otherwise specified. Comply with the following requirements:
 1. Shop Drawings prepared by Manufacturer.
 2. Verify all dimensions by field measurements.
 3. Arrange for chases, slots and openings in other building components during progress of construction, to allow for telecommunications installations.
 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

5. Sequence, coordinate and integrate installations of telecommunications materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting height is not detailed or dimensioned, contact the Architect for direction prior to proceeding with rough-in.
7. Coordinate connection of telecommunications systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies and controlling agencies. Provide required connection for each service.
8. Install systems, materials and equipment to conform with approved submittal data, including coordination Drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are indicated only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
9. Install systems, materials and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install telecommunications equipment to facilitate servicing, maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
11. Coordinate telecommunications systems, equipment and materials installations with other building components.
12. Provide access panel or doors where devices or equipment are concealed behind finished surfaces. Furnish and install access doors per the requirements of Division 08.
13. Install systems, materials and equipment giving right-of-way priority to other systems that are required to maintain a specified slope.
14. Conform to the National telecommunications Contractor's Association "Standard of Installation" for general installation practice.

3.3 CUTTING, PATCHING, PAINTING AND SEALING

- A. Structural members shall in no case be drilled, bored or notched in such a manner that will impair their structural value. Cutting of holes, if required, shall be done with core drill and only with the approval of the Architect and Structural Engineer.
- B. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- C. Cut, remove and legally dispose of selected telecommunications systems equipment, components and materials as indicated, including but not limited to removal of telecommunications items indicated to be removed and items made obsolete by the new Work.
- D. Protect the structure, furnishings, finishes and adjacent materials not indicated or scheduled to be removed.
- E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- F. Patch existing surfaces and building components using experienced installers and new materials matching existing materials and the original installation. For installers'

qualifications refer to the materials and methods required for the surface and building components being patched.

G. Application of joint sealers:

1. General: Comply with joint sealer Manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.
2. Installation of fire-stopping sealant: Install sealant, including forming, packing and other accessory materials, to fill openings around telecommunications services penetrating floors and walls, to provide fire-stops and fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

3.4 FIELD QUALITY CONTROL

A. General testing requirements:

1. The purpose of testing is to ensure that all tested telecommunications equipment, both Contractor and Owner supplied, is operational and within industry and Manufacturer's tolerances and is installed in accordance with design Specifications.
2. Tests and inspections shall determine suitability for energization.
3. Perform tests in presence of the Owner's Representative and furnish test equipment, facilities and technical personnel required to perform tests.
4. Tests shall be conducted during the construction period and at completion to determine conformity with applicable codes and with these Specifications.

B. Tests: In addition to specific system test described elsewhere, tests shall include:

1. Equipment operations: Test All systems for proper operation
2. Circuit numbering verification: Select on a random basis various patch panel ports and wire test to verify compliance of the port labeling with actual field wiring.

C. Contractor shall perform testing on fiber strands with an OTDR and Power Meter.

D. Contractor shall perform testing on each cable of the Structured Cabling system with test equipment that will provide a full test of the EIA/TIA requirements for the installed category cable and provide test results of each cable under test.

E. Testing safety and precautions:

1. Safety practices shall include the following requirements:
 - a. Applicable State and Local safety operating procedures.
 - b. OSHA.
 - c. NSC.
 - d. NFPA 70E.

F. Calibration of test equipment:

1. Testing Agency shall have calibration program that assures test instruments are maintained within rated accuracy.
2. Instruments shall be calibrated in accordance with the following frequency schedule:
 - a. Field instruments: Analog, 6 month maximum; Digital, 12 months maximum.
 - b. Laboratory instruments: 12 months.
 - c. Leased specialty equipment: 12 months where accuracy is guaranteed by lessor.

3. Dated calibration labels shall be visible on test equipment.
 4. Records, which show date and results of instruments calibrated or tested, must be kept up-to-date.
 5. Up-to-date instrument calibration instructions and procedures shall be maintained for test instrument.
 6. Calibration standards shall be of higher accuracy than instrument tested.
 7. Equipment used for field testing shall be more accurate than instrument being tested.
- G. Coordinate with General Contractor regarding testing schedule and availability of equipment ready for testing.
- H. Notify Owner and Engineer one week in advance of any testing.
- I. Any products which fail during the tests or are ruled unsatisfactory by the Owner's Representative shall be replaced, repaired or corrected as prescribed by the Owner's Representative at the expense of the Contractor. Tests shall be performed after repairs, replacements or corrections until satisfactory performance is demonstrated.
- J. Testing Agency shall maintain written record of tests and shall assemble and certify final test report.
- K. Include all test results in the maintenance manuals.

3.5 CLEANING

- A. Prior to acceptance of telecommunications systems, the Contractor shall thoroughly clean telecommunications rooms from construction debris, scrap wire, etc. using Manufacturer's approved methods and materials.
- B. Upon completion of Project, prior to final acceptance, the Contractor shall thoroughly clean both the interior and exterior of all Telecommunications equipment per Manufacturers approved methods and materials. Remove paint splatters and other spots, dirt and debris.
- C. Touch-up paint any marks, blemishes or other finish damage suffered during installation.

3.6 PROJECT CLOSEOUT

- A. Training: At the time of completion, a period of not less than 2 hours shall be allotted by the Contractor for instruction of building operating and maintenance personnel in the use of all systems. This 2 hours training is in addition to any instruction time called out in the Specifications for specific systems. All personnel shall be instructed at one time, the Contractor making all necessary arrangements with Manufacturer's Representative. The equipment Manufacturer shall be requested to provide product literature and application guides for the users' reference. Costs, if any, for the above services shall be paid by the Contractor.
- B. Special tools: Provide one of each tool required for proper operation and maintenance of the equipment provided under this Section. All tools shall be delivered to the Owner at the Project completion.

C. Keying: Provide two keys for each lock furnished under this Section and turn over to Owner.

END OF SECTION 270010

SECTION 27 05 00 - TELECOMMUNICATINS PATHWAYS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Telecom pathway system.

1.2 REFERENCES

- A. ANSI/TIA/EIA-569-A, Commercial Building Standard for Telecommunications Pathways and Spaces.
- B. ANSI/TIA/EIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications.

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide an empty ANSI/TIA/EIA-569-A compliant raceway system for the building camera data wiring as indicated on Drawings and as specified herein.
- B. Provide a complete raceway system from data outlet to IDF room designated to serve that outlet. Raceway system to include, but not limited to, wall/floor penetrations, boxes, sleeves, conduits, and surface raceway. Provide independent support from building structure for raceway components.

1.4 CLOSEOUT SUBMITTALS

- A. Submit product data and shop drawings in accordance with Division 01.
- B. Modify product data and shop drawings to reflect construction modifications.

PART 2 - PRODUCTS

2.1 RACEWAY

- A. Provide defined pathways for open cable runs through protected accessible spaces.
- B. Provide conduits and pull strings through inaccessible spaces.
- C. Components as specified in related Sections.

2.2 ACCESSORIES

- A. D-Rings:
 - 1. Die-cast aluminum.
 - 2. Designed for holding cables on equipment mounting boards. Reference product: Allentel GB13A, B, and C.
- B. J Hooks: Erico Caddy Cable Cat Clips, except the tee grid or drop wire style.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

- A. Provide independent support from building structure for raceway components and cable supports.
- B. Install plastic-jacketed pull lines printed with accurate sequential footage in empty conduits.

- C. Provide insulated bushings on conduits and sleeves.
- D. Conduit bodies (condulets) are not to be used in data raceway system.

3.2 INSTALLATION - OUTLET BOXES

- A. Install conduit no smaller than 1-inch trade size from any signal outlet box.
- B. Wall Boxes: Install minimum 2.5-inch deep double-gang (4- X 4-inch) box and minimum 1-inch conduit to accessible space.
- C. Mount center of outlet boxes as required by ADA, or noted on drawings, the following distance above the floor:

3.3 INSTALLATION - RACEWAY AND PULLBOXES

- A. Install no more than two 90 degree bends or a maximum of 180 degrees of curvature between pullboxes.
- B. Install pullboxes along conduit at maximum 100-foot spacing.
- C. Provide minimum 12- X 12- X 4-inch pullboxes with screw type lids, minimum four screws to secure lid.
- D. Use long radius elbows for raceway bends; do not use pullboxes in place of a raceway bend.
- E. Size conduits to multiple camera outlets as follows. Sizing is based on TIA/EIA 569-A for 28 percent conduit fill, assuming Category 6A cables (nominal outer diameter 0.3-inch) to each data outlet. Provide recessed backbox between surface raceway and recessed conduit sized for conduit.
 - 1. 1 to 3 cables 1-inch conduit
 - 2. 4 to 5 cables 1-1/4-inch conduit
 - 3. 6 to 7 cables 1-1/2-inch conduit
 - 4. 8 to 12 cables 2-inch conduit
- F. Provide continuous sleeving through walls, floors and ceilings separating each data outlet from its respective IDF room, using sleeve conduit sized 2" Minimum. Restore penetrations through rated assemblies to original fire rating per NFPA and local codes.
- G. install sleeves above suspended ceilings, and locate to minimize length of pathway for future cable from data outlet to IDF rooms.
- H. Where sleeves are routed between rooms with floating ceilings, extend conduits horizontally 2 feet over edge of floating ceiling to avoid exposed cabling from being seen at floor level.

END OF SECTION 270500

SECTION 270553 - IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
1. Identification Requirements and Labeling Systems - General
 2. Identification Requirements and Labeling Systems - Equipment Racks
 3. Identification Requirements and Labeling Systems - Equipment Cabinets
 4. Identification Requirements and Labeling Systems - Fuse Protectors
 5. Identification Requirements and Labeling Systems - Vertical & Horizontal Wire Managers
- B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

<u>SECTION NO.</u>	<u>SECTION TITLE</u>
270010	BASIC COMMUNICATIONS REQUIREMENTS

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
1. American National Standards Institute, Inc. (ANSI):
 2. Electronics Industries Alliance (EIA):
 3. Factory Mutual System (FM):
 4. Federal Communications Commission (FCC) Regulations:
 5. Federal Specifications (FS):
 6. Institute of Electrical and Electronic Engineers (IEEE):
 7. National Electrical Manufacturer Association (NEMA):
 8. National Fire Protection Association (NFPA):
 9. Telecommunications Industry Association (TIA)
 10. Underwriters Laboratories, Inc. (UL):

1.3 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
1. Data/catalog cuts for each product and component specified herein.
 2. Schedules for nameplates to be furnished.

1.4 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated on the Drawings.
 - 1. Identification Requirements and Labeling Systems:
 - a. Brady.
 - b. Panduit.
 - c. Tyton
- B. Substitutions: Under provisions of Section 270010: Basic Communications Requirements.

2.2 NAMEPLATES

- A. Type NP: Engraved, plastic laminated labels, Signs and Instruction Plates. Engrave stock melamine plastic laminate 1/16-inch minimum thickness for signs up to 20 square inches or 8 inches in length; 1/8 inch thick for larger sizes. Engraved nameplates shall have white letters and be punched for mechanical fasteners.
- B. Color and letter height as specified in Part 3: Execution.

2.3 INSCRIBED DEVICE COVERPLATES

- A. Methods of inscription: (Unless otherwise noted)
 - 1. Type-on-tape:
 - a. Imprinted or thermal transfer characters onto tape lettering system.
 - b. Tape trimmer.
 - c. Matte finish spray-on clear coating.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of switchboard installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 APPLICATION

- A. Identification Requirements and Labeling Systems - General
- B. Data Plates, Cameras, Cable Ends, Patch Panels

3.3 PORT LABELING STANDARDS

- A. All labeling will meet TIA/EIA-606-A Class 4 standards.
- B. All cables are to be labeled at both ends no more than 3 inches back from each end with a cable label that matches the faceplate labeling.
- C. Labels will be typed with black on white with permanent label tape with a continuous number strip.
- D. Port names will reflect its location by site/campus, floor, MDF/IDF closet, patch panel and port number to allow easy identification of each termination.

DESIGNATION	CHARACTERS
Site/Campus	2 alpha characters (site/campus acronym)
Floor	1 numeric character
MDF/IDF (Closet)	1-2 alpha characters
Patch Panel	1 alpha character
Port Number	2 numeric characters

SITE/CAMPUS	ACRONYM
Bear River High School	BR
McCourtney Road Education Site	MC
Nevada Union High School	NU
Park Avenue Alternative Education Site	PA
District Office	DO
Annex	ANX

FLOOR	CHARACTERS
Basement	0
First Floor	1
Second Floor	2
Add one for each consecutive floor thereafter	...

MDF/IDF (CLOSET)	CHARACTERS
MDF	A
First IDF	B
Second IDF	C
Add one for each consecutive IDF thereafter	...

PATCH PANEL	CHARACTERS
First patch panel in rack (top to bottom, left to right)	A
Second patch panel in rack	B
Add one for each consecutive patch panel thereafter	...

PORT NUMBER	CHARACTERS
Sequence numbers from left to right on patch panel	1-48

3.4 CLEANING

- A. Upon completion of Project prior to final acceptance the Contractor shall thoroughly clean all equipment per Manufacturers approved methods and materials. Remove paint splatters and other spots, dirt and debris.
- B. Touch-up paint any marks, blemishes or other finish damage suffered during installation.

END OF SECTION 270553

SECTION 27 15 00 - HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
 - 1. Horizontal twisted pair cabling.
 - 2. Telecommunication testing.
- B. Related Work: Consult all other Sections, determine the extent and character of related Work and properly coordinate Work specified herein with that specified elsewhere to produce a complete installation.

1.2 RELATED SECTIONS

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

<u>SECTION NO.</u>	<u>SECTION TITLE</u>
270010	BASIC COMMUNICATIONS REQUIREMENTS

1.3 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
 - 1. Federal Communications Commission (FCC) Regulations:
 - FCC Part 15; Radio Frequency Devices & Radiation Limits.
 - FCC Part 68; Connection of Terminal Equipment to the Telephone Network.
 - 2. Electronics Industries Alliance (EIA):
 - EIA; Testing Standards.
 - 3. American National Standards Institute, Inc. (ANSI) / Telecommunications Industry Association (TIA) / Electronics Industries Alliance (EIA):
 - ANSI/TIA/EIA-568-C; Commercial Building Telecommunications Cabling Standards, including the following:
 - Part 1: General Requirements.
 - Part 2: Balanced Twisted-Pair Cabling Components.
 - Part 2, Addendum 1: Transmission Performance Specifications for 4-Pair 100 Ohm Category 6 Cable.

- TIA SP 3-4426 (12/28/06 or latest version): Transmission Performance Specifications for 4-Pair 100 Ohm Augmented Category 6 Cable (to be published as TIA-568-C.2-10).
- ANSI/TIA/EIA-569-A; Commercial Building Standard for Telecommunications Pathways and Spaces, including the following:
- TIA/EIA-569-A-1: Perimeter Pathway Addendum.
 - TIA/EIA-569-A-2: Furniture Pathway Fill Addendum.
 - TIA/EIA-569-A-3: Access Floors.
 - TIA/EIA-569-A-4: Poke-Thru Devices.
 - TIA/EIA-569-A-6: Multi-Tenant Pathway and Spaces.
 - TIA/EIA-569-A-7: Cable Trays and Wireways.
- ANSI/TIA/EIA-598-B; Optical Fiber Cable Color Coding.
- ANSI/TIA/EIA-606-B; Administration Standard for Commercial Telecommunications Infrastructure.
- ANSI/J-STD-607-A; Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
- ANSI/TIA/EIA-758; Customer-Owner Outside Plant Telecommunications Cabling Standard (TIA/EIA-758-1: Addendum No. 1).
- TIA TSB-155; Guidelines for the Assessment and Mitigation of Installed Category 6A Cabling to Support 10GBase-T.
4. Building Industry Consulting Service International, Inc. (BICSI):
- BICSI (TDMM); Telecommunication Distribution Methods Manual.
 - BICSI; Customer-Owner Outside Plant Design Manual.
 - BICSI (WDRM); Wireless Design Reference Manual.
 - BICSI (NDRM); Network Design Reference Manual.
5. Insulated Cable Engineers Association (ICEA):
- ICEA S-80-576-2002; Category 1 & 2 Individually Unshielded Twisted Pair Indoor Cables for Use in Communications Wiring Systems.
 - ICEA S-83-596-1994; Fiber Optic Premises Distribution Cable.
 - ICEA S-87-640-1999; Fiber Optic Outside Plant Communications Cable.
 - ICEA S-90-661-2002; Category 3, 5 & 5e Individually Unshielded Twisted Pair Indoor Cable for Use in General Purpose and LAN Communication Wiring Systems.
 - ICEA S-104-696-2001; Standard for Indoor-Outdoor Optical Cable.
6. Underwriters Laboratories, Inc. (UL):
- UL 444; Communication Cables.
 - UL 497; Protectors for Paired-Conductor Communication Circuits.
 - UL 1651; Optical Fiber Cable.

UL 1690;	Data-Processing Cable.
UL 1963;	Communications-Circuit Accessories.
UL 2024A;	Optical Fiber Cable Routing Assemblies.

1.4 DEFINITIONS

- A. Above finish floor (AFF) - Standard mounting height (e.g., 18 inch AFF) for a device using the center line of the device as the measurement point.
- B. Administration - The methodology defining the documentation requirements of a cabling system and its containment, the labeling of functional elements and the process by which moves, additions, and changes are recorded.
- C. ANSI/TIA/EIA - Associations involved in developing telecommunications industry standards.
- D. Attenuation - The decrease in magnitude of transmission signal strength between points, expressed in dB as the ratio of output to input signal level.
- E. Attenuation-to-crosstalk ratio (ACR) - The ratio obtained by subtracting insertion loss (attenuation [dB]) from near-end crosstalk (dB). ACR is normally stated at a give frequency.
- F. Auditory assistance device - An intentional radiator used to provide auditory assistance to a handicapped person or persons. Such a device may be used for auricular training in an educational institution, for auditory assistance at places of public gatherings, such as a church, theater, or auditorium, and for auditory assistance to handicapped individuals, only, in other locations.
- G. Backboard - Backboard generally refers to the 3/4" A-C grade plywood sheeting, lining the walls of the telecommunications room. Plywood shall be void-free, with two coats of fire retardant paint matching the painted interior walls covering both sides.
- H. Backbone - A facility (e.g., pathway, cable, or conductors) between any of the following spaces: telecommunications rooms, common telecommunications rooms, floor-serving terminals, entrance facilities, equipment rooms, and common equipment rooms.
- I. Basic link test configuration - Horizontal cable of up to 90m (295 ft) plus up to 2m (6.5 ft) of test equipment cord from the main unit of the tester to the local connection, and up to 2m (6.5 ft) of test equipment cord from the remote connection to the remote unit of the tester. Maximum length is 94 m (308 ft).
- J. Bonding Conductor (BC) - A conductor used specifically for the purpose of bonding.
- K. Cable Labeling System –
 - 1. The scheme employed when identifying cable or its associated hardware.
 - 2. Scheme adapted for labeling cables to identify them based on ANSI/TIA/ EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure. See administration.

- L. Cable Runway - Hardware designed and manufactured for horizontal pathway distribution of cable and inside wiring inside the MC, IC, or TR rooms.
- M. CAT - Category used when identifying the performance characteristics of twisted pair cabling.
- N. Ceiling Distribution System - A distribution system that utilizes the space between a suspended or false ceiling and the structural surface above.
- O. Closed-Circuit Television (CCTV) - A private television system, typically used for security purposes, in which the signal is transmitted to a limited number of receivers.
- P. Communications plenum cable (CMP) - Type CMP communications plenum cable shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics. (NEC)Cables must pass required test for fire and smoke characteristics of wires and cables, NFPA 262 or UL 910.
- Q. Communications Riser Cable (CMR) - Type CMR communications riser cable shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor. (NEC) Cables must pass requirements for flame propagation.
- R. Electromagnetic Interference (EMI) - Radiated or conducted electromagnetic energy that has an undesirable effect on electronic equipment or signal transmissions.
- S. Entrance Conduit - Conduit that connects the campus underground infrastructure with the building's Telecommunications Room.
- T. Fire Retardant - Any substance added to delay the start or ignition of fire or slow the spread of the flame of any material.
- U. Firestopping - The process of installing [specialty] listed fire-rated materials into penetrations of fire-rated barriers to reestablish the fire-resistance rating of the barrier.
- V. Firestopping Location. A penetration through a fire-rated wall with a sleeve.
- W. Firestop System - A specific installation consisting of the material(s) (firestop penetration seals) that fill the opening in the wall or floor assembly, and around and between any items that penetrate the wall or floor (e.g., cables, cable trays, conduit, ducts, pipes), and any termination devices (e.g., electrical outlet boxes) along with their means of support.
- X. Grounding Conductor - A conductor used to connect the grounding electrode to the buildings main grounding busbar.
- Y. Grounding System - A system of hardware and wiring that provides an electrical path from a specified location to an earth ground point.
- Z. Horizontal Cabling - The part of the cabling system that extends from the work area telecommunications outlet to the horizontal cross-connect in the telecommunications room.

- AA. Hybrid Cable - An assembly of two or more cables, of the same or different types or categories, covered by one overall sheath.
- BB. Infrastructure (Telecommunications) - A collection of those telecommunications components, excluding equipment, that together provide the basic support for the distribution of all information within a building or campus.
- CC. Intermediate Cross-connect (IC) - the connection point between a backbone cable that extends from the main cross-connect and the backbone cable from the horizontal cross-connect.
- DD. Loose Tube - A type of optical fiber cable construction where one or more fibers are laid loosely in a tube. Also called loose tube fiber.
- EE. Main Cross-connect (MC) - The cross-connect normally located in the Telecommunications Equipment Room for cross-connection and interconnection of entrance cables, first-level backbone cables, and equipment cables.
- FF. Metropolitan Area Network (MAN) - A data communications network that covers an area larger than a campus area and smaller than a wide area network. Typically interconnects two or more LANs and usually covers an entire metropolitan area.
- GG. MPOE - Minimum Point of Entry, Utility Partnerships/Alternate Carrier, usually located within the Telecommunications Room.
- HH. Multimode Fiber (MMF) - An optical fiber that carries many paths of light or an optical waveguide that allows many bound modes to propagate.
- II. Single-mode Fiber (SMF) - An optical fiber, usually step-index grade, which supports only one mode of light propagation. This does not necessarily imply single wavelength operation. The light source is normally a laser.
- JJ. Strand (STR) - A single unit of optical fiber within a cable (e.g., a 12-strand fiber cable has 12 individual optical fibers within the cable sheath).
- KK. Telecommunications Entrance Facility - Utility Partnerships/Alternate Carrier Minimum Point of Entry that is usually located within the Main Cross-connect Room (MC).
- LL. Telecommunications Equipment Room (TER) - A centralized space that provides space and maintains a suitable operating environment for the termination of backbone and campus cabling and house centralized communications and/ or computer equipment (such as Core Switches and Servers). *Note:* An equipment room is considered distinct from a telecommunications closet because of the nature or complexity of the equipment housed by the equipment room.
- MM. Telecommunications Main Grounding Busbar (TMGB) - A grounding busbar, located in the MC, connected to the main building ground electrode by a continuous 2/0 - #4 AWG wire (Wire size is dependent on the distance between the busbar and the building main).

- NN. Telecommunications Room (TR) – A room dedicated to housing a group of telecommunications connectors (e.g., patch panel or punch-down block) that allows equipment and backbone cabling to be cross connected with patch cords or jumpers.
- OO. Underwriters Laboratories (UL) - A United States-based independent testing laboratory that sets safety tests and standards.
- PP. Uninterruptible Power Supply (UPS) - A device that is inserted between a primary power source (e.g., a commercial utility) and the primary power input of equipment to be protected (e.g., a computer system) to eliminate the effects of transient variances or temporary outages. Retain acronyms, abbreviations, and terms that remain after this Section has been edited.

1.5 SYSTEM DESCRIPTION

- A. Provide a complete telecommunication cabling system installation as specified herein and as shown on the Drawings. In general, system shall include, but not be limited to, the following:
1. Horizontal twisted pair cabling:
 - a. Primary horizontal twisted pair cable shall route between the IDF and surveillance cameras, and shall consist of Category 6A 4-pair, UTP, plenum rated copper cables.
 - b. Secondary spare horizontal twisted pair cable shall route between the IDF and the nearest ceiling of the surveillance camera primary cable, and shall consist of Category 6A 4-pair, UTP, plenum rated copper cable with 20ft coil.
 - c. Category 6A horizontal twisted pair cable for future WAP in weight room.
 - d. Category 6 horizontal twisted pair cable for future wall phone in weight room.
 - Patch cords:
 - e. UTP patch cords shall match the physical and performance criteria of the specified horizontal twisted pair cable from the same manufacturer. Patch cords shall be furnished in varying lengths as required.
 - f. Patch cord quantities shall match the following:
 - 1) One patch cord for each category 6A cable installed to the camera at the IDF.
 - 2) One field terminated male plug at the camera for a direct connection.
 2. Surveillance Camera Outlets
 - a. Above ceiling telecommunication outlets shall consist of the following, unless otherwise noted on the Drawings:
 - b. Two horizontal twisted pair category 6A cable(s) per outlet. Blues
 - c. Two port surface mount box (bisquit) for above ceiling attached to 12 awg. steel wire or wall.
 - d. One RJ-45 connector jack for spare twisted pair terminations. Color to match cable.
 - e. One field terminated Category 6A plug for camera.
 - f. Termination of a category 6A green jack (Green-Camera) and (Blue-Spare) at IDF patch Panel.

1.6 SUBMITTALS

- A. Submit in accordance with the requirements of Section 270010: Basic Communications Requirements, the following items:
1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
 2. Describe system operation, equipment, dimensions and indicate features of each component.
 3. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 4. Shop Drawings prepare in Revit 2015, to include the following:
 - a. Building floor plans showing location of all outlets, raceways, cable trays, conduits and cable routing to each device at same scale as construction documents.
 - b. Provide 1/4" scale plans of equipment layout in BDF and IDF rooms.
 - c. Provide wall elevations of BDF and IDF rooms at 1/4" scale.
 - d. Provide equipment rack elevations at 1/4" scale.
 - e. Use identical symbols as those used in construction documents.
 - f. Text shall be a minimum of 3/32" high when plotted at full scale.
 - g. Screen all background information.
 5. Furnish structural calculations for equipment anchorage as described in Section 270010: Basic Communications Requirements.
 6. Complete bill of materials listing all components.
 7. Warranty.
- B. Installer's qualifications: Furnish satisfactory proof of required experience specified herein for system installer.
1. The installing contractor shall be certified by the manufacturer for the product installed to provide a manufacturers product and application warranty.
 2. Technicians shall be certified by the manufacturer of the system components installed per the manufacturers requirements to provide a certified structured cabling system.
- C. Record Drawings:
1. Furnish Record Drawings as described in Section 270010: Basic Communications Requirements, utilizing Shop-Drawing submissions with updated field conditions. These Drawings shall include but not be limited to the following:
 - a. Plot plans and building floor plans, showing point-to-point wiring location of all devices.
 - b. Block Diagram/Riser Diagram showing the system components and all conduit and wire type/sizes between each.
 2. Drawings shall be incorporated into the Record Drawing submission.
 3. Final acceptance will not be made until the Engineer has approved the Record Drawings.

1.7 OPERATION AND MAINTENANCE MANUAL

- A. Supply operation and maintenance manuals in accordance with the requirements of Section 270010: Basic Communications Requirements, to include the following:
1. A detailed explanation of the operation of the system.
 2. Pictorial parts list and part numbers.
 3. Schematic wiring diagrams.
 4. Telephone numbers for the authorized parts and service distributor.
 5. Final testing reports.

1.8 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this section may be used on the Project unless otherwise submitted.
- C. Manufacturer qualifications: Manufacturer must have a minimum 5 continuous years of experience in design and manufacturing of the materials and equipment specified herein.
- D. Installer's qualifications:
 - 1. Installer must have a minimum 5 continuous years of experience in satisfactory completion for Projects similar in scope and cost. Provide backup information on 5 such Projects.
 - 2. Installer shall possess a current, active and valid C7 California State Contractors License.
 - 3. Conduit contractor shall possess a current, active and valid C10 California State Contractors License.
 - 4. The installer shall be the **Panduit** manufacturer's certified reseller/installer of the telecommunication equipment/cable system provided. The certification shall have been completed 60 days prior to project bid date. Provide evidence of this certification.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Telecommunication system components shall not be delivered to the Project site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipping shall be replaced and returned to Manufacturer at no cost to Owner.
- B. Storage: Store in clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris and traffic.
- C. Handling: Handle in accordance with Manufacturer's written instructions. Be careful to prevent internal components damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.10 WARRANTY

- A. Units and components offered under this Section shall be covered by a Life Time product and application warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall be provided from the component manufacturer and shall name the owner on the warranty certificate. Warranty shall begin upon acceptance by the Owner.
- B. Contractor shall provide required drawings, test results, application and any other items required by the manufacturer to produce the required warranty.

1.11 MAINTENANCE

A. Maintenance services:

1. Distributor of the major system components shall maintain a replacement parts department and provide testing equipment when needed. A complete parts department shall be located close enough to supply replacement parts within a 4 hour period.
2. Service must be rendered within 4 hours of system failure notification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturers shall be in compliance with all features specified herein and indicated on the Drawings.
1. Horizontal twisted pair category 6 and 6A cable:
 - a. General Cable
 2. Cat 6 or Cat 6A Twisted pair patch cord cable:
 - a. Panduit
 3. Category 6 and 6A Horizontal Structured Cable Systems
 - a. Panduit
 4. Test equipment:
 - a. Fluke Networks.
 - b. Agilent Technologies WireScope 350 Test Set.
 - c. Tektronix.
- B. Horizontal cable support bar:
1. Application: Suitable to horizontally support cables at termination points on back of patch panels
 2. Finish: Anodized Black

2.2 HORIZONTAL TWISTED PAIR CABLING

- A. Horizontal cables:
1. Application:
 - a. Suitable for indoor installations, exposed within equipment rooms, above suspended ceilings and below raised floors in cable trays, hangers or on deck, or within walls. If space is used as an air plenum, cable shall either be plenum rated or installed in EMT conduit.
 - b. Each cable run shall be continuous single cable, homogenous in nature, without splices.
 - c. Cables shall meet CAT6 and 6A performance criteria.
 - d. Cables shall be CMR or CMP rated as required for rating of space..
 2. Conductors:
 - a. Insulated conductors: Eight #22_AWG, solid copper wire insulated with FEP for plenum applications or thermoplastic polyethylene or high-density polyolefin for non-plenum rated applications.
 - b. Twisted pairs: Two insulated conductors twisted together to form a pair and four such paired cables to form a unit with individually color-coded pairs to conform to industry standards (ANSI/ICEA Publication S-80-576-1994 and EIA-230).
 3. Cable sheath:
 - a. Outer jacket: Seamless outer jacket, flame-retardant PVC, applied to and completely covering the internal components (twisted pairs).
 - b. Flame rating: CMP according to NEC Article 800, tested to NFPA 262 and UL Listed as such.
 4. Electrical performance: Meet or exceed TIA/EIA-568-C.2 for CAT6 and Cat 6A UTP cabling.

5. Manufacturer: General Cable
 - a. Category 6A (Camera and Spares): GenSpeed shielded cable 10,000 F/UTP (ScTP), # 7131849
 - b. Category 6: GenSpeed Enhanced 6000, #7131900

B. Patch Cords

1. Application: Suitable for indoor installations within equipment rooms or workstation environments.
2. Cords assembled from a single, continuous length of cordage, homogenous in nature and terminated at both ends via 8-position modular plugs. Splices are not permitted anywhere.
3. Cordage:
 - a. Insulated conductors: Eight #24 AWG, solid copper wire insulated with thermoplastic polyethylene or high-density polyolefin for non-plenum rated applications.
 - b. Twisted pairs: Two insulated conductors twisted together to form a pair and four such paired cables to form a unit with individually color-coded pairs to conform to industry standards (ANSI/ICEA Publication S-80-576-1994 and EIA-230).
4. Cable sheath:
 - a. Outer jacket: Seamless outer jacket, flame-retardant PVC, applied to and completely covering the internal components (twisted pairs).
 - b. Flame rating: CM according to NEC Article 800, tested to UL listed as such.
5. Electrical performance: Meet or exceed TIA/EIA-568-C.2 for Cat 6A UTP cabling.
6. Panduit #: Category 6A, #UTP28XX-~~xx~~ (Length as required)

2.3 CATEGORY 6A DATA SYSTEM PATCH PANELS

- A. Application: To terminate horizontal distribution cable for data and camera systems. The termination panels shall be modular, pre punched for Cat 6A jacks.
1. 24 port panels. CP24BLY
 2. 48 port panels. CP48BLY

2.4 CATEGORY 6 TELEPHONE SYSTEM PATCH PANELS

- A. Application: To terminate horizontal distribution cable for telephone. The Termination panels shall be pre category 6, 1U, 24 port panels.

2.5 2U HORIZONTAL WIRE MANAGERS

- A. Two sided horizontal wire mangers placed above and below patch panels.
1. Panduit #NCMH2

2.6 JACKS AND WALLPLATES

- A. Two port surface mount boxes shall be suitable for above ceiling and located near the conduit serving the camera.

- B. Outlet faceplates shall be suitable for indoor installations to standard 4 11/16" surface mount outlet box when accessible ceiling is not available, and located near the camera.
- C. Jacks:
 - 1. Security Camera Jack: #CJ6X88TGGR (Green)
 - 2. Security Camera 6A Modular Plugs: SP6X88-C
 - 3. WAP Data Jacks shall be 8 pin, IDC termination and rated Category 6A.
 - a. WAP Jack : #CJ6X88TGBU (Blue)
- D. Labels:
 - 1. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer or hand-held printer.
 - 2. Labels for horizontal cables:
 - a. Adhesive backed labels and self-laminating feature.
 - b. Fit the horizontal cables specified herein by fully wrapping around the cable jacket.
 - c. Size: 2" x .5" printable area, minimum.
 - d. Color: White with black lettering
- E. Miscellaneous components:
 - 1. Velcro cable ties:
 - a. Width: 0.75".
 - b. Color: Velcro cable ties the same color as the cable to which it is applied.
 - 2. Plenum cable ties:
 - a. Suitable for use in plenums or air handling spaces.
 - b. Color: Maroon or other distinctive non-white color.

2.7 CABLE TESTING EQUIPMENT

- A. Twisted pair cabling:
 - 1. Horizontal cable tester:
 - a. Equipment shall meet TIA/EIA-568C.2 Addendum 1 requirements for Level III accuracy, as applicable for cable type specified herein.
 - b. Test standards: ISO/IEC 11801 Class C and D; ISO/IEC 11801-2000 Class C and D, **10Base-G**, 1000Base-Y, 100Base-TX; IEEE 802.3 10Base-T; ANSI TP-PMD; IEEE 802.5.
 - c. Areas of test measurement (minimum):
 - 1) Wire Map.
 - 2) Length.
 - 3) Insertion Loss.
 - 4) The following at both master unit and remote unit:
 - a) Near End Crosstalk (NEXT) loss.
 - b) Power Sum NEXT (PSNEXT) loss.
 - c) Equal Level Far End Crosstalk (ELFEXT).
 - d) Power Sum ELFEXT.
 - e) Return Loss (RL).
 - f) Attenuation-to-Crosstalk Ratio (ACR).
 - g) Power Sum ACR (PSACR).

- 5) Propagation Delay and Delay Skew.
- 6) Characteristic Impedance.
- 7) DC Loop Resistance.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of the telecommunication cabling system installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.
- B. Verify that pathways and supporting devices are properly and completely installed prior to cable installation.
- C. Verify dimensions of pathways to include length, i.e. "true tape" conduit runs.
- D. Prior to installation, verify that equipment rooms are ready to accept cables and terminations.

3.2 INSTALLATION

- A. Horizontal management panels:
 - 1. Provide the horizontal management panels mounted to racks with one above the top patch panel and one below the bottom patch panel in each rack bay where patch panels occur.
 - 2. Provide fasteners and parts required to complete the installation.
- B. Accessories: Provide all accessories as required for a complete installation. Include one bag of rack mounting screws, as come packaged with rack product. Attach the screws directly to the rack, which shall constitute turn-over to the Owner.
- C. Horizontal twisted pair cabling:
 - 1. Horizontal cable installation and routing:
 - a. Cable runs shall have continuous sheath continuity, homogenous in nature with no splicing.
 - b. Cabling shall not exceed a cable length of 295' (90m) from the termination point at the Telecom room to the termination at the workstation outlet, including service slack, when measured using test equipment.
 - c. Place cables within the designated pathways, such as cable tray or basket tray, cable runway, cable hangers, etc. Do not fasten, support or attach cables to other building infrastructures (i.e. ducts, pipes, conduits, etc.), other systems (i.e. ceiling support wires, wall studs, etc.), or to the outside of conduits, cable trays and non-approved pathway systems.
 - d. Place and suspend cables during installation and termination in a manner to protect them from physical damage or interference. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation or termination at no additional cost.
 - e. Route cables at 90° angles, allowing for bending radius.
 - f. Do not exceed pulling tension of 25 lbs.
 - g. Do not use cable-pulling compounds.
 - h. Do not exceed a minimum bend radius of 6 times the cable diameter during and after installation.
 - i. Route cables beneath other building infrastructures (i.e. ducts, pipes, conduits, etc.) in above ceiling applications. Do not route cables over building

- infrastructure/s. The installation shall result in easy accessibility to the cables in the future.
- j. Place cables 6” minimum away from power sources to reduce interference from EMI.
 - k. **Set service loops at 360 degrees.**
 - l. Place a pull string along with cables where run in conduits and spare capacity in conduit remains. Tie off ends of the pull string to prevent the string from falling onto the conduit.
 - m. When exiting the primary pathway, such as cable or basket tray, to the workstation outlets, exit via the top of the pathway. Secure the cables to the pathway using an approved velcro cable tie.
2. Cable routing and dressing within telecommunications rooms:
- a. Within rooms, only use Velcro type straps.
 - b. Place cables within the overhead cable support system. When routing vertically on walls, fasten the cables onto vertical supports every 24” on center.
 - c. Provide 12” minimum sheath cable slack, length not to exceed permanent link maximum length requirement. Place the slack in the overhead cable support system.
 - d. At the rack bay, route and neatly dress cables from the overhead cable support system into the back of the vertical management sections. Divide the cables equally between both sides of an equipment rack such that a cable does not travel past the midpoint of the rack prior to termination. Fasten the cables to the cable support bar at the back of the patch panel using approved ties.
3. Termination in the telecommunications rooms:
- a. Provide termination apparatus and accessories required for a complete installation. Install and assemble termination apparatus, accessories and associated management apparatus according to the manufacturer’s instructions.
 - b. Properly relieve strain from the cables to and at termination points per manufacturer’s instructions. Provide a strain relief bar at the back of the modular patch panels for proper strain relief.
 - c. Terminate cables and twisted pairs in accordance with manufacturer’s latest installation requirements and TIA/EIA-568-C standard installation practices. Terminate cable pairs onto the termination apparatus compliant to T568B wiring.
 - d. Modular patch panels and horizontal management panels:
 - 1) Provide quantity of **patch** panels to support the terminations of cables served from respective Telecom Room.
 - 2) Install and assemble patch panels and wire management panels according to the manufacturer’s instructions.
 - 3) Install the termination hardware and cable management as shown on the Drawings.
 - 4) Terminate cables in sequential order using the link’s identifier starting at the top left and completing a block before moving to the next block below.
 - 5) Terminate all WAP cables on it's own patch panel.
4. Cable routing and dressing at workstations:
- a. Provide 18” cable slack at each workstation outlet, length not to exceed permanent link maximum length requirement. Place the slack within ceiling space neatly on a cable hanger or other approved cable support device.
 - b. Route to partition furniture mounted faceplates:

- 1) Route cables from primary or secondary pathway within ceiling through the furniture partition feed pathway (stub from wall or floor box) into opening at bottom of furniture system. Exercise caution to prevent scraping, cutting or other damage to cable jacket.
 - 2) Provide spiral wrap around cables from furniture-feed pathway to point where cables enter furniture.
5. Termination at the workstation outlets:
- a. Provide device components, connectors, and accessories required for a complete installation. Install and assemble connectors, jacks, adapters, termination apparatus, accessories and associated management apparatus according to the manufacturer's instructions.
 - b. Provide blue connectors for data links, yellow connectors for wireless data, and green connectors for cameras.
 - c. Wall mounted standard devices:
 - 1) Install devices at heights indicated on drawings.
 - 2) Mount faceplates plumb, square and at the same level as adjacent power receptacles.
 - 3) Patch gaps around faceplates so that faceplate covers the entire wall opening.
 - d. Partition furniture mounted devices:
 - 1) Coordinate installation of the faceplate adapters with the furniture contractor, including color.
 - 2) Mount faceplate adapters into the designated openings for horizontal cables.
 - e. Terminate cables and twisted pairs in accordance with the manufacturer's latest installation requirements and TIA/EIA-568-B standard installation practices. Terminate cable pairs onto the connector compliant to **T568B** wiring.
6. Patching and cross connecting:
- a. In equipment rooms, provide one modular patch cord for each connector jack in each workstation outlet. Cords lengths shall be coordinated with the owners IT representative.
 - b. At work station, provide one modular patch cord for each cable jack installed in each workstation outlet. Cords shall include:
 - 1) 100% of cords shall be 10'

3.3 LABELING

A. General requirements:

1. Labeling, label colors, and identifier assignments shall conform to EIA/EIA-606-A Administration Standards and as approved by the Owner.
2. Provide permanent and machine-generated labels. Hand written labels will not be accepted.

B. Horizontal twisted pair labeling:

1. Cables:
 - a. Text color shall be black, font size **to match existing**
 - b. Label installation:
 - 1) Provide labels on both ends of cable.
 - 2) Install labels such that they are visible by technician from a normal stance.
 - 3) Fully wrap label around the cable jacket (self lamination).
 - 4) Provide one label within 4" of the termination apparatus.

2. Modular patch panels:
 - a. Text color shall be black, font size **to match existing** .
 - b. Label installation:
 - 1) Patch Panel port number will match the cable designation at the station end. **Label shall match existing.**

3. Outlets:
 - a. Text color shall be black, **font size shall match existing**
 - b. Label installation:
 - 1) At faceplates, provide labels above jacks.
 - 2) At surface boxes, provide labels on the top of the box.

3.4 FIELD QUALITY CONTROL AND TESTING

A. General:

1. Calibrate test sets and associated equipment per the manufacturer's instructions at the beginning of each day's testing and after each battery charge. Fully charge the test sets prior to each day's testing to ensure proper operation.
2. Ensure test equipment and test cords are clean and undamaged during testing activities. Per the Engineer's discretion, halt testing activity and clean testing equipment, test cords and related apparatus.
3. Permanently record test results electronically within test equipment at the time of testing.

B. Twisted pair testing:

1. Test for UTP cabling as follows:

TESTS FOR CATEGORY 6 CABLING TABLE				
Subsystem	Type	Test	Configuration	Notes
Horizontal	CAT6 and Category 6A	Category 6 Category 6A	Permanent Link	Per TIA/EIA-568-C.2

2. Precautions:
 - a. Adhere to the equipment manufacturer's instructions during all testing.
 - b. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature, approximately 70°F.
 - c. Fully charge power sources before each day's testing activity.
3. Horizontal twisted pair testing:
 - a. Test equipment set-up:
 - 1) Set-up the tester to perform a full CAT6 and/or Cat 6A test, as a Permanent Link configuration.
 - 2) If the tester has the capability, set the cable type as product specific setting. If not, set as generic CAT6, or Cat 6A cable.
 - 3) Set the tester to save the full test results (all test points, graphs, etc.).
 - 4) Save the test results with associated cable link identifier.
 - 5) Calibrate the test set per the manufacturer's instructions.
 - b. Acceptable test results measurements:
 - 1) Overall test results:
 - a) Links which report a Fail, Fail or Pass for any of the individual tests shall result in an overall link Fail. All individual test results must result in a Pass to achieve an overall Pass.
 - b) Any reconfiguration of link components required as a result of a test Fail, must be re-tested for conformance.
 - c) Remove and replace any cabling links failing to meet the criteria described in this Specification, at no cost to the Owner, with cables that prove to meet the minimum requirements.

- 2) Wire map: Provide continuous pairs and terminate all of the cabling links correctly at both ends, no exceptions taken.
 - 3) Length: Ninety-four meters (308 feet) is the maximum acceptable electrical length measurements for any cabling link measured under a Permanent Link configuration, including test cords.
 - 4) Insertion loss: The acceptable insertion loss measurements for any horizontal cabling link is that which is no greater than that listed in TIA/EIA-568-C.2.
 - 5) Worst pair-to-pair near end crosstalk (NEXT) loss: The acceptable worst pair-to-pair NEXT loss for any horizontal cable is that which is no greater than that listed in TIA/EIA-568-C.2.
 - 6) Power sum NEXT loss: The acceptable power sum PS-NEXT loss for any horizontal cable is that which is no greater than that listed in TIA/EIA-568-C.2.
 - 7) Worst pair-to-pair ELFEXT and FEXT loss: The acceptable worst pair-to-pair ELFEXT and FEXT loss for any horizontal cable is that which is no greater than that listed in TIA/EIA-568-C.2.
 - 8) Power sum ELFEXT and FEXT loss: The acceptable PS-ELFEXT and PS-FEXT loss for any horizontal cable is that which is no greater than that listed in TIA/EIA-568-C.2.
 - 9) Return loss: The acceptable return loss measurements for any horizontal cabling link is that which is no greater than that listed in TIA/EIA-568-C.2.
 - 10) Propagation delay and delay skew: The acceptable propagation delay and delay skew measurements for any horizontal cabling link is that which is no greater than that listed in TIA/EIA-568-C.2.
- C. Record documents:
1. Permanently record all test results.
 2. Export test results' numerical values to a single Microsoft Excel spreadsheet.
 3. Submit test results in a format acceptable to the Owner, Owner's Representative and the Engineer before system acceptance.
 4. Cable, fiber and pair identifiers of the test reports shall match the identifiers as labeled in the field, i.e. use the same ID on the cable/termination label as what appears on the test report.
 5. Measurements shall carry a precision through one significant decimal place, minimum.
 6. Use feet for the units for measurements shown on the print of the test measurements.
 7. Print report such that fiber strands of a given cabling link have matching axis scales. The "X" and the "Y" axis shall be the same from report-to-report.
 8. The trace of the printed test report shall show the launch cord.
 9. For each fiber optic cable test, report shall contain the following information:
 - a. Project name and address.
 - b. Test company's and Operator's name.
 - c. Date measurements were taken.
 - d. Test equipment type to include model and serial numbers.
 - e. Cable identification number, fiber/strand number and fiber type (i.e. multimode, , etc).
 - f. Measurement direction.
 - g. Set-up parameters (i.e. wavelength, pulse width, refractive index, event threshold, etc.)
 - h. Length of fiber.

- i. Overall link loss.
 - j. Passive link insertion loss testing:
 - 1) Wavelength.
 - 2) Loss measurement.
 - k. Pass/Fail
10. For each cabling link, include either a schematic graphic or a brief narrative accurately describing the test set-up. The description shall include test/launch cord (with length), expected events (connectors, slices, etc.) with expected distances, etc. This information will eliminate many questions the Engineer will have while reviewing the reports.
11. For each twisted pair horizontal cable test, report shall contain the following information:
- a. Project name and address.
 - b. Test company's and Operator's name.
 - c. Date measurements were taken.
 - d. Test equipment type to include model and serial numbers.
 - e. Cable identification number and pair number.
 - f. Measurement results.
 - g. Pass/Fail

3.5 INSPECTION AND ADJUSTMENTS

- A. Contractor shall inspect all installed Work in conjunction with the General Contractor and develop a "punchlist" for all items needing correction. Provide punchlist to the Engineer prior to their final walk of Project.
- B. Punchlist work and the required remediation shall be performed prior to system final acceptance.
- C. Replace or repair work completed by others that was defaced or destroyed during the installation of the telecommunication cabling system by this contractor.
- D. Make changes to adjust the system to optimum operation for final use. Contractor is responsible for making changes to the system such that any defects in workmanship are correct and all cables and the associated termination hardware passes the minimum test requirements.

3.6 CLEANING

- A. Remove all unused, excess and left over products, to include debris, spills, and installation equipment.
- B. Leave finished work and adjacent surfaces in neat, clean conditions with no evidence of damage.
- C. Legally dispose of debris.
- D. Clean installed products in accordance with manufacturer's instructions prior to final punch list.

3.7 TRAINING

- A. At the completion of all Work, a period of not less than 4 hours shall be allocated by the Contractor for instruction and training for the Owner's Representative. The Cabling Contractor will need to describe how the cable from each cover plate is separated between different patch panels and 110 blocks, how cross-connects are made and other basic cable plant management skills.
- B. Contractor shall schedule training with a minimum of 7 days advance notice.

END OF SECTION 271500

SECTION 283100 - FIRE ALARM/LIFE SAFETY SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
1. Initiating devices.
 2. Notification devices.
 3. Auxiliary equipment control and supervision
 4. Zone modules
 5. Expansion panels
 6. Power supplies
 7. DSA completion certification
 8. Record Drawings.
- B. Work furnish and connected to Fire Alarm system under this Section, but installed and connected to HVAC system under another Section:
1. Fire/smoke dampers. Except that wiring for damper power, control and monitoring shall be under this contract.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:
1. American National Standards Institute, Inc. (ANSI):
ANSI C62.41; Guide for Surge Voltage in Low-Voltage AC Power Circuits.
 2. National Fire Protection Association (NFPA):
NFPA 72; National Fire Alarm Code with CSFM amendments
NFPA 101; Life Safety Code.
 3. California Electrical Code
 4. Underwriters Laboratories, Inc. (UL):
UL 38; Manual Signaling Boxes Fire Alarm Systems.
UL 268; Smoke Detectors for Fire Alarm Signaling Systems.
UL 268 A; Smoke Detectors for Duct Application.
UL 464; Audible Signal Appliances.
UL 497B; Protectors for Data Communications and Fire Alarm Circuits.
UL 521; Heat Detectors for Fire Protective Signaling Systems.
UL 864; Control Units and Accessories for Fire Alarm Systems.
UL 1424; Cables for Power-Limited Fire-Alarm Circuits.

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| UL 1480; | Speakers for Fire Alarm, Emergency and Commercial and Professional Use. |
| UL 1481; | Power Supplies for Fire-Protective Signaling Systems. |
| UL 1638 | Visual Signaling Appliances Standard. |
| UL 1711; | Amplifiers for Fire Protective Signaling Systems. |
| UL 1971 | Signal Devices for Hearing Impaired. |
5. Factory Mutual System (FM) approval guide.
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| FM P7825 | Approval Guide. |
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1.3 DEFINITIONS

- A. Alarm signal: A signal that indicates a state of emergency requiring immediate notification of the fire department and building occupants.
- B. Supervisory signal: A signal that indicates the impairment of a fire protection system, which may prevent its normal operation.
- C. Trouble signal: A signal that indicates that a fault, such as an open circuit or ground, has occurred in the fire alarm system or in a separate subsystem monitored by the fire alarm system.
- D. Initiating device: A system component that originates transmission of a change of state condition, which initiates an appropriate response via the fire alarm system.
- E. Notification device circuit: A circuit to which notification devices are connected to visually and audibly indicate an alarm signal.
- F. Signaling line circuit: A circuit to which any combination of circuit interfaces, control units or transmitters are connected and over which multiple system input signals or output signals are carried.
- G. Class A wiring: A circuit that is monitored for integrity such that a single break, a single wire-to-wire short or a single loss of carrier condition will be indicated by a trouble signal on the FACP no matter where the break, short or loss of carrier condition occurs and will allow all functions of the affected circuit to remain operational. This would be Style 7 wiring for signaling line circuits.
- H. Class B wiring: A circuit that is monitored for integrity such that a single break, a single wire-to-wire short or a single loss of carrier condition will be indicated by a trouble signal on the FACP no matter where the break, short or loss of carrier condition occurs, but which would prohibit devices beyond the fault, short or carrier loss from remaining operational. This would be Style 3 wiring for signaling line circuits, Style B for initiating device circuits and Style Y for notification device circuits.

1.4 SYSTEM DESCRIPTION

- A. Demolition of the existing Fire Alarm Control Panel, booster panels, notification devices, annunciating devices, modules, relays and fire alarm cabling. Remove all fire alarm cabling from site conduits, and building conduits to origination.
- B. A new intelligent reporting, Style 7 networked, fully peer-to-peer, microprocessor-controlled fire detection and emergency voice alarm communication system shall be installed in accordance with the specifications and as indicated on the Drawings.

- C. Each Signaling Line Circuit (SLC) and Notification Appliance Circuit (NAC): Limited to only 80 percent of its total capacity during initial installation.
- D. Basic Performance:
 - 1. Network Communications Circuit (Net SOLO) Serving Network Nodes: Wired using single twisted non-shielded 2-conductor cable and connected using existing fiber optic cable between nodes in Class A configuration.
 - 2. Signaling Line Circuits (SLC) Serving Addressable Devices: Wired Class B.
 - 3. Initiation Device Circuits (IDC) Serving Non-addressable Devices Connected to Addressable Monitor Modules: Wired Class B.
 - 4. Notification Appliance Circuits (NAC) Serving Strobes, and Speakers: Wired Class B.
 - 5. On Class A Configurations: Single ground fault or open circuit on Signaling Line Circuit shall not cause system malfunction, loss of operating power, or ability to report alarm.
 - 6. Transponders:
 - a. Operate in peer-to-peer fashion with other panels and transponders in system.
 - b. Each transponder shall store copy of audio evacuation messages and tones.
 - c. Systems that use centralized message storage and control at main fire alarm control panel shall not be acceptable.
 - 7. Network Node Communications, Audio Evacuation Channels and Fire Phone Communications:
 - a. Communicated between panels and transponders on fiber optic cables.
 - 9. Signaling Line Circuits (SLC):
 - a. Reside in remote transponders with associated audio zones.
 - b. SLC modules shall operate in peer-to-peer fashion with all other panels and transponders in system.
 - c. On loss of INCC Command Center, each transponder shall continue to communicate with remainder of system, including all SLC functions and audio messages located in all transponders.
 - d. Systems that provide a "Degraded" mode of operation upon loss of INCC Command Center or short in riser shall not be acceptable.
 - 10. Audio Amplifiers and Tone-Generating Equipment: Electrically supervised for normal and abnormal conditions.
 - 11. Amplifiers: Located in transponder cabinets serving no more than 3 floors per transponder to enhance system survivability, reduce required riser wiring, simplify installation, and reduce power losses in length of speaker circuits.
 - 12. Speaker NAC Circuits: Arranged such that there is a minimum of 1 speaker circuit per fire alarm zone.
 - 13. Notification Appliance Circuits (NAC), Speaker Circuits, and Control Equipment: Arranged such that loss of any 1 speaker circuit will not cause loss of any other speaker circuit in system.
 - 14. Speaker Circuits:

- a. Electrically supervised for open and short circuit conditions.
 - b. If short circuit exists on speaker circuit, it shall not be possible to activate that circuit.
 - c. Arranged for 70 VRMS and shall be power limited in accordance with NEC
 - d. 20 percent spare capacity for future expansion or increased power output requirements.
15. Speaker Circuits and Control Equipment:
- a. Arranged such that loss of any 1 speaker circuit will not cause loss of any other speaker circuit in system.
 - b. Systems utilizing "bulk" audio configurations shall not be acceptable.
16. 2-Way Telephone Communication Circuits:
- a. Shall communicate digitally over the network between transponders.
 - b. Supervised for open and short circuit conditions.
 - c. Short circuit condition on 2-way telephone communications circuit shall result in trouble condition and not result in call-in condition.
17. Voice Communication:
- a. Connect telephone circuits to speaker circuits to allow voice communication over speaker circuit from telephone handset.
 - b. Capable of remote phone-to-phone conversations and party-line communications as required.
- E. Basic System Functional Operation: When fire alarm condition is detected and reported by 1 of the system alarm initiating devices, the following functions shall immediately occur:
1. System Alarm LEDs: Flash.
 2. Local Piezo-Electric Signal in Control Panel: Sound at a pulse rate.
 3. 80-Character LCD Display: Indicate all information associated with fire alarm condition, including type of alarm point and its location within protected premises.
 4. Historical Log: Record information associated with fire alarm control panel condition, along with time and date of occurrence. History Log shall have capacity for recording up to 4,100 events.
 5. System output programs assigned via control-by-event equations to be activated by particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
 - a. Close Fire Doors
 - b. Shut down air handlers as required by code
 - c. Notify the Central Station or Municipal Tie.
 6. Strobes flash synchronized continuously.
 7. Audio Portion of System: Sound alert tone followed by pre-recorded message determined by event and this scenario repeating or other message as approved by local authority until system is reset.
- F. Fire Alarm System Functionality:

1. Provide complete, electrically supervised distributed, Class A networked analog/addressable fire alarm and control system, with analog initiating devices, integral multiple-channel voice evacuation, and fire fighter's phone system.
2. Fire Alarm System:
 - a. Consist of multiple-voice channels with no additional hardware required for total of 4 channels.
 - b. Incorporate multiprocessor-based control panels, including model E3 Series modules includes Intelligent Network INCC Command Center(s) (INCC), Intelligent Loop Interface (ILI-MB-E3 or ILI95-MB-E3), Intelligent Network Transponders (INX), communicating over peer-to-peer token ring network with standard capacity of up to 64 nodes expandable to 122.
3. Each ILI-MB-E3 or ILI95-MB-E3 Node: Incorporate 2 Signaling Line Circuits (SLC), with capacity to support in Velociti[®] mode up to 159 analog addressable detectors and 159 addressable modules per ILI-MB-E3 SLC or support in Apollo mode up to 126 detectors and modules per ILI95-MB-E3 SLC.
4. Voice, Data, and Fire Fighter's Phone Riser: Transmit over single pair of wires or fiber optic cable.
5. Each Intelligent Network Transponder: Capable of providing 16 distributed voice messages, fire fighter phones connections, SLC loop for audio control devices, and integral network interface.
6. Each Network Node: Incorporate Boolean control-by-event programming, including as a minimum AND, OR, NOT, and Timer functions.
7. Control Panels: Capability to accept firmware upgrades via connection with laptop computer, without requirement of replacing microchips.
8. Network:
 - a. Based on peer-to-peer token ring technology operating at 625 K baud, using Class A configuration.
 - b. Capability of using twisted-pair wiring, pair of fiber optic Multi-mode cable strands up to 200 microns or Single-mode optimized for 9/125 microns, or any combination, to maximize flexibility in system configuration.
9. Each Network Node:
 - a. Capability of being programmed off-line using Windows-based software supplied by fire alarm system manufacturer. Capability of being downloaded by connecting laptop computer into any other node in system. Systems that require system software to be downloaded to each transponder at each transponder location shall not be acceptable.
 - b. Capability of being grouped with any number of additional nodes to produce a "Region", allowing that group of nodes to act as 1, while retaining peer-to-peer functionality. Systems utilizing "Master/Slave" configurations shall not be acceptable.
 - c. Capability of annunciating all events within its "Region" or annunciating all events from entire network, on front panel LCD or touch screen display without additional equipment.

10. Each SLC Network Node: Capability of having integral DACT (digital alarm communicator transmitter) that can report events in either its region, or entire network to single central station monitoring account.
11. Each Control Panel: Capability of storing its entire program, and allow installer to activate only devices that are installed during construction, without further downloading of system.
12. Password Protection: Each system shall be provided with 4 levels of password protection with up to 16 passwords.
13. Have the capacity for multiple pre-recorded messages (at least sixteen (16), but more if required by local AHJ) and address a list of subjects.
 - a. Fire evacuation and relocation
 - b. Intruder or hostile person sighted within or around the building grounds
 - c. Directions to occupants to take cover within building
 - d. Emergency weather conditions appropriate for local area
 - e. All Clear

1.5 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260010: Basic Electrical Requirements, the following items:
 1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
 2. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
 3. Describe system operation, equipment and dimensions and indicate features of each component.
 4. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 5. Shop Drawings shall include:
 - a. Basic:
 - 1) Name of Owner and occupant.
 - 2) Address of the building.
 - 3) Contractor's name, address, telephone number and license number.
 - b. Symbols legend.
 - c. Equipment list showing quantity, make, model and CSFM listing number for each device.
 - d. Wire and cable schedule.
 - e. Scope of Work with overall system description.
 - f. Sequence of operation matrix with system inputs signals and output functions.
 - g. Code summary and Building type.
 - h. Assignment of Class and/or Style designation for device circuits.

- i. Plot plan and floor plans of building with partitions, walls and room identification, showing locations of each device and control/monitoring equipment, communication equipment, conduit routing and size and cable/conductor type and quantity. Field devices shall all have a discrete identification designation located adjacent to each device on the Drawings.
 - j. Point-to-point wiring diagram in block or riser format showing all fire alarm components, device designations, conduit, wire types and sizes.
 - k. Provide 1/4" scale plan of equipment layout in main fire control room.
 - l. Include elevations of control panels, fireman's fan and damper control panel, voice communications panel, graphic annunciator panel and remote annunciator panel.
 - m. Overall description of smoke control system based on Smoke Control Report, developed by others.
 - n. Smoke control operation matrix by individual initiating device for fan and damper control/monitoring as well as ancillary equipment controlled.
 - o. Elevation indicating mounting heights for manual pull stations, audible and visual devices and combination audible/visual devices.
 - p. Rated penetration details.
 - q. Typical wiring diagram details of field devices.
 - r. Detector mounting details at HVAC ducts.
 - s. Battery standby calculations showing total standby power needed to meet the specified system requirements.
 - t. Voltage drop calculations for system wiring circuits.
6. Furnish structural calculations for equipment anchorage as required for the installation of fire alarm panels:
 7. Submit Manufacturer's installation instructions.
 8. Complete bill of materials listing all components.
 9. Provide California State Fire Marshal 'CSFM' listing sheet for each device.
 10. Warranty.
- B. Contractor shall submit approved Shop Drawings for review by State/Local Fire Marshal prior to the purchase and installation of equipment. Provide quantities of Drawing sets as required by jurisdiction. Drawings shall be wet stamped and signed by a registered professional Engineer.
- C. Record Drawings:
1. Furnish Record Drawings utilizing Shop Drawing submissions with updated field conditions. These Drawings shall include but not be limited to the following:
 - a. Plot plans and building floor plans, showing point-to-point wiring location of and conduit routing to all devices.
 - b. Block diagram/riser diagram showing the LSCP, system components and all conduit and wire type/sizes between each.
 2. Drawings shall be incorporated into the Record Drawing submission.

3. Final acceptance will not be made until the Engineer has approved the Record Drawings.

1.6 OPERATION AND MAINTENANCE MANUAL

A. Supply operation and maintenance manuals to include the following:

1. A detailed explanation of the operation of the system.
2. Instructions for routine maintenance.
3. Pictorial parts list and part numbers.
4. Schematic Drawings of wiring system, including all initiation and annunciation devices, control panel, annunciators, communication system, fan control system, printer/terminal, etc.
5. Telephone numbers for the authorized parts and service distributors.

1.7 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new, unused and currently under production.
- B. Only products and applications listed in this Section may be used on the Project unless otherwise submitted.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Fire alarm/life safety system components shall not be delivered to the Project site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipment shall be replaced and returned to Manufacturer at no cost to Owner.
- B. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris and traffic. Provide heat where required to prevent condensation.
- C. Handling: Handle in accordance with Manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to Manufacturer.

1.9 WARRANTY

- A. Units and components offered under this Section shall be covered by a 1 year parts and labor warranty for malfunctions resulting from defects in materials and workmanship. Warranty shall begin upon acceptance by the Owner.
- B. The warranty package shall include, but not be limited to the following:
 1. Emergency maintenance service.
 2. Service by factory trained service representative of system Manufacturer.
 3. Replacement of any defective components.

1.10 SYSTEM START-UP

- A. Upon completion of installation, a factory trained dealer service representative shall perform initial start-up of the fire alarm/life safety system. Sufficient time shall be allowed to properly check the system out and perform required minor adjustments before the Engineer's witnessed test shall begin.

1.11 MAINTENANCE

A. Extra Material:

1. Provide the following fire alarm system components as extra materials, matching the products installed and packaged for storing.
 - a. Manual pull station: Furnish a quantity equal to 10 percent of the number installed.
 - b. Detectors: Furnish a quantity equal to 10 percent, for each type, of the number installed.
 - c. Strobes and Speaker/strobes: Furnish a quantity equal to 10 percent of the number installed.
 - d. Speakers: Furnish a quantity equal to 10 percent of the number installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products furnished by the following Manufacturer shall be provided per the districts standards.
 1. Gamewell/FCI.
- B. Substitutions: Substitutions will not be accepted.

2.2 FIRE ALARM AND DETECTION SYSTEM

- A. Control panel:
 1. The panel is existing.
- B. Initiation/notification modules:
 1. All modules shall be plug-in, dynamically supervised and easily replaceable. Field wiring shall be connected to the panel with removable multi-conductor connectors to facilitate rapid removal and replacement of both the module and wiring for ease of serving the panel. The modules shall be system interconnected by a card edge connector.
 2. Provide zone input addressable modules for monitoring non-addressable initiating circuits.
 3. Provide programmable signal modules on output circuits for operation of DC audible devices.
 4. Provide, as needed, programmable supplementary relay modules containing four independent relays fitted with form "C" contacts, rated at 120 VAC, 5 amps inductive.
- C. Remote station signal transmitter: Electrically supervise, capable of transmitting alarm and trouble signals over telephone lines to remote monitoring station receiver.
- D. Auxiliary relays: Provide sufficient SPDT auxiliary relay contacts for each initiating device zone to provide accessory functions specified.

2.3 ADDRESSABLE INITIATING DEVICES

- A. Manual pull stations: Shall conform to the applicable requirements of UL 38. Addressable manual stations shall be connected into addressable initiating circuits. Stations shall be dual action type. Stations shall be finished in red, with raised letter operating instructions of contrasting color. Control panel shall monitor the station by address and function. The use of a key or wrench shall be required to reset the station. Stations shall have a separate screw

- terminal for each conductor and be capable of field programming for its "address" location on a initiating circuit.
- B. Heat detectors: Shall conform to the applicable requirements of UL 521. Addressable detectors shall be electronic designed for detection of fire by combination fixed temperature and rate-of-rise principle. Detectors shall be connected into addressable initiating circuits. All electronics shall be contained within detector head and shall plug-in to terminal base. Detector shall be field programmable and contain external indication that is readily visible. The detector shall be dynamically supervised and individually identified by LSCP, as well as sensitivity adjustable. Rating for fixed temperature portion shall be 135 degrees F. Detectors shall have screw terminals in base for making all wiring connection.
 - C. Smoke detectors: Shall conform to the applicable requirements of UL 268:
 - 1. Photoelectric detectors: Addressable detectors shall be electronic designed for detection of abnormal smoke densities. Detectors shall consist of separate transmitter and receiver units. The transmitter unit shall emit an infrared beam to the receiver unit. When the signal at the receiver falls below a preset sensitivity, the detector shall initiate an alarm. The receiver shall contain an LED that is powered upon an alarm condition. Long-term changes to the received signal caused by environmental variations shall be automatically compensated. Detectors shall be connected into addressable initiating circuits. All electronics shall be contained within detector head and shall plug-in to terminal base. Detectors shall be field programmable and contain external indication that is readily visible. The detector shall be dynamically supervised and individually identified by LSCP, as well as sensitivity adjustable. Detectors shall have multiple sensitivity settings in order to meet UL listings for the different distances covered by the beam. Detectors shall have screw terminals in base for making all wiring connections.
 - 2. Duct smoke detectors: Addressable detector shall have a duct housing, mounted exterior to the duct and with perforated sampling tubes. Activation of a detector shall cause shutdown of the associated air-handling unit via auxiliary contact base. Detectors shall be rated for the air velocity to be expected.
 - 3. In-duct smoke detector: Addressable detector shall have external mounted box with relay output, remote test station with LED status indicator and keyed test switch and sensor head mounted within duct. Activation of detector shall cause associated fire/smoke damper to close via auxiliary relay base.
 - D. Interface modules: Addressable interface module shall be connected into addressable initiating circuits. This device shall be used for interfacing normally open or normally closed direct shorting contact devices to an addressable initiating circuit (i.e. waterflow, tamper switches, non-addressable initiating devices, etc.). Module shall be dynamically supervised and individually identified by LSCP.
 - E. Programmable relay modules: Addressable interface module containing a programmable control relay with contacts rated at 2.0 amps at 30VDC, 0.6 amps at 120 VAC.

2.4 NOTIFICATION DEVICES

- A. Speakers, strobes and combination speaker strobes:
 - 1. These units shall be mounted flush in all finished areas and surface mounted in unfinished equipment areas. White enamel grill for units mounted in finished (public) areas; red for units mounted in unfinished (mechanical) areas.

2. Maximum loading: The loading on both the strobe and audio circuits shall not exceed 75% of its rated capacity. Verify that strobe in-rush currents are safely within the maximum rated capacity of the circuit.
3. Speaker: Wall or ceiling mounted units shall include a blocking capacitor for line supervision and screw terminals for in and out wiring. The back of the speaker cone shall be covered to protect the cone from damage and dust. The speakers shall operate over a frequency range of 400 - 4000Hz and shall have field selectable power taps of 1/8 to 8 watts with sound output up to 92dBA at 10 feet measured per UL standard 1480 when set on the 8 watt tap. Speaker shall be rated for operation on a 70.7-volt audio system.
4. Strobe: Wall mounted units shall incorporate 15, 30, 75, 110 candela strobe lights that flash once per second with 24 VDC input with a maximum current draw of .088 amps.
5. Strobe/speaker: Wall mounted units with speaker Specifications listed above and shall incorporate 15, 30, 75, 110 candela strobe lights that flash once per second with 24 VDC input with a maximum current draw of .088 amps.
6. Remote power supplies for strobe circuits:
 - a. Provide quantity of remote power supplies required for system. Power supplies shall be mounted in hinged NEMA 1 enclosures, maximum 24" wide, with locking handle and the following items:
 - 1) Back-up emergency batteries, sized per NFPA standards. Provide separate enclosure for batteries if required to prevent damage from corrosive gases.
 - 2) Provide a automatic dual rate (high rate and float charge) battery charger capable of recharging batteries to 80% capacity in 8 hours. The charger output shall be supervised and fused.
 - 3) Supervised programmable relays or network interface module to control strobe lights on a floor-by-floor basis.
 - b. Power supplies shall be connected to emergency power 120 VAC circuits.
 - c. If the power supply loses AC power, a system trouble shall occur.
 - d. Locks shall be keyed the same as all other life safety panels.
- B. Bells: Shall be 6 inch10 inch surface mounted with matching mounting back box. Bells shall be of vibrating type, suitable for use in an electrically supervised circuit. Bells shall be the under-dome type producing a sound output rating of at least 84 dBA87 dBA at 10 feet. Bells used in exterior locations shall be specifically listed or approved for outdoor use and provided with metal housing and protective grilles.

2.5 FIBER OPTIC PATCH CORDS

- A. The fiber nodes shall utilize existing 62.5/125 micron fiber. The existing fiber is terminated with SC fiber connectors
 1. Provide SC-ST Duplex fiber jumpers to connect the FACP and Remote nodes TX/RX fiber ports (4 fiber).
 2. Provide SC-SC duplex fiber jumpers to patch fiber from one node to the next at the IDF location. Quantity as required.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall thoroughly examine Project site conditions for acceptance of fire alarm/life safety system installation to verify conformance with Manufacturer and Specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 INSTALLATION

A. General:

1. Install fire alarm/life safety system in accordance with Manufacturer's written instructions, as indicated on the Drawings and as specified herein.
2. The 120/208-volt, 3 wire, 60 cycles AC emergency power supply required to power the system. Connect to red colored circuit breaker(s) in panel board. Identify circuit as "Fire Alarm Circuit Control".

B. Wiring:

1. Individual input and output device addressability as well as remote sensitivity measurement, supervision and power shall all be performed on the same pair of wires. Wiring shall be Class B.
2. Each Class B initiating circuit shall consist of a two (2)-wire circuit, allowing multiple T-taps and not requiring any end-of- line device for supervision. Each initiating circuit shall accommodate up to thirty (30) addressable programmable initiating devices. On the initial installation, only 21 devices are to be allowed per circuit to allow for future expansion.
3. Wiring for shielding certain conductors from others or routing in separate raceways, shall be as recommended by the Manufacturer's current requirements.
4. All cabling when concealed above accessible ceiling can be routed free air and supported every 48" in J-Hooks. J-hooks shall be sized for a maximum 40% fill and shall be color coded red, and not used for any other cable.
5. J-hooks shall be supported by independent 12 gauge steel wire or directly to building structure. Support to other disciplines support structure such as electrical conduit, mechanical ducting, ceiling wire, ATR, unistrut etc. will not be accepted and will require the contractor to install an independent support system.
6. All wiring shall be installed in a steel conduit when in exposed areas, and through walls and shall be of the size recommended by the equipment Supplier. Wire color-coding shall remain the same throughout the system.
7. No wiring other than that directly associated with life safety/fire alarm detection, alarms or auxiliary fire protection functions (no 120 VAC), shall be permitted in life safety/fire alarm support systems and pathways.
8. Make conduit and wiring connections to sprinkler flow switches, PIV's, sprinkler valve monitors, door hold-open/closure devices, smoke management fans, smoke dampers, fire pump controller, etc.
9. All wiring shall be checked and tested to ensure that there are no grounds, opens or shorts.
10. All life safety/fire alarm junction boxes shall be color-coded and marked. Wire nut splices are not allowed.

11. Wires shall be numbered at each connection, termination and junction point. Wire numbering tags shall be Brady Perma-Code, Westline or equal wire makers. Each group of wires shall be tagged with its destination at each panel, terminal box or junction box.
12. All wire used on the life safety/fire alarm and communication system shall have a minimum insulation rating of 105 degrees C. Bell wire or thermostat wire is not acceptable.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's field service: Contractor shall arrange and pay for the services of a factory-authorized service representative to supervise the initial start-up, pretesting and adjustment of the fire alarm/life safety system.
- B. Contractor shall perform all quality control electrical testing, calibration and inspection required herein. Testing objectives shall be to:
 1. Assure fire alarm/life safety system installation conforms to specified requirements and operates within specified tolerances.
 2. Field test and inspect to ensure operation in accordance with Manufacturer's recommendations and Specifications.
 3. Prepare final test report including results, observations, failures, adjustments and remedies.
 4. Apply label on fire alarm/life safety system control panel upon satisfactory completion of tests and results.
 5. Verify settings and make final adjustments.
 6. Testing, inspection and maintenance shall comply with NFPA 72, Ch. 14 requirements.
- C. Pre-functional testing:
 1. Visual and mechanical inspection:
 - a. Inspect for physical damage, defects alignment and fit.
 - b. Perform mechanical operational tests in accordance with Manufacturer's instructions.
 - c. Compare nameplate information and connections to Contract Documents.
 - d. Check tightness of all control and power connections.
 - e. Check that all covers, barriers and doors are secure.
 2. Electrical tests:
 - a. The system shall be completely tested prior to final acceptance testing. All points shall be tested from point of initiation to the final point or points of annunciation. All circuits shall be tested for continuity and ability to transmit the required signal correctly to the LSCP. Any problem due to wrong wire type, wire twist, impedance, mismatches, noise filtering or shielding shall be completely corrected during pretesting and prior to any final acceptance tests.
 - b. Testing shall include each and every device in the system. Coordinate with other trades as necessary for testing.
 - 1) Smoke detectors and duct smoke detectors: Test with actual or approved artificial smoke. Verify that reset does not occur when devices are cleared of

smoke. Verify supervisory circuit function. Perform pressure differential test on all duct-mounted smoke detectors.

- 2) Tone and prerecorded message generation: Activate by means of an alarm initiating device on each floor and verify that they are clearly audible in all occupied spaces including elevator lobbies, toilets, core areas, stairwells, mechanical rooms and garage. Adjust power taps at speakers to obtain proper +15 dBA level above ambient noise. Verify the override capability of the microphone paging system.
- 3) Central station notification: Verify that one set of conductors in the terminal cabinet becomes a short circuit on any "trouble" condition and that the other set becomes a short circuit on any "alarm" condition. Verify that the conductor groups are labeled properly.

c. Test Report:

- 1) Provide a complete report listing every device, the date it was tested, the results and the date retested (if failure occurred during the previous test). The test report shall indicate that every device tested successfully.
- 2) Submit two typed copies of the test report on 8- 1/2" x 11" paper in a neatly bound folder to the Engineer for approval. Failure to comply with this will result in a delay of final testing and acceptance.

D. Functional performance testing:

1. After the approval of the test report, provide a schedule of final testing to be done in the presence of the Fire Marshal and Owner's Representative. The schedule must be received by the District a minimum of 2 weeks prior to the Final Test Date and must list the dates and time slots in which the various systems can be tested.
 2. Coordination of the Final Test dates with all parties (General Contractor, Mechanical Contractor, Electrical Contractor, Owner and others) shall be the sole responsibility of the Contractor. If a party is required to be present during any phase of testing to activate a device, ensure that the party or a qualified representative of the party is present throughout that phase of the testing.
- E. In the event that the system fails to function properly during the testing as a result of inadequate pretesting or preparation. The Contractor shall bear all costs incurred by the necessity for retesting including test equipment, transportation, subsistence and the Engineer's hourly rate.
- F. Contractor shall replace at no costs to the Owner all devices which are found defective or do not operate within factory specified tolerances.
- G. Contractor shall submit the Testing final report to the Engineer for review prior to Project closeout and final acceptance by the Owner. Test report shall indicate test dates, devices tested, results, observation, deficiencies and remedies. Test report shall be included in the operation and maintenance manuals.

3.4 TRAINING

- A. Factory authorized service representative shall conduct a 2 hour training seminar for Owner's Representatives upon completion and acceptance of system. Instructions shall include safe operation, maintenance and testing of equipment with both classroom training and hands-on instruction.

B. Contractor shall schedule training with a minimum of 7 days advance notice.

END OF SECTION

**Nevada Union High
School District
Nevada Union High School
Pool Bldg. Renovation**

**Fire Alarm Cut Sheets
and
CSFM Listing Sheets**

Sept., 27, 2018

Submitted by:
The Engineering Enterprise



by Honeywell

Description

The Gamewell-FCI, PM-9 Power Supply is a switching power supply that provides 9 amperes of filtered and regulated 24 VDC (nominal). It provides the power to the INX Transponder assembly and all of the E3 Series components. It is a component of the following systems.

- E3 Series[®] Expandable Emergency Evacuation System
- E3 Series Combined Fire and Mass Notification System
- E3 Series Broadband Voice Evacuation System
- NetSOLO[®] System

The PM-9 has an internal battery charging circuit capable of maintaining up to 55 A/H batteries. This module is designed for use with the Gamewell-FCI distributed audio networks.

Installation

Typically, the PM-9 Module can be mounted in the following E3 Series cabinets:

- Cabinet B and D, backbox
- Cabinet C, INX-E3 sub-assembly plate
- Cabinet C, INCC-E3 sub-assembly plate
- Cabinet D, E3-INX-D Plate
- Cabinet D, E3-ILI-D Plate

For information on the installation of the PM-9, refer to the following documents:

- E3 Series Expandable Emergency Evacuation Installation/Operating Manual, P/N: 9000-0574
- PM-9 Installation Instructions, P/N: 9000-0548
- Mass Notification System Manual, P/N:LS10013-000GF-E

Specifications

Input Voltage:	120 VAC 60 Hz @ 3.5 A. max.
Output Voltage:	24 VDC (nominal) FWR
Output Current:	9 amperes
Output Current:	1 ampere battery charging current
Alarm Current:	0.050 amp
Operating Temperature:	32° to 120° F (0° to 49° C)
Relative Humidity:	0 to 93% (non-condensing) at 90° F (32° C)
Dimensions:	10 1/2" W x 5" H x 2" D (27 x 13 x 5 cm)

E3 Series[®] and NetSOLO[®] are registered trademarks of Honeywell International Inc.
UL[®] is a registered trademark of Underwriter's Laboratories Inc.

PM-9 Power Supply



PM-9

Features

- Listed under UL[®] Standard 864, 9th Edition.
- Listed under UL Standard UL2572 for Mass Notification.
- Includes 9 ampere, filtered, regulated power supply.
- Provides 1 ampere battery charging current.
- Offers energy and space saving switching technology.
- Contains an integral battery charger capable of recharging up to 55 AH batteries. (Batteries not furnished).

Ordering Information

Part Number	Description
PM-9	Power supply
29229	AC Line Filter Kit



City of Chicago
City of DENVER
Approved Approved
Class 1
Class 2
High Rise



GAMEWELL-FCI

12 Clintonville Road, Northford, CT 06472-1610 USA • Tel: (203) 484-7161 • Fax: (203) 484-7118

Specifications are for information only, are not intended for installation purposes, and are subject to change without notice. No responsibility is assumed by Gamewell-FCI for their use.

Description

The Gamewell-FCI, AM-50 Series amplifiers are a 50 watt, digital, switching power amplifier. The following lists the 2 types of AM-50 Series amplifiers that may be ordered.

- The AM-50-25 amplifier produces 25 V_{RMS} audio output.
- The AM-50-70 amplifier produces 70.7 V_{RMS} audio output.

The amplifiers are components of the following E3 Series® Systems.

- E3 Series Expandable Emergency Evacuation System
- E3 Series Combined Fire and Mass Notification System
- E3 Series Broadband Voice Evacuation System

WARNING: AM-50 Series Amplifiers Node Restriction:

The INI-VGX can support up to 4 AM-50 Series amplifiers with the same output voltage. However, you cannot wire an AM-50-25 amplifier and an AM-50-70 amplifier to the same INI-VGX Voice Gateway Node.

Each AM-50 Series amplifier provides 2 speaker circuits that can be wired Style Y (Class “B”) or Style Z (Class “A”). The terminal connections can accommodate up to 12 AWG, twisted-pair, shielded wire. Both speaker circuits produce a combined total of 50 watts of power. The 50 watts of power can be divided between the 2 integral Class A/B speaker circuits. The 2 speaker circuits may be individually activated and supervised by an INI-VGX Transponder Voice Gateway.

The AM-50 Series amplifier can be programmed to broadcast 16 messages generated from its local INI-VGX Voice Gateway. In addition, the AM-50 Series amplifiers produce superior clarity for intelligible LIVE voice paging.

When the selected System Sensor, SpectrAlert® Advance Series speakers are used with the Manufacturer’s 520 Hz audiophile, the E3 Series® System is compliant with UL Standard 464 Low Frequency requirements.

For additional information, refer to the SpectrAlert Advance Series Data Sheet, P/N:9021-60346.

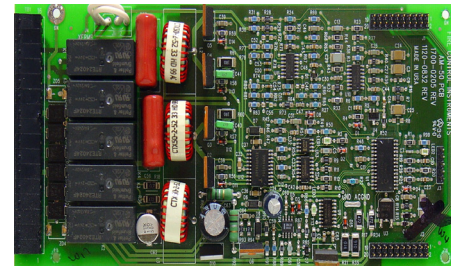
Installation

As many as four AM-50 Series amplifiers can be installed in the following cabinets when supervised and controlled by an INI-VGX Voice Gateway.

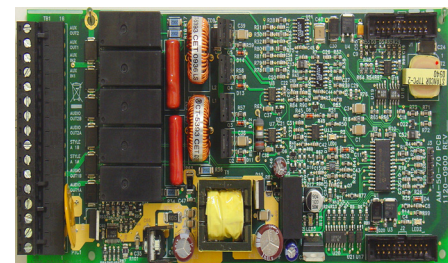
- Cabinet B, INX CAB-B
- Cabinet C, INX-CAB-C
- Cabinet D, INX-CAB-D

E3 Series® and SpectrAlert® are registered trademarks of Honeywell International Inc.
UL® is a registered trademark of Underwriters Laboratories, Inc.

AM-50 Series Amplifiers



AM-50-25



AM-50-70

Features

- Listed under UL® Standard 864, 9th Edition.
- Listed under UL Standard UL2572 for Mass Notification.
- Complies with UL Standard 464 for 520 Hz Low Frequency.
- Provides digital, switching amplifier technology.
- Produces 50 watts of digital power.
- Includes 2 speaker circuits, wired Style Y (Class B) or Style Z (Class A).
- Up to 4 AM-50 Series amplifiers with the same output voltage can be controlled by the INI-VGX voice gateway.

SIGNALING



LISTED
S1869



APPROVED
3017416



Approved
FDNY:
7165-1703:0125



City of
Chicago

Approved

Class 1
Class 2
High Rise

City of
DENVER

Approved

Class 2

Description (Continued)

The AM-50 Series amplifiers can be installed using the AM-50 Extender Plate whenever the E3 Series control panel is used in conjunction with the Autonomous Control Unit of the E3 Series Combined Fire and Mass Notification System.

- Cabinet C, E3 INCC-CAB-C

For additional information, refer to the E3 Series Combined Fire and Mass Notification Data Sheet, P/N:9021-60758

Specifications

AM-50-25 Amplifier

Operating Voltage: 27.3 to 20.4 VDC
Operating Current: 0.086 amp normal standby
Alarm Current: 2.206 amp max. alarm @ 50 Watt
Audio Output: 50 watts max. @ 25 V_{RMS}

AM-50-70 Amplifier

Operating Voltage: 27.3 to 20.4 VDC
Operating Current: 0.049 amp normal standby
Alarm Current: 2.30 amp max. alarm @ 50 watt
Audio Output: 50 watts max. @ 70.7 V_{RMS}

AM-50 Series Amplifiers

Relative Humidity: 0 to 93% max., (non-condensing) at 90° F (32° C)
Operating Temperature: 32° to 120° F (0° to 49° C)
Dimensions: 7 1/2" W x 3 1/2" H x 1 1/4" D
(19 W x 9 H x 3 D cm)

Ordering Information

Part Number Description

1100-0456 AM-50-25, INX 25V_{RMS} audio output, 50 watt amplifier
AM-50-70 INX 70.7V_{RMS} audio output, 50 watt amplifier

GAMEWELL-FCI

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7165-1703:0125
CATEGORY: 7165 -- FIRE ALARM CONTROL UNIT (COMMERCIAL)

Page 1 of 2

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309
Email: vladimir.kireyev@honeywell.com

DESIGN: Model E3 Series® BROADBAND and E3 Series® CLASSIC Voice Evacuation System. The E3 Systems may also work in conjunction with all the sub-assemblies of listee's 7100 Series Control Panel and NetSOLO systems (CSFM Listing No. 7165-1703:105 and 6911-1703:116, and 6911-1703:118).

Unit conveys all fire alarm, audio evacuation, voice paging, and fire fighter communications. Power-limited; non-coded, automatic, manual, smoke control, water flow, sprinkler supervisory, local auxiliary, central station, remote station, and proprietary service. Refer to listee's data sheet for additional detailed product description and operational considerations.

System components:

ILI-MB-E3; Intelligent Loop Interface Master Board
PM-9, PM-9G*; Power Supply
ILI-95-MB-E3, ILI-95-S-E3; Loop Interface Subassemblies
E3BB-FLUSH-LCD; Enclosure for ICD-E3
E3BB-BA/-RA/-BAA/-RAA/-BB/-RB/-BC/-RC/-BD; Cabinets*
RPT-E3-FO or; Repeater Sub-assembly, Fiber Optic or
RPT-E3-UTP; Repeater Sub-assembly, Unshielded twisted pair wire
LCD-E3; LCD Keypad Display
DACT-E3 sub-assembly; Digital alarm communicator transmitter
ILI-S-E3; Intelligent Loop Unit, Expansion Board
ANX-SR, ANX-MR-FO, ANX-MR-UTR; Addressable Node Expanders Sub Assembly*
INCC-E; Intelligent Network Enclosure*
INCC; Intelligent Network Central Command*
INI-VG, INI-VGC-UTP, INI-VGC-FO, INI-VGX-UTP; Intelligent Network Interface Sub Assembly*
INI-VGX-FO, INI-VGE-UTP, INI-VGE-FO; Intelligent Network Interface Sub Assembly*
ASM-16; Annunciator Switch Sub Assembly*
INX; Network Audio Transponder Enclosure*
ANU-48; Annunciator Sub Assembly*
NGA; Touch Screen LCD Display Sub Assembly*
LCD-7100; Remote LCD Display*
SBB-C4, SBB-D4; Backbox*

*Rev. 03-18-11bh



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, 2017**

Listing Expires **June 30, 2018**

Authorized By: **DAVID CASTILLO, Program Coordinator**
Fire Engineering Division

FCI-VDR-D4B, FCI-DR-C4B, FCI-CR-D4B; Doors with locks*
 AA-100, AA-120; Amplifiers*
 AM-50-25, AM-50-70; Amplifier Sub Assembly*
 CHG120; Battery Charger with Cabinet*
 BC-1/FCI-LBB; Backbox*
 IPDACT-2; IP Digital Alarm Communicator*
 FPJ; Firefighters's Telephone Jack Receptacle*
 FHS; Portable Firefighters's Telephone Handset*
 7100 Series#; Fire Alarm Control Panel or
 INI-7100 UTP#; Intelligent Network Interface Sub-assembly, [Twisted, unshielded wire] or
 INI-7100 FO#; Intelligent Network Interface

RATING: 120 V, 60 Hz, 3.5 A Primary; 24 V dc, 9A Secondary

INSTALLATION: In accordance with listee's printed installation instructions, NFPA 72, applicable codes & 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 fire alarm control unit for use with separately listed electrically and functionally compatible initiating and indicating devices. Suitable for high-rise applications when used with the above voice evacuation systems.

This control unit can generate a distinctive three-pulse Temporal Pattern Fire Alarm Evacuation Signal (for total evacuation) in accordance with NPFA 72, 2002 Edition.

This control unit meets the requirements of UL Standard 864, 9th Edition.

NOTE: For Fire Alarm Verification Feature (delay of alarm signaling), the Retard/Reset/Restart period shall be 30 seconds or less.

*Rev. 03-18-11bh



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Date Issued: **July 01, 2017**

Listing Expires **June 30, 2018**

Authorized By: **DAVID CASTILLO, Program Coordinator**
 Fire Engineering Division

by Honeywell

Description

The Gamewell-FCI, HPFF8 is a Notification Appliance Circuit (NAC) expansion panel designed to extend the power capabilities of existing NACs and provide power for the auxiliary devices. The HPFF8 connects to any 12 or 24V Fire Alarm Control Panel (FACP) or stand alone.

The HPFF8 is available in 8.0 amps. It provides regulated and filtered 24VDC power to each of the four NACs and an auxiliary output. The NAC outputs are rated at 3.0 amps each (the total output cannot exceed 8.0 amps). The auxiliary output is rated at 2.0 amps. This output is continuously supplied, even in alarm, and therefore must be taken into account for power supply loading and battery size calculations.

The NAC outputs may be configured as any of the following:

- Four Class B (Style Y)
- Two Class A (Style Z)
- Two Class B and one Class A
- Four Class A with the optional HPP31076 Class A adapter installed

These power supplies contain an internal Battery charger capable of charging up to 26.0 amp-hour (AH) batteries.

The HPFF8 is mounted in lockable wall cabinet units that can accommodate up to two (2), 18AH batteries. A multi-pack option allows for up to four chassis mount units installed in a single lockable SBB-D4 enclosure. These chassis mount units have a "CM" suffix, HPFF8CM and can accommodate two 12AH batteries. Power supplies are available in either 120VAC/60 Hz or 240VAC/50 Hz.

One of the most challenging aspects of a retrofit application is locating the existing End-of-Line (EOL) resistor. In these applications that have EOL values, other than the 3.9k normally used with the HPFF8, a single resistor matching the existing EOL can be used as a reference for all the outputs. This feature speeds the installation and the system checkout, because the actual EOL does not need to be located and changed in the circuit. The reference resistor must be within the range of 1.9k to 25k.

NAC Expander/Power Supply



HPFF8

Features

- Four (4) supervised notification application circuits (NACs) capable of supplying +24VDC at 3.0 amp maximum each
- NAC output circuits may be configured as any of the following:
 - Four Class B (Style Y)
 - Two Class B & one Class A
 - Two Class A (Style Z)
 - Four Class A with the optional HPP31076 Class A adapter installed
- Four field-programmable operational modes
- 2.0 amp auxiliary continuously supplied output
- Two (2) fully supervised input/output control circuits
- Temporal coding and sync protocols compatible with the following notification appliance brands:
 - System Sensor
 - Faraday
 - Gamewell
 - Amseco
 - Cooper-Wheelock
 - Gentex
- Supervised AC input, battery voltage, auxiliary output, charger, and earth ground faults
- Trouble indication for supervision of the following:
 - NAC circuits
 - Auxiliary output
 - AC input
 - Charger
 - Battery voltage
 - Open contacts in the initiating device signal inputs (for FACP trouble notification)
 - Earth ground faults by individual status LED's
- Separate Trouble and AC Fail Form-C relay Contacts

An ISO 9001-2000 Company



GAMEWELL-FCI

12 Clintonville Road, Northford, CT 06472-1610 USA • Tel: (203) 484-7161 • Fax: (203) 484-7118

Specifications are for information only, are not intended for installation purposes, and are subject to change without notice. No responsibility is assumed by Gamewell-FCI for their use.

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www.gamewell-fci.com

9021-60521 Rev. B page 1 of 2

Features (Continued)

- The Trouble Form-C relay contacts selectable for immediate or a 2 hour delay with AC failure
- 26 AH battery charger capability; the wall cabinet supports two 12V 18AH batteries, while the multi-pack equipment cabinets supports two 12V 12AH batteries.
- NAC Overload protection and indication
- Up to four chassis mount units (HPFF8CM) can be installed in the SBB-D4 backbox
- Wall mount units can be configured to internally house the following:
 - one AOM-2SF single control module
 - one AOM-2R single relay module

Specifications

Primary Input Power:	120VAC/60Hz, 3.6A or 220VAC/50Hz, 1.5A
Secondary Power:	24 volt operation: two (2), 7-24 AH batteries
Battery Charging Capacity:	Up to 26 AH batteries mounted
Battery Space:	
HPFF8 Cabinet:	Up to two 18AH batteries
SBB-D4 Cabinet:	Up to two 12AH batteries per supply
Total Output Power:	8.0A max
Standby Current:	0.030 A
Auxiliary Power Output:	0.15A under all conditions 2.0A if load is removed during operation (external relay or AC Fail Relay is required)

Specifications (Continued)

NAC Output Ratings:	24VDC fully regulated, 3.0A max per circuit (8.0A total)
End-of-Line Resistor Range:	2K to 25k ohm, ½ watt
Common Trouble Relay/AC Fail Relay:	2.0A at 28VDC or 120VAC
Input Control Circuit:	16-30VDC @ 5mA min.
Temperature Rating:	32°F to 120°F (0°C to 49°C)
Relative Humidity:	10% to 93% non-condensing
Cabinet Dimensions:	
HPFF8 Cabinet:	16.65" W x 19.0" H x 5.2" D (42.29 W x 48.26 H 13.23 D cm)
SBB-D4 Cabinet:	24" W x 45.9" H x 5.15" D (60.96 W x 116.52 H x 13.1D cm)

Ordering Information

Part Number	Description
HPFF8	8A fire rated power supply operating at 120VAC/60 Hz. Unit includes red enclosure with HPP lock and key
HPFF8CM	8A fire rated power supply - chassis mounted operating at 120VAC/60 Hz. Unit includes mounting hardware for installation in the SBB-D4 enclosure
HPFF8E	8A fire rated power supply operating at 240VAC/50 Hz
HPFF8CME	8A fire rated power supply chassis mounted operating at 240VAC/50 Hz
HPP31076	Class A (Style Z) NAC module
FCI-VDR-D4	Vented door, PK-625 lock and key for SBB-D4 backbox, black
SBB-D4	Backbox, accepts up to 4 chassis, black

GAMEWELL-FCI

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
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FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7315-1637:0102

Page 1 of 1

CATEGORY: 7315 -- POWER UNITS

LISTEE: HONEYWELL POWER PRODUCTS 12 Clintonville Road, Northford, CT 06472
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309
Email: Vladimir.kireyev@honeywell.com

DESIGN: Models HPF24S6, HPF24S8, HPFF8, HPFF8E, HPFF8CM, HPFF8CME, HPFF12, HPFF12E, *HPFF12CM and *HPFF12CME power limited power supply/battery chargers used for supervision and expanded power driving capability of up to four Notification Appliance Circuits (FACP Fire Circuits, Signaling Devices) or resettable/non resettable outputs. Model ZNAC-4 Class A converter. Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: 120 VAC, 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, product designation, electrical rating and UL label.

APPROVAL: Listed as power supply/battery chargers for use with separately listed compatible fire alarm control units.

XLF: 7315-0075:0206

*Rev. 10-20-10 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, 2017**

Listing Expires **June 30, 2018**

Authorized By: **DAVID CASTILLO, Program Coordinator**
Fire Engineering Division



by Honeywell

Velociti® Series ASD-PL2F, ASD-PTL2F and ASD-PL2FR

Description

The Gamewell-FCI Velociti® Series, analog addressable plug-in smoke sensors with integral communication provide features that surpass conventional sensors. Sensitivity can be programmed in the control panel software, and is continuously monitored and reported to the panel. Point ID capability allows each sensor's address to be set, providing exact locations for selective maintenance when the chamber contamination reaches an unacceptable level. The ASD-PL2F photoelectric sensor's unique optical sensing chamber is engineered to sense smoke produced by a wide range of combustion sources. Dual electronic thermistors add 135°F (57°C) fixed-temperature thermal sensing on the ASD-PTL2F model.

The Velociti® Series use a communication protocol that substantially increases the speed of communication between the sensors and certain Gamewell-FCI analog addressable fire alarm controls. These devices operate in a grouped fashion. If one of the devices in the group has a status change, the panel's microprocessor stops the group poll and concentrates on the single device. The net effect is a response speed up to five times greater than earlier designs.

Ordering Information

Part Number	Description
ASD-PL2F	Analog, addressable photoelectric smoke sensor
ASD-PTL2F	Analog, addressable photoelectric smoke sensor with thermal sensing
ASD-PL2FR	Analog, addressable photoelectric smoke sensor used with the DNR duct base when the remote test is required.

Velociti® is a registered trademark of Honeywell International Inc.

UL® is a registered trademark of Underwriters Laboratories Inc.

Analog, Addressable Photoelectronic Smoke Sensor



ASD-PL2F/ASD-PTL2F



ASD-PL2FR

Features

- Sleek, low-profile design.
- Visual rotary, decimal switch addressing (01-159).
- Built-in functional test switch activated by an external magnet.
- Bicolor LEDs flash green whenever the sensor is addressed, and light steady red on alarm.*
- Optional relay, isolator, or sounder bases.
- Low standby current.
- Analog addressable communication.
- Stable communication technique with noise immunity.
- Optional remote, single-gang LED Indicator (RA100Z).
- Compatible with Gamewell-FCI analog addressable panels.

Note: *Only the red LED is operative in panels that do not operate in Velociti® mode.

SIGNALING



APPROVED 3023594

MEA Approved FDNY



COA #:219-02-E 7272-1703:0121

Vol.VI



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9020-0617 Rev. J page 1 of 2

Installation

ASD-PL2F plug-in sensors use a separate base to simplify installation, service, and maintenance. A special tool allows maintenance personnel to plug-in and remove sensors without using a ladder.

Mount the base on a box which is at least 1.5" (3.8 cm) deep. Suitable mounting base boxes include:

- 4.0" (10.2 cm) square box.
- 3.5" (8.9 cm) or 4.0" (10.2 cm) octagonal box.
- Single-gang box (except relay or isolator bases).
- With B200S or B200SR base, mounted on a 4.0" (10.2 cm) octagonal or square box.
- With B224RB or B224BI base, mounted on a 3.5" (8.9 cm) octagonal box, or a 4.0" (10.2 cm) octagonal or square box.

NOTE: Because of the inherent supervision provided by the SLC, end-of-line resistors are not required. Wiring "T-taps" or branches are permitted for Style 4 (Class "B") wiring.

Sensor Spacing

Gamewell-FCI recommends that the spacing sensors be used in compliance with NFPA 72.

Specifications

ASD-PL2F, ASD-PTL2F, ASD-PL2FR:

Dimensions:	2.1" (5.1 cm) height
Diameter:	4.1" (10.4 cm) installed in the B501 base 6.1" (15.5 cm) installed in the B210LP base
Shipping Weight:	5.2 oz. (147 g)
Operating Temperature:	ASD-PL2F: 32° F to 120° F (0° C to 49° C) ASD-PTL2F: 32° F to 100° F (0° C to 38° C)
UL®-Listed	0-4000 ft./min. (1,219.2 m/min.), suitable for installation in ducts.
Velocity Range:	
Relative Humidity:	10-93% (non-condensing)
Thermal Ratings:	Fixed-temperature setpoint 135° F (57° C)

Electrical Specifications

Voltage Range:	15 – 32 volts DC peak
Standby Current:	(max. avg.): .0003 A @ 24 VDC (One communication every 5 seconds with LED blink enabled).
Maximum Alarm-Current:	.0065 A @ 24 VDC (LED) lit).

Bases and Options

B501	Plug-in sensor base without flange
Dimensions:	4.1" (10.4 cm) diameter
B210LP	Flanged mounting base
Dimensions:	6.1" (15.5 cm) diameter
B210LPBP	Flanged mounting base bulk pack
Dimensions:	6.1" (15.5 cm) diameter
B224RB	Plug-in sensor base with auxiliary relay, SPDT, rated 2 amps @ 30 VDC (resistive).
Relay Base	Screw terminals: Up to 14 AWG (2.0 mm ²) 2 coil latching relay 1 Form C contact UL/CSA Rating: 0.9 A @ 125 VAC, inductive 0.9 A @ 110 VDC, inductive 3 A @ 30 VDC, resistive
Dimensions:	6.1" (15.5 cm) diameter Maximum: 25 devices between isolator bases.
B200S	Intelligent sensor sounder base
Dimensions:	6.875" (17.5 cm) diameter
B200SR	Standard sounder base, UL 8649th Edition compliant, ULC Listed
Dimensions:	6.875" (17.5 cm) diameter
RA100Z	Remote LED Annunciator
BCK-200	Black detector covers (box of 10)
DNR	Duct smoke housing

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LISTING SERVICE

LISTING No. 7272-1703:0121
CATEGORY: 7272 -- SMOKE DETECTOR-SYSTEM TYPE-PHOTOELECTRIC

Page 1 of 1

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Brian Reynolds (203) 484-6277 Fax (203) 484-7309
Email: brian.reynolds@honeywell.com

DESIGN: Models ASD-PL2F, ASD-PL2FR*, ASD-FILTREXF, ASD-PTL2F, and MCS-ACCLIMATE2F photoelectric smoke detector. Models ASD-PL2F and MCS-ACCLIMATE2F employ a 135°F supplement integral heat sensor which only assists in a fire situation. This thermal circuitry is NOT approved for use in lieu of a required heat detector. Refer to listee's data sheet for detailed product description and operational considerations.

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating, and UL label.

APPROVAL: Listed as photoelectric smoke detectors when used in conjunction with listee's separately listed compatible fire alarm control units and bases. All models are suitable for open areas and inside duct installations with air velocities between 0-4000 FPM. Models ASD-PL2F and ASD-PL2FR are also approved for installations inside System Sensor duct detector housing DNR (OSFM Listing No. 3242-1653:209) and DNRW (OSFM Listing No. 3242-1653:210)*.

NOTE: The photoelectric type detectors are generally more effective at detecting slow, smoldering fires which smolder for hours before bursting into flame. Sources of these fires may include cigarettes burning in couches or bedding. The ionization type detectors are generally more effective at detecting fast, flaming fires that consume combustible materials rapidly and spread quickly. Sources of these fires may include paper burning in a waste container or a grease fire in the kitchen.

FORMERLY: 7272-1209:160 and 7272-0694:263

XLF: 7272-1653:0123

*Rev. 01-28-2010 fm



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Date Issued: **July 01, 2017**

Listing Expires **June 30, 2018**

Authorized By: **DAVID CASTILLO, Program Coordinator**
Fire Engineering Division



by Honeywell

Velociti® Series ATD-L2F, ATD-RL2F

Description

The Gamewell-FCI Velociti® Series, addressable plug-in thermal sensors with integral communication provide features that surpass conventional sensors. Point ID capability allows each sensor's address to be set, providing exact locations for pinpointing alarm locations and for selective maintenance. ATD thermal sensors use an innovative thermistor sensing circuit to produce 135°F/57°C fixed-temperature (ATD-L2F). The ATD-RL2F provides a combination 15°/minute rate-of-rise with 135° fixed thermal detection that is included in a low-profile package. The ATD-HL2F provides fixed high-temperature detection at 190°F/88°C. These thermal sensors provide cost-effective, addressable property protection in a variety of applications.

The Velociti® Series uses a communication protocol that substantially increases the speed of communication between the sensors and Gamewell-FCI analog addressable fire alarm controls. These devices operate in a grouped fashion. If one of the devices in the group has a status change, the panel's microprocessor stops the group poll and identifies the single device with the status change. The net effect is response speed up to five times greater than earlier designs.

Installation

ATD plug-in sensors use a separate base to simplify installation, service, and maintenance. A special tool allows maintenance personnel to plug-in and remove sensors without using a ladder.

Mount the base on a box which is at least 1.5" (3.8 cm) deep. Suitable mounting base boxes include:

- 4.0" (10.2 cm) square box.
- 3.5" (8.9 cm) or 4.0" (10.2 cm) octagonal box.
- Single-gang box (except relay or isolator base).
- With B200S or B200SR base, mounted on a 4.0" (10.2 cm) octagonal or square box.
- With B224RB or B224BI base, mounted on a 3.5" (8.9 cm) octagonal box, or a 4.0" (10.2 cm) octagonal or square box.

NOTE: Because of the inherent supervision provided by the SLC, end-of-line resistors are not required. Wiring "T-taps" or branches are permitted for Style 4 (Class "B") wiring.

Velociti® and E3 Series® are registered trademarks of Honeywell International Inc.

UL® is a registered trademark of Underwriters Laboratories Inc.

ULC® is a registered trademark of Underwriters Laboratories Canada Inc.

Addressable Thermal Sensor



ATD-L2F

Features

- Sleek, low-profile design
- Visual rotary switch addressing
- Built-in functional test switch activated by an external magnet
- Bicolor LEDs flash green whenever the sensor is addressed, and light steadily red on alarm*
- Optional relay, isolator, or sounder bases
- Low standby current
- Addressable communication
- Stable communication technique with noise immunity
- Optional remote, single-gang LED accessory (RA-100Z)
- Suitable for installation in ducts

Note: *Only the red LED is operative in panels that do not operate in Velociti® mode.

An ISO 9001-2000 Company

SIGNALING



MEA Approved



S2332 3023594 219-02-E Vol.VI 7270-1703:0115

GAMEWELL-FCI

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Specifications

ATD-L2F/ATD-RL2F

Dimensions: 2.1" (5.3 cm) Height
4.1" (10.4 cm) diameter installed in the B501 base
6.1" (15.5 cm) diameter installed in the B210LP base

Shipping Weight: 4.8 oz. (137 g)

Operating Temperature:

ATD-L2F or ATD-RL2F -4° F to 100° F (-20° C to 38°C)
ATD-HL2 -4° F to 150°F (-20 C to 66°C)

Sensor Spacing: UL® approved for 50 ft. (15.2 m) center to center
FM approved for 25 x 25 ft. (7.6 x 7.6 m) spacing

Relative Humidity: 10 – 93% (non-condensing)
ATD-L2F Fixed-temperature setpoint 135°F (57°C)

ATD-RL2F Combination 135° F fixed temperature and 15° F(8.3°c)/per minute rate-of-rise°

ATD-HL2F Fixed-temperature setpoint 190°F (88°C)

Electrical Specifications

Voltage Range: 15 - 32 Volts DC peak
Standby Current: 200 mA @ 24 VDC (without communication)
(max. avg.) .0003 A @ 24 VDC (one communication every 5 seconds with LED blink enabled)

LED Current (max.) .0065 A @ 24 VDC (LED lit)

Specifications

Bases and Options

B501 Plug-in sensor base without flange
Dimensions: 4.1" (10.4 cm) diameter

B210LP Flanged mounting base
Dimensions: 6.1" (15.5 cm) diameter

B210LPBP Flanged mounting base bulk pack
Dimensions: 6.1" (15.5 cm) diameter

B224RB Plug-in sensor base with auxiliary relay, SPDT
2 coil latching relay 1 Form C contact UL/CSA Rating:
0.9 A @ 125 VAC (inductive)
0.9 @ 110 VDC (inductive)
3.A @ 30 VDC (resistive)
Dimensions: 6.1" (15.5 cm) diameter

B224BI Plug-in sensor isolator base for Style 7 operation
Dimensions: 6.1" (15.5 cm) diameter
Maximum 25 devices between isolator bases

B200S Intelligent sensor sounder base
Dimensions: 6.875" (17.5 cm) diameter

B200SR Standard sounder base, UL 864 9th Edition compliant, ULC Listed
Dimensions: 6.875" (17.5 cm) diameter

RA-100Z Remote LED Annunciator

BCK-200 Black detector covers (box of 10)

Ordering Information

Part Number	Description
ATD-L2F	Addressable thermal sensor, fixed, 135° F
ATD-RL2F	Addressable thermal sensor, combination fixed, 135° F and 15°/minute rate-of-rise.
ATD-HL2F	Addressable thermal sensor, fixed, 190° F

GAMEWELL-FCI

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LISTING SERVICE

LISTING No. 7270-1703:0115

Page 1 of 1

CATEGORY: 7270 -- HEAT DETECTOR

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309
Email: vladimir.kireyev@honeywell.com

DESIGN: Models ATD-L2, *ATD-L2F, ATD-HL2 AND *ATD-HL2F (fixed temperature) and ATD-RL2, *ATD-RL2F (fixed temperature with Rate-of-Rise) electronic heat detectors. Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: ATD-L2, *-L2F, ATD-RL2, -*RL2F = 135°F fixed temperature
ATD-HL2, *-HL2F = 190°F fixed temperature

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 separately listed compatible fire alarm control units. Refer to listee's Installation Instruction Manual for details.

NOTE: FORMERLY: 7270-0694:256



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, 2017**

Listing Expires **June 30, 2018**

Authorized By: **DAVID CASTILLO, Program Coordinator**
Fire Engineering Division



by Honeywell

System Sensor, 5600 Series

Description

The System Sensor® 5600 Series mechanical heat detectors offer a low-cost solution for property protection against fire and protection in conditions where the non-life safety installations may not require smoke detectors.

The 5600 Series offers both single and dual circuit models. Each model is available with low or high temperature ratings, and fixed temperature or rate-of-rise activation. The rate-of-rise element is restorable to accommodate field testing of the unit.

The detectors mount readily on single gang or octagonal backboxes. They can also mount on a four inch (10.16 cm) square box with the support of a square to round plaster ring. The mounting bracket is reversible to allow for flush and surface mount installations.

The 5600 units provide clear markings readily visible on the unit to ensure the proper application. Alphanumeric characters identify the type of detector and temperature rating, both in Fahrenheit and Celsius. Fixed temperature models are labeled "FX," while the combination units are marked "FX/ROR". The detector also features a positive indication of actuation of the fixed temperature portion. The collector disc drops from the unit making it readily identifiable.

Electrical Specifications

Operating Voltage	Contact Ratings
6 -125 VAC	3A
6-28 VDC	1A
125 VDC	0.3A

Mechanical Heat Detectors



5600 Series

Features

- Offers an attractive low silhouette design.
- Has multiple configurations available.
- Uses single and dual circuit models.
- Has a fixed temperature and combination, or a fixed temperature/rate-of-rise activation.
- Displays readily visible alphanumeric markings.
- Includes a standard 3.5" (8.8 cm) or a 4" (10.16 cm) octagonal mounting.
- Installed as a single gang or a standard 4" (10.16 cm) square mounting with the support of a plaster ring.

System Sensor® is a registered trademark of Honeywell International Inc.

SIGNALING



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S2101



APPROVED
3016008

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FDNY:



COA # 199-33-4 7270-1653:0167



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Ordering Information

System Sensor, 5600 Series

Part Number	Circuit	Temperature Rating	Rating	Max. UL Spacing - 10 Foot Ceiling*
5601	Single	135°F (57°C)	FT + ROR	50 ft. x 50 ft. (15.24 m x 15.2 m)
5602	Single	194°F (90°C)	FT + ROR	50 ft. x 50 ft. (15.24 m x 15.2 m)
5603	Single	135°F (57°C)	FT only	25 ft. x 25 ft. (7.62 m x 7.62 m)
5604	Single	194°F (90°C)	FT only	25 ft. x 25 ft. (7.62 m x 7.62 m)
5621	Dual	135°F (57°C)	FT + ROR	50 ft. x 50 ft. (15.24 m x 15.2 m)
5622	Dual	194°F (90°C)	FT + ROR	50 ft. x 50 ft. (15.24 m x 15.2 m)
5623	Dual	135°F (57°C)	FT only	25 ft. x 25 ft. (7.62 m x 7.62 m)
5624	Dual	194°F (90°C)	FT only	25 ft. x 25 ft. (7.62 m x 7.62 m)

*Note: Refer to NFPA 72 for guidelines for spacing reductions when ceiling heights exceed 10 feet.

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9020-0590 Rev. D page 2 of 2

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LISTING SERVICE

LISTING No. 7270-1653:0167

Page 1 of 1

CATEGORY: 7270 -- HEAT DETECTOR

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309
Email: Vladimir.Kireyev@honeywell.com

DESIGN: Models 5601, 5601P, 5602, 5621, and 5622 combination fixed-temperature and rate-of-rise type and Models 5603, 5604, 5623, and 5624 fixed-temperature mechanical heat detectors. Refer to listee's data sheet for detailed product description and operational considerations.

RATING: Models 5601, 5601P, 5603, 5621, & 5623 have a fixed temperature of 135°F.

Models 5602, 5604, 5622, & 5624 have a fixed temperature of 194°F.

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, temperature/electrical rating, and UL label.

APPROVAL: Listed as heat detectors for use with separately listed compatible fire alarm control units. Refer to listee's Installation Instruction Manual for details and UL directory for dimensions.

NOTE: Formerly 7270-1209:227

06-20-05



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, 2018**

Listing Expires **June 30, 2019**

Authorized By: **DAVID CASTILLO**, Program Coordinator
Fire Engineering Division



by Honeywell

Velociti® Series

AMM-4F

Description

The Gamewell-FCI Velociti® Series, addressable monitor module (AMM-4F) features a single Style D, Class A initiating device circuit. It may also be configured as a Style B, Class B initiating circuit with end-of-line resistor. This module provides an address for any device or group of devices connected to this circuit. Any alarm initiating devices with normally open (N.O.) dry contacts, such as heat detectors, linear heat detection devices, 4-wire projected beam smoke detectors, 4-wire smoke detectors, water flow switches, tamper switches, manual stations, etc. may be installed in this circuit.

The Velociti® Series use a communication protocol that substantially increases the speed of communication between the sensors and certain Gamewell-FCI analog addressable fire alarm controls. These devices operate in a grouped fashion. If one of the devices in the group has a status change, the panel's microprocessor stops the group poll and concentrates on the single device. The net effect is response speed up to five times greater than earlier designs.

The AMM-4F module is designed for installation in the signaling line circuit of any Gamewell-FCI analog addressable control panel. The initiating circuit of the AMM-4F has a maximum line resistance of 40 ohms, allowing the module to accommodate a number of initiating devices at a distance from the module. The AMM-4F is designed to mount in a 4" square junction box 2 1/8" deep.

The initiating device circuit of the AMM-4F can support a maximum line resistance of up to 40 ohms allowing the use of linear heat detection devices.

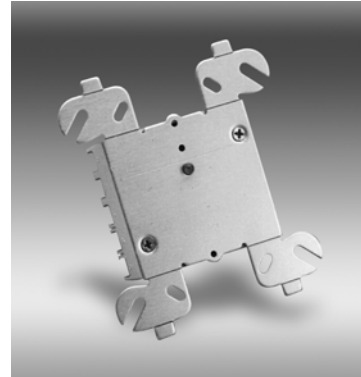
Ordering Information

Model Description

AMM-4F Addressable monitor module, single circuit, Style D, Class A or Style BC/A and B

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Addressable Monitor Module



AMM-4F

Features

- Compact size allows easy installation
- Class A, Style D, or Class B, Style B initiating circuit
- Visual rotary, decimal switch addressing (01-159)
- 40 ohm line resistance for each initiating device circuit
- Accommodates any N/O dry contact device
- Bicolor LEDs flash green whenever the module is addressed, and light steady red on alarm*

*Note: Only the red LED is operative in panels that do not operate in Velociti® mode.

Specifications

Supervisory current:	.000375 amps. (LED flashing)
Alarm current:	.005 amps. (LED lit)
Operating temperature:	32° to 120° F (0° to 49° C)
Relative humidity:	10 to 93% (non-condensing)
End-of-line resistor:	47K ohms
Dimensions:	4 1/2" H x 4" W x 1 1/4" D (11.4 x 10.2 x 3.2 cm)

SIGNALING



LISTED
S1949



APPROVED
3023594

MEA
Approved



227-03-E Vol. IV 7300-1703:0102



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9020-0624 Rev. E page 1 of 1

Velociti® Series AOM-2RF

Addressable Output Relay Control Module

General

The Gamewell-FCI Velociti® Series, addressable output relay control module (AOM-2RF) allows a Gamewell-FCI analog addressable fire alarm control panel to switch discrete relay contacts by code command. The relay provides two isolated sets of Form-C contacts which transfer simultaneously. Circuit connections to the relay contacts are not supervised by the module.

The Velociti® Series use a communication protocol that substantially increases the speed of communication between the SLC devices and certain Gamewell-FCI analog addressable fire alarm control panels. These devices operate in a grouped fashion. If one of the devices in the group has a status change, the panel's microprocessor stops the group poll and concentrates on the single device. The net result produces a superior response speed up to five times greater than earlier designs.

The AOM-2RF Module is designed for installation in the signaling line circuit of any Gamewell-FCI analog addressable fire alarm control panel. The module contains a panel controlled LED. The AOM-2RF is designed to mount in a 4" (10.16 cm) square junction box 2 1/8" (5.53 cm) deep.

Ordering Information

AOM-2RF: Addressable output relay control module

Table 1 lists the relay contact ratings.

CURRENT RATING	MAXIMUM VOLTAGE	LOAD DESCRIPTION	APPLICATION
3A	30 VDC	Resistive	Non-Coded
2A	30 VDC	Resistive	Coded
0.9A	110 VDC	Resistive	Non-Coded
0.5A	125 VAC	Resistive	Non-Coded
0.5A	30 VDC	Inductive (L/R=5ms)	Coded
1A	30 VDC	Inductive (L/R=2ms)	Coded
0.5A	125 VAC	Inductive (PF=.35)	Non-Coded
0.7A	75 VAC	Inductive	Non-Coded

Table 1: Relay Contact Ratings



AOM-2RF

FEATURES & BENEFITS

- Listed under UL® Standard 864
 - Provides visual rotary, decimal switch addressing (01-159)
 - Includes a bi-color LED that flashes green whenever the module is addressed, and lights steady red upon activation*
 - Designed as a compact size to allow easy installation
- Note: Only the red LED is operative in panels that do not operate in Velociti® mode

Velociti® Series AOM-2RF Technical Specifications

SYSTEMS

Supervisory Current: .000375 amps.

Alarm Current: .0065 amps.

Operating Temperature: 32° to 120° F (0° to 49° C)

Relative Humidity: 10 to 93% relative humidity (non-condensing)

Dimensions: 4 1/2" H x 4" W x 1 1/4"
(11.4 x 10.2 x 3.2 cm)

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.

STANDARDS

The Velociti Series® AOM-2RF is designed to comply with the following standard:

UL Standard: UL 864 9th Edition

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

UL: S1913

FM: 3023594

MEA FDNY: 219-02-E Vol. VI

CSFM: 7300-1703:0102

ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: <http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx>

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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

Learn more about Gamewell-FCI's Velociti® Series AOM-2RF and other products available by visiting www.Gamewell-FCI.com

Honeywell Gamewell-FCI

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OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7300-1703:0102 Page 1 of 1

CATEGORY: 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309
Email: vladimir.kireyev@honeywell.com

DESIGN: Models AMM-4, *AMM-4F, AMM-2 and *AMM-2F monitor modules and Models AOM, AOM-2, AOM-2R, *AOM-2RF, AOM-2S and *AOM-2SF control modules. Refer to listee's data sheet for detailed product description and operational considerations.

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model designation, electrical rating and UL label.

APPROVAL: Listed as accessories for use with separately listed compatible control units. System Sensor Model SMB500 surface mount box (CSFM Listing No. 7300-1653:103) may be used as an enclosure for these modules

NOTE: FORMERLY: 7300-0694:178

XLF: 7300-1653:0103

12-4-07



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Date Issued: **July 01, 2017**

Listing Expires **June 30, 2018**

Authorized By: **DAVID CASTILLO**, Program Coordinator
Fire Engineering Division



Indoor Selectable-Output Speaker Strobes and Dual Voltage Evacuation Speakers for Wall Applications

System Sensor L-Series selectable output speaker strobes and dual-voltage evacuation speakers can reduce ground faults and enable faster installation with lower current draw and modern aesthetics.

Features

- Plug-in design and protective cover reduce ground faults
- Universal mounting plate with an onboard shorting spring tests wiring continuity before installation
- No extension ring required
- Field selectable candela settings on wall units: 15, 30, 75, 95, 110, 135, 185
- Automatic selection of 12- or 24-volt operation at 15 and 30 candela
- Rotary switch simplifies field selection of speaker voltage (25 and 70.7 Vrms) and power settings (¼, ½, 1 and 2 watts)
- Speakers offer high fidelity and high volume sound output
- Compatible with System Sensor synchronization protocol
- Electrical compatibility with existing SpectrAlert and SpectrAlert Advance products
- Tamper-resistant construction
- Updated modern aesthetics

Agency Listings



The System Sensor L-Series of speakers and speaker strobes reduce costly ground faults using a plug-in design and universal mounting plate that allow the installer to pre-wire mounting plates, dress the wires, and confirm wiring continuity before plugging in the speakers. In addition, a protective plastic cover prevents nicked wires by covering exposed speaker components.

These devices also enable faster installations by providing instant feedback to ensure that wiring is properly connected, rotary switches to select voltage and power settings, and 7 field-selectable candela settings for wall speaker strobes.

The low total harmonic distortion of the speaker offers high fidelity sound output while still offering high volume sound output for use in high ambient noise applications.

System Sensor L-Series makes installation easy

- Attach a universal mounting plate to a 4 × 4 × 2 1/8 inch back box. Flush-mount applications do not require an extension ring.
- Connect the notification appliance circuit or speaker wiring to the terminals on the mounting plate.
- Attach the speaker or speaker strobe to the mounting plate by inserting the product tabs into the mounting plate grooves. Hinge the device into position to lock the product pins into the mounting plate terminals. The device will temporarily hold in place with a catch until it is secured with a captured mounting screw.

L-Series Speaker and Speaker Strobe Specifications

Architectural/Engineering Specifications

General

L-Series speaker and speaker strobes shall mount to a 4 × 4 × 21/8-inch back box. A universal mounting plate shall be used for mounting ceiling and wall products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate. Also, L-Series speaker strobes, 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°F and 120°F from a regulated DC, or full-wave rectified, unfiltered power supply. Wall-mount speaker strobes shall have field-selectable candela settings including 15, 30, 75, 95, 110, 135, 185.

Speaker

The speaker shall be a System Sensor L-Series model _____ dual-voltage transformer speaker capable of operating at 25.0 or 70.7 nominal Vrms. It should be listed to UL 1480 and shall be approved for fire protective service. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. The speaker shall have power taps and voltage that are selected by rotary switches.

Speaker Strobe combination

The speaker strobe shall be a System Sensor L-Series model _____ listed to UL1480 and UL 1971 and be approved for fire protective signaling systems. The speaker shall be capable of operating at 25.0 or 70.7 nominal Vrms selected via rotary switch, and shall have a frequency range of 400 to 4,000 Hz. The speaker shall have power taps that are selected by rotary switch. The strobe shall comply with the NFPA 72 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.

Synchronization Module

The module shall be a System Sensor Sync•Circuit model MDL3 listed to UL 464 and shall be approved for fire protective service. The module shall synchronize SpectrAlert strobes at 1 Hz. The module shall mount to a 411/16 × 411/16 × 21/8-inch back box. The module shall also control two Style Y (class B) circuits or one Style Z (class A) circuit. The module shall synchronize multiple zones. Daisy chaining two or more synchronization modules together will synchronize all the zones they control. The module shall not operate on a coded power supply.

Physical Specifications

Operating Temperature	32°F to 120°F (0°C to 49°C)		
Humidity Range	10 to 93% non-condensing		
Dimensions, Wall-Mount	Length	Width	Depth
SPL Speaker	6.5 in, 165 mm	5 in, 127 mm	.97 in, 23 mm
With Surface Mount Back Box	6.6 in, 168 mm	5.1 in, 130 mm	3.2 in, 82 mm
SPSL Speaker/Strobe (including lens and speaker)	6.5 in, 165 mm	5.0 in, 127 mm	2.3 in, 58 mm
With Surface Mount Back Box	6.6 in, 168 mm	5.1 in, 130 mm	4.5 in, 116 mm

Electrical/Operating Specifications

Nominal Voltage (speakers)	25 Volts or 70.7 Volts(nominal)
Maximum Supervisory Voltage (speakers)	50 VDC
Strobe Flash Rate	1 flash per second
Nominal Voltage (strobes)	Regulated 12 VDC or regulated 24 DC/FWR ^{1,2}
Operating Voltage Range (includes fire alarm panels with built in sync)	8 to 17.5 V (12 V nominal) or 16 to 33V (24 V nominal)
Operating Voltage with MDL3 Sync Module	8.5 to 17.5 V (12 V nominal) or 16.5 to 33V (24 V nominal)
Frequency Range	400 to 4000 Hz
Power	¼, ½, 1, 2 watts

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. Strobe products will operate at 12 V nominal only for 15 and 30 cd

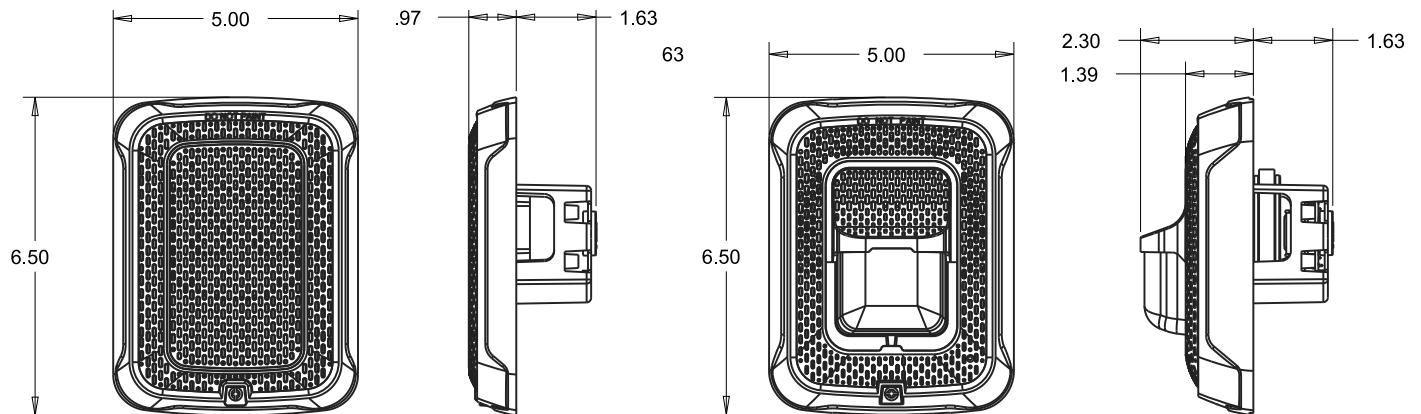
UL Current Draw Data

UL Max Strobe Current Draw (mA RMS)				
Candela	8 to 17.5 Volts		16 to 33 Volts	
	DC		DC	FWR
15	88		43	60
30	143		63	83
75	N/A		107	136
95	N/A		121	155
110	N/A		148	179
135	N/A		172	209
185	N/A		222	257

Sound Output Speaker Strobe				
	¼ W	½ W	1 W	2 W
UL Reverberant (dBA @10 ft)	77	80	83	86
UL Anechoic (dBA @10 ft)	77	80	83	86

Sound Output Speaker				
	¼ W	½ W	1 W	2 W
UL Reverberant (dBA @10 ft)	79	82	85	88
UL Anechoic (dBA @10 ft)	79	82	85	88

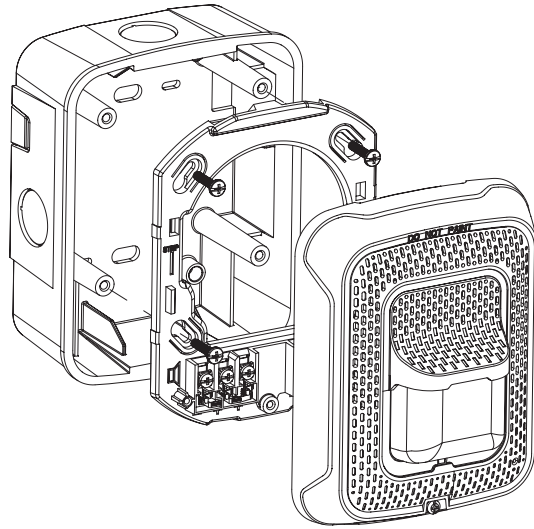
L-Series Dimensions



Wall-Mount Speaker

Wall-Mount Speaker Strobe

Surface Mounting



Wall-Mount Speaker Strobe with SBBSP Surface Mount Back Box

L-Series Ordering Information

Wall Mount		
White	Red	Description
SPWL	SPRL	Speaker only
SPSWL	SPSRL	Speaker Strobe
SPSWL-P	SPSRL-P	Plain Speaker Strobe
SPSWL-ALERT	—	Speaker Strobe, Amber Lens
SPSWL-CLR-ALERT	—	Speaker Strobe Clear Lens
—	SPSRL-SP	Speaker Strobe, Fuego
Accessories		
White	Red	Description
RFPW	RFP	7 in × 9.5 in Retrofit Plate
SBBSPWL	SBBSPRL	Surface Mount Back Box for Speakers and Speaker Strobes
TR-2W	TR-2	Wall Mount Trim Ring

Notes:

All -P models have a plain housing (no "FIRE" marking on the cover)



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 for current product information, including the latest version of this data sheet.
 AVDS86701 • 03/17

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7320-1653:0505

Page 1 of 2

CATEGORY: 7320 -- SPEAKERS

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309
Email: Vladimir.Kireyev@honeywell.com

DESIGN: System Sensor Indoor Models:
SPRL and SPWL Wall Speakers;
SPCRL and SPCWL Ceiling Speakers;
SPSRL, SPSWL, SPSRL-P, SPSRL-SP, SPSWL-P, SPSWL-ALERT and SPSWL-CLR-ALERT Wall Speaker Stobes;
SPSCRL, SPSCWL, SPSCWL-P, SPSCWL-SP and SPSCWL-CLR-ALERT Ceiling Speaker Stobes.

Wall Bezel Parts:

BZSPR-P, BZSPR-AL, BZSPR-EV, BZSPR-AG, BZSPR-PG, BZSPR-F and BZSPR-SP,
BZSPW-P, BZSPW-AL, BZSPW-EV, BZSPW-AG, BZSPW-PG, BZSPW-F and BZSPW-SP,

Ceiling Bezel Parts:

BZSPRC-P, BZSPRC-AL, BZSPRC-EV, BZSPRC-AG, BZSPRC-PG, BZSPRC-F and BZSPRC-SP,
BZSPWC-P, BZSPWC-AL, BZSPWC-EV, BZSPWC-AG, BZSPWC-PG, BZSPWC-F and BZSPWC-SP,

Wall Trim Rings for Speaker Stobes:

TR2 and TR2W

Ceiling Trim Rings for Speaker Stobes:

TRC2 and TRC2W.

Wall Surface Mounted Back Boxes:

SBBSPRL and SBBSPWL,

Ceiling Surface Mounted Back Boxes:

SBBCRL and SBBCWL

Refer to listee's data sheet for detailed product description and operational considerations.

02-27-17 gt



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Date Issued: July 01, 2017

Listing Expires June 30, 2018

Authorized By: DAVID CASTILLO, Program Coordinator
Fire Engineering Division

- RATING:** 25 or 70.7 VAC, 1/4, 1/2, 1, 2 Watt outputs.
Regulated 12 VDC and 24 VDC/FWR is for 2-wire strobe portion.
- INSTALLATION:** In accordance with listee's printed installation instructions, NFPA 72, 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 speakers and speaker-strobes when used with separately listed compatible fire alarm control units. Suitable for indoor use, dry and damp environments. Authority having jurisdiction should be consulted prior to installation. Refer to listee's Installation Instruction Manual for details.

02-27-17 gt



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Date Issued: **July 01, 2017**

Listing Expires **June 30, 2018**

Authorized By: **DAVID CASTILLO**, Program Coordinator
Fire Engineering Division



Indoor Selectable-Output Horns, Strobes, and Horn Strobes for Wall Applications

System Sensor L-Series audible visible notification products are rich with features guaranteed to cut installation times and maximize profits with lower current draw and modern aesthetics.

Features

- Updated Modern Aesthetics
- Small profile devices for Horns and Horn Strobes
- Plug-in design with minimal intrusion into the back box
- Tamper-resistant construction
- Automatic selection of 12- or 24-volt operation at 15 and 30 candela
- Field-selectable candela settings on wall units: 15, 30, 75, 95, 110, 135, and 185
- Horn rated at 88+ dBA at 16 volts
- Rotary switch for horn tone and two volume selections
- Mounting plate for all standard and all compact wall units
- Mounting plate shorting spring checks wiring continuity before device installation
- Electrically Compatible with legacy SpectrAlert and SpectAlert Advance devices
- Compatible with MDL3 sync module
- Listed for wall mounting only

Agency Listings



The System Sensor L-Series offers the most versatile and easy-to-use line of horns, strobes, and horn strobes in the industry with lower current draws and modern aesthetics. With white and red plastic housings, standard and compact devices, and plain, FIRE, and FUEGO-printed devices, System Sensor L-Series can meet virtually any application requirement.

The L-Series line of wall-mount horns, strobes, and horn strobes include a variety of features that increase their application versatility while simplifying installation. All devices feature plug-in designs with minimal intrusion into the back box, making installations fast and foolproof while virtually eliminating costly and time-consuming ground faults.

To further simplify installation and protect devices from construction damage, the L-Series utilizes a universal mounting plate for all models with an onboard shorting spring, so installers can test wiring continuity before the device is installed.

Installers can also easily adapt devices to suit a wide range of application requirements using field-selectable candela settings, automatic selection of 12- or 24-volt operation, and a rotary switch for horn tones with two volume selections.

L-Series Specifications

Architect/Engineer Specifications

General

L-Series standard horns, strobes, and horn strobes shall mount to a standard 2 x 4 x 1 7/8-inch back box, 4 x 4 x 1 1/2-inch back box, 4-inch octagon back box, or double-gang back box. L-Series compact products shall mount to a single-gang 2 x 4 x 1 7/8-inch back box. A universal mounting plate shall be used for mounting ceiling and wall products for all standard models and a separate universal mounting plate shall be used for mounting wall compact models. The notification appliance circuit wiring shall terminate at the universal mounting plate. Also, 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. Strobes and horn strobes shall have field-selectable candela settings including 15, 30, 75, 95, 110, 135, and 185.

Strobe

The strobe shall be a System Sensor L-Series 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.

Horn Strobe Combination

The horn strobe shall be a System Sensor L-Series 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 two audibility options and an option to switch between a temporal three pattern and a non-temporal (continuous) pattern. These options are set by a multiple position switch. The horn on horn strobe models shall operate on a coded or non-coded power supply.

Synchronization Module

The module shall be a System Sensor Sync•Circuit model MDL3 listed to UL 464 and shall be approved for fire protective service. The module shall synchronize SpectraAlert strobes at 1 Hz and horns at temporal three. Also, while operating the strobes, the module shall silence the horns on horn strobe models over a single pair of wires. The module shall mount to a 4 1/16 x 4 1/16 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

Standard Operating Temperature	32°F to 120°F (0°C to 49°C)
Humidity Range	10 to 93% non-condensing
Strobe Flash Rate	1 flash per second
Nominal Voltage	Regulated 12 DC or regulated 24 DC/FWR ^{1,2}
Operating Voltage Range	8 to 17.5 V (12 V nominal) or 16 to 33 V (24 V nominal)
Operating Voltage Range MDL3 Sync Module	8.5 to 17.5 V (12 V nominal) or 16.5 to 33 V (24 V nominal)
Input Terminal Wire Gauge	12 to 18 AWG
Wall-Mount Dimensions (including lens)	5.6" L x 4.7" W x 1.91" D (143 mm L x 119 mm W x 49 mm D)
Compact Wall-Mount Dimensions (including lens)	5.26" L x 3.46" W x 1.91" D (133 mm L x 88 mm W x 49 mm D)
Horn Dimensions	5.6" L x 4.7" W x 1.25" D (143 mm L x 119 mm W x 32 mm D)
Compact Horn Dimensions	5.25" L x 3.45" W x 1.25" D (133mm L x 88mm W x 32mm D)

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. Strobe products will operate at 12 V nominal only for 15 cd and 30 cd.

UL Current Draw Data

UL Max. Strobe Current Draw (mA RMS)				
Candela Range	Candela	8-17.5 Volts		
		DC	16-33 Volts DC	FWR
Candela Range	15	88	43	60
	30	143	63	83
	75	N/A	107	136
	95	N/A	121	155
	110	N/A	148	179
	135	N/A	172	209
	185	N/A	222	257

UL Max. Horn Current Draw (mA RMS)				
Sound Pattern	dB	8-17.5 Volts		
		DC	16-33 Volts DC	FWR
Temporal	High	39	44	54
Temporal	Low	28	32	54
Non-Temporal	High	43	47	54
Non-Temporal	Low	29	32	54
3.1 KHz Temporal	High	39	41	54
3.1 KHz Temporal	Low	29	32	54
3.1 KHz Non-Temporal	High	42	43	54
3.1 KHz Non-Temporal	Low	28	29	54
Coded	High	43	47	54
3.1 KHz Coded	High	42	43	54

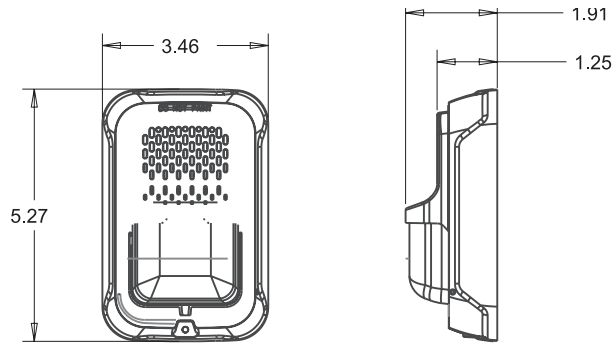
UL Max. Current Draw (mA RMS), 2-Wire Horn Strobe, Candela Range (15-115 cd)										
DC Input	8-17.5 Volts		16-33 Volts							
	15cd	30cd	15cd	30cd	75cd	95cd	110cd	135cd	185cd	
Temporal High	98	158	54	74	121	142	162	196	245	
Temporal Low	93	154	44	65	111	133	157	184	235	
Non-Temporal High	106	166	73	94	139	160	182	211	262	
Non-Temporal Low	93	156	51	71	119	139	162	190	239	
3.1K Temporal High	93	156	53	73	119	140	164	190	242	
3.1K Temporal Low	91	154	45	66	112	133	160	185	235	
3.1K Non-Temporal High	99	162	69	90	135	157	175	208	261	
3.1K Non-Temporal Low	93	156	52	72	119	138	162	192	242	
16-33 Volts										
FWR Input	15cd	30cd	75cd	95cd	110cd	135cd	185cd			
Temporal High	83	107	156	177	198	234	287			
Temporal Low	68	91	145	165	185	223	271			
Non-Temporal High	111	135	185	207	230	264	316			
Non-Temporal Low	79	104	157	175	197	235	283			
3.1K Temporal High	81	105	155	177	196	234	284			
3.1K Temporal Low	68	90	145	166	186	222	276			
3.1K Non-Temporal High	104	131	177	204	230	264	326			
3.1K Non-Temporal Low	77	102	156	177	199	234	291			

Horn Tones and Sound Output Data

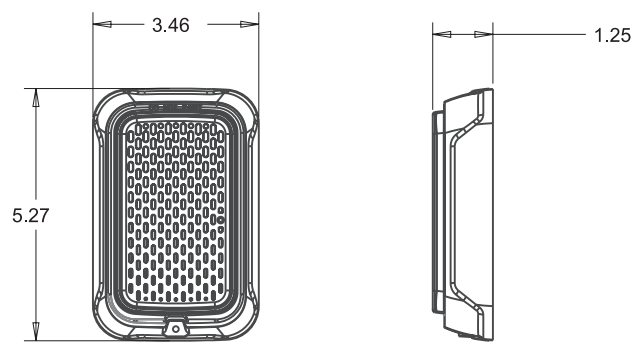
Horn and Horn Strobe Output (dBA)					
Switch Position	Sound Pattern	dB	8-17.5 Volts		16-33 Volts
			DC	DC	FWR
1	Temporal	High	84	89	89
2	Temporal	Low	75	83	83
3	Non-Temporal	High	85	90	90
4	Non-Temporal	Low	76	84	84
5	3.1 KHz Temporal	High	83	88	88
6	3.1 KHz Temporal	Low	76	82	82
7	3.1 KHz Non-Temporal	High	84	89	89
8	3.1 KHz Non-Temporal	Low	77	83	83
9*	Coded	High	85	90	90
10*	3.1 KHz Coded	High	84	89	89

* Settings 9 and 10 are not available on the 2-wire horn strobes.

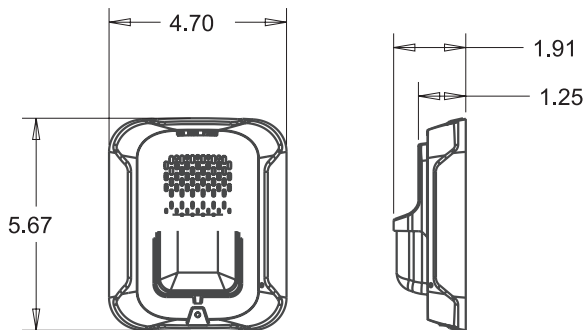
L-Series Dimensions



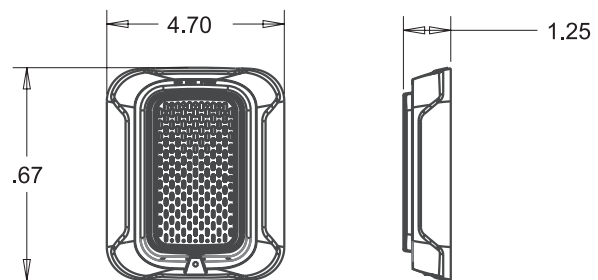
Compact Strobe / Horn Strobe



Compact Horn



Strobe / Horn Strobe



Horn

L-Series Ordering Information

Model	Description
Wall Horn Strobes	
P2RL	2-Wire, Horn Strobe, Red
P2WL	2-Wire, Horn Strobe, White
P2GRL	2-Wire, Compact Horn Strobe, Red
P2GWL	2-Wire, Compact Horn Strobe, White
P2RL-P	2-Wire, Horn Strobe, Red, Plain
P2WL-P	2-Wire, Horn Strobe, White, Plain
P2RL-SP	2-Wire, Horn Strobe, Red, FUEGO
P2WL-SP	2-Wire, Horn Strobe, White, FUEGO
Wall Strobes	
SRL	Strobe, Red
SWL	Strobe, White
SGRL	Compact Strobe, Red
SGWL	Compact Strobe, White
SRL-P	Strobe, Red, Plain
SWL-P	Strobe, White, Plain
SRL-SP	Strobe, Red, FUEGO
SWL-CLR-ALERT	Strobe, White, ALERT

Model	Description
Horns	
HRL	Horn, Red
HWL	Horn, White
HGRL	Compact Horn, Red
HGWL	Compact Horn, White
Accessories	
TR-2	Universal Wall Trim Ring Red
TR-2W	Universal Wall Trim Ring White
SBBRL	Wall Surface Mount Back Box, Red
SBBWL	Wall Surface Mount Back Box, White
SBBGRL	Compact Wall Surface Mount Back Box, Red
SBBGWL	Compact Wall Surface Mount Back Box, White

Notes:

All -P models have a plain housing (no "FIRE" marking on cover)
 All -SP models have "FUEGO" marking on cover
 All -ALERT models have "ALERT" marking on cover



3825 Ohio Avenue • St. Charles, IL 60174
 Phone: 800-SENSOR2 • Fax: 630-377-6495
www.systemsensor.com

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 for current product information, including the latest version of this data sheet.
 AVDS86503 • 03/17

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OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7125-1653:0504

Page 1 of 2

CATEGORY: 7125 -- FIRE ALARM DEVICES FOR THE HEARING IMPAIRED

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309
Email: Vladimir.Kireyev@honeywell.com

DESIGN: System Sensor Indoor 2-wire Models:
SRL, SWL, SGRL, SGWL, SRL-P SWL-P, SRL-SP, SWL-CLR-ALERT and SWL-ALERT
Wall Strobes;
SCRL, SCWL and SCWL-CLR-ALERT Ceiling 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:

TR2 and TR2W

Ceiling Trim Rings:

TRC2 and TRC2W.

Wall Surface Mounted Back Boxes:

SBBRL, SBBGRL, SBBWL and SBBGWL,

Ceiling Surface Mounted Back Boxes:

SBBCRL and SBBCWL

Refer to listee's data sheet for detailed product description and operational considerations.

02-14-17 gt



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Date Issued: **February 16, 2017**

Listing Expires **June 30, 2017**

Authorized By: **DAVID CASTILLO**, Program Coordinator
Fire Engineering Division

- RATING:** Regulated 12 VDC setting: 8-17.5 VDC
Regulated 24 VDC/fwr setting: 16-33 VDC
- INSTALLATION:** In accordance with listee's printed installation instructions, NFPA 72, 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 two wire strobe units used for synchronous application when used with separately listed compatible fire alarm control units. Suitable for indoor use, vertical wall or horizontal ceiling mounted. Authority having jurisdiction should be consulted prior to installation. Refer to listee's Installation Instruction Manual for details.

02-14-17 gt



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Date Issued: **February 16, 2017**

Listing Expires **June 30, 2017**

Authorized By: **DAVID CASTILLO**, Program Coordinator
Fire Engineering Division

L-Series, Indoor Strobes and Horn Strobes

Indoor Selectable-Output Strobes/Horn Strobes for Ceiling Applications

General

The L-Series audible visible notification products offer the most versatile and easy-to-use product line of horns, strobes, and horn strobes in the industry. This product includes lower current draws and a modern aesthetic design which reduce installation times and maximize profits. In addition, the L-Series offers white and red plastic housings and wall and ceiling mounting options.

Similar to the entire L-Series product line, the ceiling-mount strobes and horn strobes include a variety of features that increase their application versatility while simplifying the installation. All devices offer a plug-in design so that there is minimal intrusion into the backbox. These features make installations fast and foolproof while eliminating costly and time-consuming ground faults.

To simplify the installation, the L-Series uses a universal mounting plate allowing you to mount the devices to a wide array of backboxes. With an on-board shorting spring, installers can test wiring continuity before the device is installed.

Installers can also easily adapt devices to suit a wide range of application requirements using the following:

- Field-selectable candela settings
- Automatic selection of 12- or 24-volt operation
- Rotary switch for horn tones with two volume selections



Ceiling Horn Strobe

FEATURES & BENEFITS

- | | | | | |
|--|---|---|---|---|
| <ul style="list-style-type: none"> • Listed for ceiling mounting only • Features a plug-in design so that there is minimal intrusion into the backbox • Designed with a tamper-resistant construction • Provides an automatic selection of 12- or 24-volt operation at 15 and 30 candela | <ul style="list-style-type: none"> • Uses field-selectable candela settings on the following ceiling units: <ul style="list-style-type: none"> - 15 - 30 - 75 - 95 - 115 - 150 - 177 | <ul style="list-style-type: none"> • Produces horn rated at 88+ dBA at 16 volts • Offers a rotary switch for horn tone and two volume selections • Includes a universal mounting plate for ceiling units | <ul style="list-style-type: none"> • Contains a mounting plate with a shorting spring feature that checks the wiring continuity before device installation • Compatible with MDL3 sync module | <ul style="list-style-type: none"> • Supports electrical compatibility with the legacy SpectrAlert and the SpectrAlert Advance devices |
|--|---|---|---|---|

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
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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: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309
Email: Vladimir.Kireyev@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.

WallTrim Rings:
*TR-2 and *TR-2W

CeilingTrim 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



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Date Issued: **July 01, 2017**

Listing Expires **June 30, 2018**

Authorized By: **DAVID CASTILLO, Program Coordinator**
Fire Engineering Division

SBBCRL and SBBCWL

MP120KL 120 VAC Adapter Mounting Plate

Refer to listee's data sheet for detailed product description and operational considerations.

- RATING:** 12 VDC regulated and 24 VDC/FWR
- INSTALLATION:** In accordance with listee's printed installation instructions, NFPA 72, 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 audible devices when used with separately listed compatible fire alarm control units. Suitable for indoor use, wall or ceiling mounted. Authority having jurisdiction should be consulted prior to installation. Refer to listee's Installation Instruction Manual for details.

Revision 08-21-2017 dcc



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Date Issued: **July 01, 2017**

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Authorized By: **DAVID CASTILLO**, Program Coordinator
Fire Engineering Division

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7125-1653:0504

Page 1 of 2

CATEGORY: 7125 -- FIRE ALARM DEVICES FOR THE HEARING IMPAIRED

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309
Email: Vladimir.Kireyev@honeywell.com

DESIGN: System Sensor Indoor 2-wire Models:
SRL, SWL, SGRL, SGWL, SRL-P SWL-P, SRL-SP, SWL-CLR-ALERT and SWL-ALERT
Wall Strobes;
SCRL, SCWL and SCWL-CLR-ALERT Ceiling 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:

TR2 and TR2W

Ceiling Trim Rings:

TRC2 and TRC2W.

Wall Surface Mounted Back Boxes:

SBBRL, SBBGRL, SBBWL and SBBGWL,

Ceiling Surface Mounted Back Boxes:

SBBCRL and SBBCWL

Refer to listee's data sheet for detailed product description and operational considerations.

02-14-17 gt



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Date Issued: **July 01, 2017**

Listing Expires **June 30, 2018**

Authorized By: **DAVID CASTILLO, Program Coordinator**
Fire Engineering Division

- RATING:** Regulated 12 VDC setting: 8-17.5 VDC
Regulated 24 VDC/fwr setting: 16-33 VDC
- INSTALLATION:** In accordance with listee's printed installation instructions, NFPA 72, 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 two wire strobe units used for synchronous application when used with separately listed compatible fire alarm control units. Suitable for indoor use, vertical wall or horizontal ceiling mounted. Authority having jurisdiction should be consulted prior to installation. Refer to listee's Installation Instruction Manual for details.

02-14-17 gt



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Date Issued: **July 01, 2017**

Listing Expires **June 30, 2018**

Authorized By: **DAVID CASTILLO**, Program Coordinator
Fire Engineering Division

Architect/Engineer Specifications

General

The L-Series ceiling-mount strobes and horn strobes shall mount to any of the following:

- double-gang backbox
- 4-inch octagon backbox
- a standard 4 x 4 x 1 1/2-inch backbox

Two-wire products shall also mount to a single-gang compact 2 x 4 x 1 7/8-inch backbox. 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, the 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 it is used with the Sync•Circuit Module, the following occur:

- 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.

The Indoor L-Series products shall operate between 32 and 120 degrees Fahrenheit from a regulated DC or full-wave rectified unfiltered power supply.

Ceiling strobes and horn strobes shall have the following field-selectable candela settings including:

- 15
- 30
- 75
- 95
- 115
- 150
- 177

Strobe

The strobe shall be an L-Series Model _____ listed to UL Standard 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.

Horn Strobe Combination

The horn strobe shall be an L-Series Model _____ listed to UL Standard 1971 and UL Standard 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 two audibility options and an option to switch between a temporal three pattern and a non-temporal (continuous) pattern. These options are set by a multiple position switch. The horn on horn strobe models shall operate on a coded or non-coded power supply.

Synchronization Module

The module shall be a Sync•Circuit model MDL3 listed to UL Standard 464 and shall be approved for fire protective service. The module shall synchronize the L-Series strobes at 1 Hz and synchronize horns at temporal three. Also, while operating the strobes, the module shall silence the horns on horn strobe models over a single-pair of wires.

The module shall mount to a 4 11/16 x 4 11/16 x 2 1/8-inch backbox. 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.

UL Current Draw

Table 1 lists the UL maximum strobe current draw.

Candela	8-17.5 Volts	16-33 Volts	FWR
	DC	DC	
15	87	41	60
30	153	63	86
75	N/A	111	142
95	N/A	134	164
115	N/A	158	191
150	N/A	189	228
177	N/A	226	264

Table 1: UL Maximum Strobe Current Draw (mA RMS)

UL Current Draw Data

Table 2 lists the maximum UL Current Draw (mA RMS) allowed for 2-Wire Horn Strobes.

DC Input	8-17.5 Volts		16-33 Volts						
	15cd	30cd	15cd	30cd	75cd	95cd	115cd	150cd	177cd
Temporal High	103	167	71	90	143	165	187	217	254
Temporal Low	96	165	54	71	137	161	185	211	249
Non-Temporal High	106	173	71	90	141	165	187	230	273
Non-Temporal Low	95	166	54	71	124	161	170	216	258
3.1K Temp Hi	111	164	69	94	147	163	184	229	257
3.1K Temp Low	103	163	54	88	143	155	185	212	252
3.1K Non-Temporal High	111	172	69	94	144	164	202	229	271
3.1K Non-Temporal	103	169	54	88	131	155	187	217	259
	16-33 Volts								
FWR Input	15cd	30cd	75cd	95cd	115cd	150cd	177cd		
Temporal High	107	135	179	198	223	254	286		
Temporal Low	78	101	151	172	199	229	262		
Non-Temporal High	107	135	179	198	223	254	286		
Non-Temporal Low	78	101	151	172	199	229	262		
3.1K Temporal High	108	135	179	200	225	256	289		
3.1K Temporal Low	79	101	150	171	196	229	260		
3.1K Non-Temporal High	108	135	179	200	225	255	289		
3.1K Non-Temporal Low	79	101	150	171	196	229	260		

Table 2 UL Max. Current Draw (mA RMS), 2-Wire Horn Strobe

Horn Strobe Tones and Sound Output Data

Table 3 lists the horn strobe tones and sound output data.

Switch Position	Sound Pattern	dB	8-17.5 Volts	16-33 Volts	FWR
			DC	DC	
1	Temporal	High	84	89	89
2	Temporal	Low	75	83	83
3	Non-Temporal	High	85	90	90
4	Non-Temporal	Low	76	84	84
5	3.1 KHz Temporal	High	83	88	88
6	3.1 KHz Temporal	Low	76	82	82
7	3.1 KHz Non-Temporal	High	84	89	89
8	3.1 KHz Non-Temporal	Low	77	83	83

Table 3: Horn Strobe Tones and Sound Output Data

L-Series Dimensions

Figure 1 illustrates the dimensions for the ceiling-mount horn strobes.

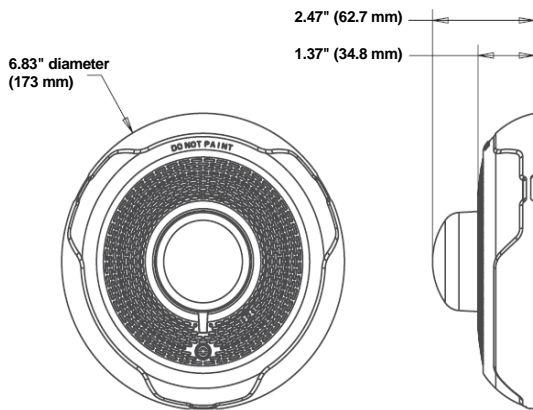


Figure 1 Ceiling-Mount Horn Strobes

L-Series Dimensions

Figure 2 illustrates the dimensions for the ceiling backbox surface mount backbox.

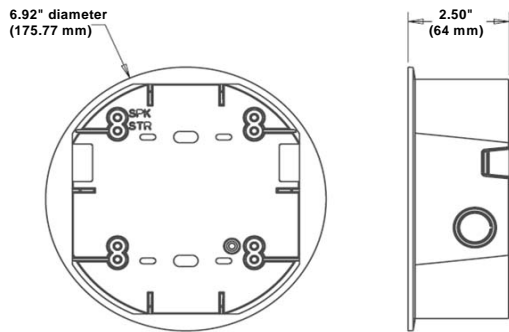


Figure 2 Ceiling-Surface-Mount Backbox

L-Series Ordering Information

Ceiling Horn Strobes:

PC2RL: 2-Wire, Horn Strobe, Red

PC2WL: 2-Wire, Horn Strobe, White

PC4RL: 4-Wire Ceiling Horn Strobe, Red, FIRE

PC4WL: 4Wire Ceiling Horn Strobe, White, FIRE

Ceiling Strobes:

SCRL: Strobe, Red

SCWL: Strobe, White

SCWL-CLR-ALERT: Strobe, White, ALERT

L- Series Dimensions

Figure 3 illustrates the dimensions for the ceiling backbox surface mount backbox.

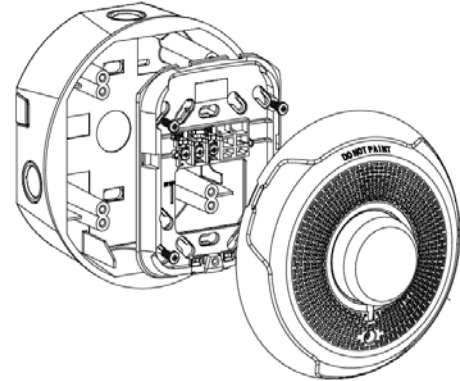


Figure 3 2-Wire Ceiling Mount Horn Strobes with Ceiling Surface Mount Backbox

SL Series Dimensions

Figure 4 illustrates the dimensions for the ceiling backbox surface mount backbox.

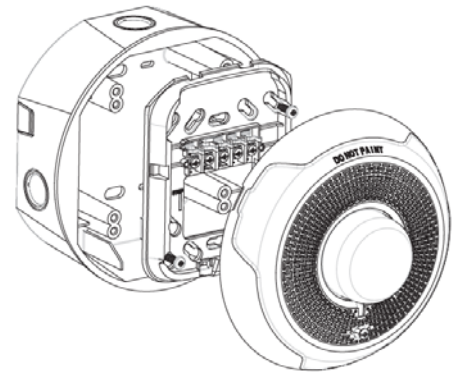


Figure 4 4-Wire Ceiling Mount Horn Strobes with Ceiling Surface Mount Backbox

L-Series Ordering Information

Accessories:

TRC-2: Universal Ceiling Trim Ring Red

TRC-2W: Universal Ceiling Trim Ring White

SBBCRL: Ceiling Surface Mount Back Box, Red

SBBCWL: Ceiling Surface Mount Back Box, White

L-Series, Indoor Strobes and Horn Strobes Technical Specifications

SYSTEMS

Temperature Ranges:

Standard Operating Temperature: 32°F to 120°F (0°C to 49°C)

Humidity Range: 10 to 93% non-condensing

Voltages:

Strobe Flash Rate: 1 flash per second

Nominal Voltage: Regulated 12 VDC or regulated 24 DC/FWR¹

Operating Voltage Range²: 8 to 17.5 V (12 V nominal) or 16 to 33 V (24 V nominal)

Operating Voltage Range (MDL3): 8.5 to 17.5V(12 V nominal) or 16.5 to 33 V(24V nominal)

Wire Gage:

Input Terminal Wire Gauge: 12 to 18 AWG

Dimensions:

Ceiling-Mount Dimensions (including lens): 6.8" diameter x 2.5" high (173 mm diameter x 64 mm high)

Ceiling-Mount Surface Mount Back Box Skirt Dimensions (SBB CR, SBBCW): 6.9" diameter x 3.4" high (175 mm diameter x 86 mm high)

Notes:

1. Full Wave Rectified (FWR) voltage is a non-regulated, time-varying power source that is used on some power supply and panel outputs.
2. P, S, PC, and SC products will operate at 12 V nominal only for 15 and 30 cd.

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.

STANDARDS

The L-Series, Ceiling Strobes and Horn Strobes are designed to comply with the following standard:

UL Standard: UL 1971 and UL 464

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

UL: S5512, S4011

CSFM: 7135-1653:0503

7125-1653:0504

ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: <http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx>

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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

Learn more about Gamewell-FCI's L-Series, Indoor Strobes and Horn Strobes and other products available by visiting www.Gamewell-FCI.com

Honeywell Gamewell-FCI

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Honeywell



by Honeywell

SpectrAlert® Advance Outdoor Notification Appliances

Description

The SpectrAlert® Advance series offers the broadest line of outdoor speakers and speaker strobes in the industry. From metal and plastic outdoor back boxes, to white and red plastic housings, to wall and ceiling mounting options, virtually every application is covered. SpectrAlert Advance outdoor speakers and speaker strobes offer reliable operation over the entire temperature range of -40°F to 151°F. They may be used indoors or outdoors in wet or dry applications. In addition, these speakers provide a broad frequency response range and low harmonic distortion to provide an accurate and intelligible broadcast of evacuation messages. High sound pressure level at all tap settings ensures that messages are clearly heard.

The plug-in design allows the installer to pre-wire mounting plates and dress the wires before plugging in the speakers to help reduce ground faults. This design also allows faster installations with instant feedback to ensure that wiring is properly connected, rotary switches to select voltage and power settings, and field selectable candela settings for wall and ceiling speaker strobes.

The weatherproof back boxes have plastic and metal versions. They are designed to accommodate in-and-out wiring for daisy chaining outdoor devices. The plastic weatherproof back boxes are shipped with the product feature removable side flanges and have improved resistance to salt water corrosion. The screw hole knockouts, located on the back of the weatherproof back box, eliminate the need to drill holes for screw-in mounting. Both weatherproof back boxes are available with 3/4 inch top and bottom conduit entries and 3/4 inch knock-outs at the back. Included with each back box is a screw-in NPT plug with an O-ring gasket for a watertight seal. Metal back boxes are available separately.

Outdoor Selectable Output Speaker Strobes and Dual Voltage Evacuation Speakers



SpectrAlert Advance

Features

- Plug-in design
- Electrical compatibility with existing SpectrAlert products
- Shorting spring on mounting plate tests continuity before installation
- Rotary switch simplifies field selection of speaker voltage and power settings
- Universal mounting plate for wall- and ceiling-mount units
- Weatherproof per NEMA 4x, IP56
- Compatible with System Sensor synchronization protocol
- Automatic selection of 12- or 24-volt operation at 15 and 15/75 candela
- Field selectable candela settings on wall and ceiling units
- Ceiling and wall mount application

An ISO 9000-2000 Company



SpectrAlert® is a registered trademarks of Honeywell International Inc.
UL® is a registered trademark of Underwriter's Laboratories Inc.

GAMEWELL-FCI

12 Clintonville Road, Northford, CT 06472-1610 USA • Tel: (203) 484-7161 • Fax: (203) 484-7118

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Architectural/Engineering Specifications

General

SpectrAlert Advance outdoor speaker and speaker 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 and amplifier wiring shall terminate at the universal mounting plate. Outdoor SpectrAlert Advance products shall operate between -40°F and 151°F from a regulated DC, or full-wave rectified, unfiltered power supply.

Speaker

The Speaker shall be a System Sensor SpectrAlert Advance Model _____ dual voltage transformer speaker capable of operating at 25.0 or 70.7 nominal Vrms. Speaker shall be Listed to UL® Standard S4048 for outdoor fire protective signaling systems. Speaker shall have a frequency range of 400 to 4000 Hz and shall have an operating temperature from -40°F to 150.8°F. Speaker shall have power taps and wattage settings which are selected by rotary switches. The speaker must be installed with its weatherproof backbox in order to remain outdoor approved per UL listing S4048. The speaker shall be suitable for use in air handling spaces, as well as wet environments.

Speaker Strobe Combination

The Speaker Strobe shall be a System Sensor Model _____ listed to UL 1638 and UL 1480 and be approved for fire protective signaling systems. Speaker shall be capable of operating at 25.0 or 70.7 nominal Vrms, and shall have a frequency range of 400 to 4000 Hz. Speaker shall have power taps that are selected by rotary switch. The strobe shall consist of a xenon flash tube with associated lens/reflector system and operate on either 12V or 24V. The strobe shall also feature selectable candela output, providing options for 15 or 15/75 candela when operating on 12V and 15, 15/75, 30, 75, 110, 115, 135, 150, 177 or 185 when operating on 24V. The strobe shall comply with the Americans with Disabilities Act requirement for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range. The speaker strobe must be installed with its weatherproof back box in order to remain outdoor approved per UL. The speaker strobe shall be suitable for use in wet environments.

Sound Output				
UL Reverberant (dBA@10 ft)	2 W	1 W	1/2 W	1/4 W
Outdoor Speaker	90	87	84	81
Outdoor Speaker/Speaker Strobe	89	86	83	80

UL Maximum Strobe Current Draw (mA RMS)					
	Candela	8 to 17.5 Volts		16 to 33 Volts	
		DC	FWR	DC	FWR
Standard Candela Range	15	123	128	66	71
	15/75	142	148	77	81
	30	NA	NA	94	96
	75	NA	NA	158	153
	vmvm95	NA	NA	181	176
	110	NA	NA	202	195
	115	NA	NA	210	205
High Candela Range	135	NA	NA	228	207
	150	NA	NA	246	220
	177	NA	NA	281	251
	185	NA	NA	286	258

Candela Derating

NOTE: 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

GAMEWELL-FCI

Specifications

Physical Specifications

Operating Temperature:	-40°F to 151°F (-40°C to 66°C)
Wall-Mount Dimensions:	
SPS Speaker Strobe:	6.0"L x 5.0"W x 4.9"D (including lens and speaker)
SP Speaker:	6.0"L x 5.0"W x 2.9"D
Ceiling Mount Dimensions:	
SPS Speaker Strobe:	6.8"Dia x 4.8"D (including lens and speaker)
SP Speaker:	6.8"L x 2.9"D
Wall-Mount Weatherproof Backbox:	
Dimensions:	6.5"L x 5.5"H x 2.9"D
Ceiling-Mount Weatherproof Backbox:	
Dimensions:	7.2"Dia x 2.9"D

Electrical/Operating Specifications:

Nominal Voltage (speakers):	25 Volts or 70.7 Volts (nominal)
Maximum Supervisory Voltage (speakers):	50VDC
Strobe Flash Rate:	1 flash per second
Nominal Voltage (Strobes):	Regulated 12VDC/FWR or 24VDC/FWR
Operating Voltage Range (includes fire panels with built-in sync):	8 to 17.5V (12V nominal) or 16 to 33V (24 nominal)
Operating Voltage with MDL Sync Module:	9 to 17.5V (12V nominal) or 17 to 33V (24V nominal)
Frequency Range:	400 to 4000Hz
Power:	¼, ½, 1, 2 watts

Ordering Information

Part Number Description

SPWK:	Wall mount outdoor speaker; white
SPRK:	Wall mount outdoor speaker; red
SPSWK:	Wall mount outdoor speaker strobe, selectable candela (15, 15/75, 30, 75, 95, 100, 115); white
SPSRK:	Wall mount outdoor speaker strobe, selectable candela (15, 15/75, 30, 75, 95, 100, 115); red
SPCWK:	Ceiling mount outdoor speaker; white.
SPSCWK:	Ceiling mount outdoor speaker strobe, selectable candela (15, 15/75, 30, 50, 75, 95, 110, 115); white
SPSCWHK:	Ceiling mount outdoor speaker strobe, selectable candela, high cd (135, 150, 177, 185); white

Accessories

MWBB:	Wall, metal weatherproof backbox; red
MWBBW:	Wall, metal weatherproof backbox; white
MWBBCW:	Ceiling, metal weatherproof backbox; white
PWBB:	Wall, plastic weatherproof backbox; red
PWBBW:	Wall, plastic weatherproof backbox; white
PWBBCW:	Ceiling, plastic weatherproof backbox; white

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CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7320-1653:0201

Page 1 of 1

CATEGORY: 7320 -- SPEAKERS

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174

Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309

Email: Vladimir.Kireyev@honeywell.com

DESIGN: Models SPR,SPW,SPRV, and SPWV SpectrAlert Speakers - Rectangular enclosure.
Models SPCW, SPCR, SPCWV, and SPCRV SpectrAlert Speakers with round enclosure.
Models SPSR, SPSRH, SPSW, SPSW-ALERT, SPSW-CLR-ALERT,
*SPSWK-CLR-ALERT, SPSWH, SPSRV, and SPSWV SpectrAlert Speaker/Strobe with rectangular enclosure. Models SPSCR, SPSCRH, SPSCW, *SPSCWK-CLR-ALERT, SPSCWH, SPSCRV, SPSCRVH, SPSCWV, and SPSCWVH SpectrAlert Speaker/Strobe with round enclosure. Model SPSCW-CLR-ALERT Speaker/Strobe. Model SPSW-ALERT has amber lens and is intended for non-fire use.

All models identified are intended for indoor use mounted on the wall or ceiling. Models with a "K" in the suffix are suitable for indoor or outdoor use with an operating temperature rating of -40°C to +66°C (-40°F to +151°F) and have a NEMA 4X enclosure rating when used with models PWBB, PWBBW (wall) or the model PWBBCW (ceiling) plastic weatherproof back boxes or with Model MWBBW (Wall), MWBB (Wall) or MWBBCW (Ceiling) metal weatherproof back boxes. Models with a " P" in the suffix have plain housings with no lettering on the enclosure. Models not containing " - P", in the suffix have English lettering reading "FIRE" on the housing. Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: Nominal Voltage: 25 Vrms or 70 Vrms
Power Settings: ¼, ½, 1, 2 Watts
Frequency Range: 400 - 4000 Hz

INSTALLATION: In accordance with listee's printed installation instructions, NFPA 72, 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 speaker/strobes when used with separately listed compatible fire alarm control units. Suitable for wall or ceiling mount.
These speaker/strobes do not generate a distinctive three-pulse temporal code pattern (for total evacuation) as required per NFPA 72, 2010 edition. If required, the appliances must be used with a fire alarm control unit that can generate the temporal pattern signal.

*Corrected 02-06-12 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, 2017**

Listing Expires **June 30, 2018**

Authorized By: **DAVID CASTILLO, Program Coordinator**
Fire Engineering Division

Technical Data Sheet

Fire Alarm Cables



2833 West Chestnut Street
Washington, PA 15301
Toll Free: (800) 245-4964
Fax: (724) 222-6420
www.westpenn-wpw.com

PART NUMBER:	60991B
DESCRIPTION:	16/2 Solid bare copper conductors, unshielded with an overall jacket.
NEC RATING:	FPLP, NEC Article 760
APPROVALS:	(UL) Listed
APPLICATION:	Indoor within ducts, plenums, and other spaces used for environmental air for (Audio Circuits, Control Circuits, Initiating Circuits, Notification Circuits)

Construction Parameters:

Conductor	16 AWG Bare Copper
Stranding	Solid
Insulation Material	PVC
Insulation Thickness	0.008" Nom.
Number of Conductors	2
Shield	None
Drain	None
Jacket Material	PVC
Jacket Thickness	0.015" Nom.
Overall Cable Diameter	0.161" Nom.
Approximate Cable Weight	25 Lbs/1M' Nom.
Flame Rating	NFPA- 262 Flame Test

Electrical & Environmental Properties:

Temperature Rating	-10deg C to 60deg C
Operating Voltage	300 V RMS
Max.Capacitance Between Conductors @ 1 KHz	32 pf/ft Nom.
DC Resistance per Conductor @ 20deg C	4.1 Ohms/1M' Nom.
Insulation Colors	Black, Red
Jacket Color	Red, Blue, Orange, White, Yellow
RoHS Compliant	Yes

Mechanical Properties:

Max. Recommended Pull Tension	62.4 lbs.
Min. Bend Radius (Install)	1.6"



Specification Issue Date: 7/06

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Technical Data Sheet

Fire Alarm Cables

WEST PENN WIRE



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Washington, PA 15301
Toll Free: (800) 245-4964
Fax: (724) 222-6420
www.westpenn-wpw.com

PART NUMBER:	60992B
DESCRIPTION:	14/2 Solid bare copper conductors, shielded with an overall jacket.
NEC RATING:	FPLP, NEC Article 760
APPROVALS:	(UL) Listed
APPLICATION:	Indoor within ducts, plenums, and other spaces used for environmental air for (Audio Circuits, Control Circuits, Initiating Circuits, Notification Circuits)

Construction Parameters:

Conductor	14 AWG Bare Copper
Stranding	Solid
Insulation Material	PVC
Insulation Thickness	0.010" Nom.
Number of Conductors	2
Shield	100% Aluminum Polyester Foil
Drain	Stranded Tinned Copper
Jacket Material	PVC
Jacket Thickness	0.015" Nom.
Overall Cable Diameter	0.202" Nom.
Approximate Cable Weight	39 Lbs/1M' Nom.
Flame Rating	NFPA- 262 Flame Test

Electrical & Environmental Properties:

Temperature Rating	-10deg C to 60deg C
Operating Voltage	300 V RMS
Max.Capacitance Between Conductors @ 1 KHz	84 pf/ft Nom.
Capacitance Between Conductors to Shield @ 1 KHz	151 pf/ft Nom.
DC Resistance per Conductor @ 20deg C	2.6 Ohms/1M' Nom.
Insulation Colors	Black, Red
Jacket Color	Red
RoHS Compliant	Yes

Mechanical Properties:

Max. Recommended Pull Tension	113.4 lbs.
Min. Bend Radius (Install)	2.1"



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Fire Alarm Cables

WEST PENN WIRE



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Washington, PA 15301
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Fax: (724) 222-6420
www.westpenn-wpw.com

PART NUMBER:	60995B
DESCRIPTION:	12/2 Solid bare copper conductors, unshielded with an overall jacket.
NEC RATING:	FPLP, NEC Article 760
APPROVALS:	(UL) Listed
APPLICATION:	Indoor within ducts, plenums, and other spaces used for environmental air for (Audio Circuits, Control Circuits, Initiating Circuits, Notification Circuits)

Construction Parameters:

Conductor	12 AWG Bare Copper
Stranding	Solid
Insulation Material	PVC
Insulation Thickness	0.010" Nom.
Number of Conductors	2
Shield	None
Drain	None
Jacket Material	PVC
Jacket Thickness	0.015" Nom.
Overall Cable Diameter	0.239" Nom.
Approximate Cable Weight	53 Lbs/1M' Nom.
Flame Rating	NFPA- 262 Flame Test

Electrical & Environmental Properties:

Temperature Rating	-10deg C to 60deg C
Operating Voltage	300 V RMS
Max.Capacitance Between Conductors @ 1 KHz	44 pf/ft Nom.
DC Resistance per Conductor @ 20deg C	1.8 Ohms/1M' Nom.
Insulation Colors	Black, Red
Jacket Color	Red
RoHS Compliant	Yes

Mechanical Properties:

Max. Recommended Pull Tension	158 lbs.
Min. Bend Radius (Install)	2.25"

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Technical Data Sheet

Aquaseal® Fire-Alarm Cables

WEST PENN WIRE



2833 West Chestnut Street
 Washington, PA 15301
 Toll Free: (800) 245-4964
 Fax: (724) 222-6420
 www.westpenn-wpw.com



PART NUMBER:	AQ225
DESCRIPTION:	16/2 Stranded bare copper conductors, overall unshielded with Aquaseal tape and overall jacket.
NEC RATING:	FPL – PLTC, CL3 NEC Article 760 And 725
APPROVALS:	(UL) Listed - Direct Burial
APPLICATION:	Materials suitable for outdoor use, and indoor trays, allows a variety of uses for (Low voltage industrial process control circuits, Power-Limited circuits, Power-Limited fire alarm circuits, Power-Limited tray cable PLTC)

Construction Parameters:

Conductor	16 AWG Bare Copper
Stranding	7x24
Insulation Material	PVC with Nylon
Insulation Thickness	PVC 0.015" Nom. Nylon .005" Nom.
Number of Conductors	2 (1 Pair)
Shield	None
Drain	None
Water-Blocking Tape	2 Ply water swellable tape
Jacket Material	Sunlight/ Moisture Resistant PVC
Jacket Thickness	0.040" Nom.
Overall Cable Diameter	0.295" Nom.
Approximate Cable Weight	48 Lbs/1M' Nom.
Flame Rating	UL 1685 Vertical Tray

Electrical & Environmental Properties:

Temperature Rating	-20deg C to 90deg C
Operating Voltage	300 V RMS
Max.Capacitance Between Conductors @ 1 KHz	28 pf/ft Nom.
DC Resistance per Conductor @ 20deg C	4.2 Ohms/1M' Nom.
Insulation Colors	Black, Red
Jacket Color	Black
RoHS Compliant	--
TIA455-82B Water Infiltration Test Compliant	Yes
UL 444 & 13 Compliant	Yes

Mechanical Properties:

Max. Recommended Pull Tension	54 lbs.
Min. Bend Radius (Install)	2.9"

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Technical Data Sheet

Aquaseal® Fire-Alarm Cables

WEST PENN WIRE



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 Fax: (724) 222-6420
 www.westpenn-wpw.com



PART NUMBER:	AQ294
DESCRIPTION:	16/2 Stranded bare copper conductors, overall shield with Aquaseal tape and overall jacket.
NEC RATING:	FPL – PLTC, CL3 NEC Article 760 And 725
APPROVALS:	(UL) Listed – Direct Burial
APPLICATION:	Materials suitable for outdoor use, and indoor trays, allows a variety of uses for (Low voltage industrial process control circuits, Power-Limited circuits, Power-Limited fire alarm circuits, Power-Limited tray cable PLTC)

Construction Parameters:

Conductor	16 AWG Bare Copper
Stranding	7x24
Insulation Material	PVC with Nylon
Insulation Thickness	PVC 0.015" Nom. Nylon .005" Nom.
Number of Conductors	2 (1 Pair)
Shield	100% Aluminum Polyester Foil
Drain	Stranded Tinned Copper
Water-Blocking Tape	2 Ply water swellable tape
Jacket Material	Sunlight/ Moisture Resistant PVC
Jacket Thickness	0.040" Nom.
Overall Cable Diameter	0.328" Nom.
Approximate Cable Weight	58 Lbs/1M' Nom.
Flame Rating	UL 1685 Vertical Tray

Electrical & Environmental Properties:

Temperature Rating	-20deg C to 90deg C
Operating Voltage	300 V RMS
Max.Capacitance Between Conductors @ 1 KHz	37 pf/ft Nom.
Capacitance Between Conductors to Shield @ 1 KHz	67 pf/ft Nom.
DC Resistance per Conductor @ 20deg C	6.2 Ohms/1M' Nom.
Insulation Colors	Black, Red
Jacket Color	Black
RoHS Compliant	--
TIA455-82B Water Infiltration Test Compliant	Yes
UL 444 & 13 Compliant	Yes

Mechanical Properties:

Max. Recommended Pull Tension	69 lbs.
Min. Bend Radius (Install)	3.2"

Specification Issue Date: 7/06

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CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7165-1703:0176 Page 1 of 1

CATEGORY: 7165 -- FIRE ALARM CONTROL UNIT (COMMERCIAL)

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Brian Reynolds (203) 484-6124 Fax (203) 484-7309
Email: Brian.Reynolds2@honeywell.com

DESIGN: Model S3 fire alarm control unit. Automatic, manual, waterflow, sprinkler supervisory, local, remote station (PPU), and central station (PPU) services. System components:

SLP-E3; Smart Loop Panel Main Board Subassembly
LCD-SLP; Liquid Crystal Display- Smart Loop Panel Subassembly
FML-E3; Fiber Optic Multi Mode Board
FSL-E3; Fiber Optic Single Model Board
SLC-PM; Signaling Line Circuit for System Sensor Devices
SLC95-PM; Signaling Line Circuit for Apollo Devices
SLP-BB; Basic System Enclosure - Backbox, Door, Mounting Plate

Refer to the listee's data sheet for additional detailed product description and operational considerations

RATING: 120 V, 60 Hz, 2.75 A
240 V, 50/60 Hz, 1.4 A

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 for use with separately listed compatible initiating and indicating devices. Refer to manufacturer's installation manual for details.

NOTE: For Fire Alarm Verification feature (delay of fire alarm), the retard/reset/restart period shall not exceed 30 seconds.

09-23-13 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, 2015**

Listing Expires **June 30, 2016**

Authorized By: **JAMES PARSEGIAN, Program Coordinator**
Fire Engineering Division

SECTION 31 1000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities or abandoning site utilities in place.
7. Temporary erosion- and sedimentation-control measures.

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for temporary utility services, construction and support facilities, security and protection facilities, and temporary erosion- and sedimentation-control measures.
2. Division 01 Section "Execution" for field engineering and surveying.
3. Division 02 Section "Structure Demolition" for demolition of buildings, structures, and site improvements.
4. Division 02 Section "Selective Structure Demolition" for partial demolition of buildings or structures.

1.3 REFERENCES

A. Organization and Trade Standards

1. State of California, Department of Transportation (CalTrans), Standard Specifications as adopted by local jurisdictional authority, latest edition, including amendments.
2. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones" current edition.
3. Local jurisdictional and agency engineering and public works regulations and standards.

1.4 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.
- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.
- F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by a circle concentric with each tree with a radius equal to the diameter of the drip line unless otherwise indicated.
- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.5 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or videotape.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.

1.8 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises.
- D. Utility Locator Service: Notify Underground Services Alert (USA) for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- F. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54 inches above the ground.
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. General: Protect trees and plants remaining on-site according to requirements in Division 01 Section "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.
 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Architect not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Architect's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 3. Use only hand methods for grubbing within protection zones.
 4. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of 6 inches to 12 inches as required to remove all organic material in a manner to prevent intermingling with underlying subsoil or other waste materials.
1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
1. Limit height of topsoil stockpiles to 72 inches.
 2. Do not stockpile topsoil within protection zones.
 3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
 4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

SECTION 31 2000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Preparing subgrades for walks pavements turf and grasses and plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks pavements.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.
8. Excavating well hole to accommodate elevator-cylinder assembly.

- B. Related Sections:

1. Division 01 Section "Construction Progress Documentation" for recording preexcavation and earth moving progress.
2. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
3. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
4. Divisions 21, 22, 23, 26, 27, 28, and 33 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
5. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping topsoil, and removal of above- and below-grade improvements and utilities.
6. Division 31 Section "Dewatering" for lowering and disposing of ground water during construction.
7. Division 31 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
8. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
9. Division 32 Section "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.
10. Division 33 Section "Storm Utility Drainage Piping" and "Subdrainage" for installing underground drainage facilities and drainage structures.

- C. Construct in accordance with Organization and Trade Standards of the authority having jurisdiction and in the presence of a representative of that agency.

1.3 REFERENCES

A. Organization and Trade Standards

1. State of California, Department of Transportation (CalTrans), Standard Specifications as adopted by local jurisdictional authority, latest edition, including amendments.
2. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones" current edition.
3. Local jurisdictional and agency engineering and public works regulations and standards.

1.4 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Construction Manager. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Site Rock: Solid mineral material with a volume in excess of 1/3 cubic yard capacity that cannot be removed by ripping with a Catapillar D9H or equivalent with a single shank ripping tooth, driven by an experienced operator, without drilling or blasting.
2. Trench Rock: Solid mineral material with a volume in excess of 1/6 cubic yard or solid material that cannot be removed with a Caterpillar 235 or equivalent, driven by an experienced operator, without drilling or blasting
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 1. Geotextiles.
 2. Controlled low-strength material, including design mixture.
 3. Geofam.
 4. Warning tapes.
- B. Samples for Verification: For the following products, in sizes indicated below:
 1. Geotextile: 12 by 12 inches.
 2. Warning Tape: 12 inches long; of each color.
- C. Qualification Data: For qualified testing agency.
- D. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 1. Classification according to ASTM D 2487.
 2. Laboratory compaction curve according to ASTM D 698.
- E. Blasting plan approved by authorities having jurisdiction.
- F. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.
- G. Water Pollution Control Plan (WPCP) in conformance with 2016 California Green Building Standards Code (Nonresidential). WPCP shall be submitted prior to the start of construction. WPCP shall include minimum required Standard Construction Stormwater BMPs as provided in

Table 1-1 of the Caltrans Construction Site Best Management Practices Manual. BMP's shall conform to California Stormwater Quality Association (CASQA) BMP Handbook for Construction or Caltrans Construction Site Best Management Practices Manual.

1.6 QUALITY ASSURANCE

- A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:
 - 1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
- B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:
 - 1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
- C. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Utility Locator Service: Notify "Underground Service Alert" (USA) for area where Project is located before beginning earth moving operations.
- D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 01 Section "Temporary Facilities and Controls," Division 31 Section "Site Clearing," are in place.
- E. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.
- F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Topsoil: Defined as the upper layer of organic soils to be stripped and removed in accordance with Geotechnical recommendations, after completion of clearing operations specified in Section 02230.
- C. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- D. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- E. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Base Course: Class 2 Aggregate Base in accordance with Caltrans requirements.
- G. Trench Zone (1 foot above pipe to bottom of subgrade) Backfill Materials:
1. Type C - slurry cement backfill per Section 19-3.062, CalTrans Standard Specifications as approved by Owner and geotechnical engineer.
 2. Type D - Select Backfill: On Site or imported non-expansive soils complying with Section 19, Caltrans Specification and geotechnical recommendations.
 3. Type G – Use for all sewer pipe in existing paved roadways per Truckee Sanitary District requirements. Pipe backfill from twelve inches above the top of the pipe to the asphalt subgrade shall be Class 2, conforming to Section 68-1.025 of Caltrans Specifications and placed at 95 percent relative compaction.
 4. Type H – Use for all sewer pipe in new pavement areas per Truckee Sanitary District requirements. Pipe backfill from twelve inches above the top of the pipe to the asphalt

subgrade shall be Class 3, conforming to Section 68-1.025 of Caltrans Specifications and placed at 95 percent relative compaction.

H. Bedding Materials

1. Type A - Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
2. Type B - Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, or organic matter; maximum particle size and volume of 1/2 inch and 18 percent respectively, with minimum Sand Equivalent value of 30 per California Test Method 217.
3. Type E - Concrete Encasement: Class 480-C-2000 per Section 64-106, CalTrans Standard Specifications., as approved by Owner and geotechnical engineer.
4. Type F – Use for all sewer pipe per Truckee Sanitary District requirements. Pipe bedding and initial backfill up to twelve inches above the top of the pipe (pipe zone) shall be Class I, Type A permeable material, or Class 2, conforming to Section 68-1.025 of Caltrans Specifications and placed at 95 percent relative compaction.

I. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

J. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

K. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

L. Sand: ASTM C 33; fine aggregate.

M. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
4. Tear Strength: 56 lbf; ASTM D 4533.
5. Puncture Strength: 56 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.2 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 247 lbf; ASTM D 4632.
3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
4. Tear Strength: 90 lbf; ASTM D 4533.
5. Puncture Strength: 90 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

- A. Controlled Low-Strength Material: Self-compacting, flowable concrete material produced from the following:
1. Portland Cement: ASTM C 150, Type I.
 2. Fly Ash: ASTM C 618, Class C or F.
 3. Normal-Weight Aggregate: ASTM C 33, 3/4-inch nominal maximum aggregate size.
 4. Foaming Agent: ASTM C 869.
 5. Water: ASTM C 94/C 94M.
 6. Air-Entraining Admixture: ASTM C 260.
- B. Produce low-density, controlled low-strength material with the following physical properties:
1. As-Cast Unit Weight: 30 to 36 lb/cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
 2. Compressive Strength: 80 psi, when tested according to ASTM C 495.

2.4 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- D. Implement Water Pollution Control Plan (WPCP) in conformance with 2016 California Green Building Standards Code (Nonresidential), State Regional Water Quality Control Board (RWQCB) requirements and the current edition of the CASQA California Storm Water Best Management Practice (BMP) Handbook for Construction Activity. Update plan as required. Contractor is required to prevent potential discharges and to reduce water pollution to the maximum extent practicable by implementing best management practices (BMPs). Minimum Required Standard Construction Stormwater BMPs are provided in Table 1-1 of the Caltrans Construction Site Best Management Practices Manual. Contractor shall install, monitor, maintain, or revise the selected BMPs to ensure their effectiveness.”

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.
- C. Groundwater levels shall be lowered to at least 5-feet below the lowest portion of the excavation; or as directed by Geotechnical Consultant.
- D. Groundwater shall be discharged in accordance with the requirements of the Storm Water Pollution Prevention Plan.
- E. Keep excavations and site construction area free from water.
- F. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

- A. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.

1. Perform blasting without damaging adjacent structures, property, or site improvements.
2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 2. Remove rock to lines and grades indicated to permit installation of permanent construction in accordance with geotechnical recommendations and without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 12 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches beneath bottom of concrete slabs-on-grade.
 - f. 6 inches beneath pipe in trenches, and the greater of 12 wider than pipe or as required by the applicable utility jurisdiction.
 3. Site areas receiving building structures, canopy structures, concrete structures, retaining walls, and structural fills:
 - a. Excavate as required to remove existing colluvium/alluvium/uncompacted soils to a depth of 4.5 feet below existing grade or as directed by the Geotechnical Engineer. Excavate a minimum of five feet beyond edge of structure or footing.
 - b. Excavate existing soils to a minimum depth of as directed by Geotechnical Consultant below existing grade or finished soil grade, whichever is lower.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.
- B. Excavate existing to a minimum depth of 1.0 feet below existing grade or finished soil grade, whichever is lower or as directed by the Geotechnical Engineer and recompact at 95% relative compaction with suitable material.
- C. Excavate a minimum of two feet beyond paving edge.

3.6 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls to 6 inches each side of pipe or conduit unless otherwise indicated or as required by applicable utility jurisdiction.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
 - 3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
 - 4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- E. Trenches in Tree- and Plant-Protection Zones:
 - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 - 3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.7 SUBGRADE INSPECTION

- A. Notify Materials Testing inspector when excavations have reached required subgrade.
- B. If Materials Testing inspector determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.8 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean

concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Place and compact initial backfill of bedding material, in accordance with agency requirements, to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- G. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.
- H. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- I. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
- J. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 1. Under grass and planted areas, use satisfactory soil material.
 2. Under walks and pavements, use satisfactory soil material.
 3. Under steps and ramps, use engineered fill.
 4. Under building slabs, use engineered fill.
 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Revise depth of layers in first paragraph below to suit Project.
- B. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

- C. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- D. Make grade changes gradual, blending slope into level areas. After completion of grading operation, proof roll earthwork areas. Repair low or spongy spots developed during rolling operation.
- E. Use equipment and procedures outlined in Section 19, Caltrans Standard Specifications.
- F. Place and compact materials in continuous layers not exceeding 6 inches compacted depth using methods which do not disturb or damage foundations, perimeter drainage and waterproofing systems, or utilities in trenches.
- G. Rock encountered may be broken into material complying with fill characteristics, at Contractors option. Otherwise remove all rock exceeding specified fill dimensions from site.
- H. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. For utility trenches, compact each layer of initial and final backfill soil material at 90 percent relative compaction, when not located within pavement areas.
 - 2. All backfill supporting pavement or structural foundations shall be compacted to 95 percent relative compaction.
 - 3. All fill with heights greater than 10' shall be compacted to 95 percent relative compaction.

3.15 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Division 33 Section "Subdrainage."
 - 1. Compact each filter material layer to 90 percent of maximum dry unit weight according to ASTM D 698.
- B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - 1. Compact each filter material layer to 90 percent of maximum dry unit weight according to ASTM D 698.
 - 2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

3.16 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 - 1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Place base course material over subbase course under hot-mix asphalt pavement.
 - 3. Shape subbase course to required crown elevations and cross-slope grades.
 - 4. Place subbase course 6 inches or less in compacted thickness in a single layer.

5. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 6. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
- C. Pavement Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 2. Place drainage course 6 inches or less in compacted thickness in a single layer.
 3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.18 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 2. Determine that fill material and maximum lift thickness comply with requirements.
 3. Determine, at the required frequency, that in-place density of compacted fill complies with Geotechnical Engineer recommendations and local agency requirements..
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. All excess material including oversize rock that cannot be placed onsite shall be off-hauled to a permitted disposal site at the contractors expense.
- C. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

TABLE 1-1

CONSTRUCTION SITE BMPs				
ID	BMP NAME	APPROVED FOR STATEWIDE USE ON ALL PROJECTS ⁽¹⁾	APPROVED FOR USE ON A PROJECT-BY-PROJECT BASIS	MINIMUM REQUIREMENT
TEMPORARY SOIL STABILIZATION				
SS-1	Scheduling	X		✓
SS-2	Preservation of Existing Vegetation	X		✓
SS-3	Hydraulic Mulch	X		✓ ⁽²⁾
SS-4	Hydroseeding	X		✓ ⁽²⁾
SS-5	Soil Binders	X		✓ ⁽²⁾
SS-6	Straw Mulch	X		✓ ⁽²⁾
SS-7	Geotextiles, Plastic Covers, & Erosion Control Blankets/Mats	X		✓ ⁽²⁾
SS-8	Wood Mulching	X		
SS-9	Earth Dikes/Drainage Swales & Lined Ditches		X	
SS-10	Outlet Protection/Velocity Dissipation Devices		X	
SS-11	Slope Drains		X	
SS-12	Streambank Stabilization	X		
TEMPORARY SEDIMENT CONTROL				
SC-1	Silt Fence	X		✓ ⁽³⁾
SC-2	Sediment/Desilting Basin		X	
SC-3	Sediment Trap		X	
SC-4	Check Dam		X	
SC-5	Fiber Rolls		X	✓ ⁽³⁾
SC-6	Gravel Bag Berm		X	
SC-7	Street Sweeping and Vacuuming	X		✓
SC-8	Sandbag Barrier		X	
SC-9	Straw Bale Barrier		X	
SC-10	Storm Drain Inlet Protection		X	✓
WIND EROSION CONTROL				
WE-1	Wind Erosion Control	X		✓
TRACKING CONTROL				
TC-1	Stabilized Construction Entrance/Exit		X	
TC-2	Stabilized Construction Roadway		X	
TC-3	Entrance/Outlet Tire Wash		X	

⁽¹⁾ Implementation depends on applicability to a project

⁽²⁾ The Contractor shall select one of the five measures listed or a combination thereof to achieve and maintain the contract's rainy season disturbed soil area (DSA) requirements

⁽³⁾ The Contractor shall select one of the two measures listed or a combination thereof to achieve and maintain the contract's rainy season disturbed soil area (DSA) requirements"



TABLE 1-1

CONSTRUCTION SITE BMPs				
ID	BMP NAME	APPROVED FOR STATEWIDE USE ON ALL PROJECTS ⁽¹⁾	APPROVED FOR USE ON A PROJECT-BY-PROJECT BASIS	MINIMUM REQUIREMENT
NON-STORM WATER MANAGEMENT				
NS-1	Water Conservation Practices	X		
NS-2	Dewatering Operations	X		
NS-3	Paving and Grinding Operations	X		
NS-4	Temporary Stream Crossing	X		
NS-5	Clear Water Diversion	X		
NS-6	Illicit Connection/Illegal Discharge Detection and Reporting	X		✓
NS-7	Potable Water/Irrigation	X		
NS-8	Vehicle and Equipment Cleaning	X		✓
NS-9	Vehicle and Equipment Fueling	X		✓
NS-10	Vehicle and Equipment Maintenance	X		✓
NS-11	Pile Driving Operations	X		
NS-12	Concrete Curing	X		
NS-13	Material and Equipment Use Over Water	X		
NS-14	Concrete Finishing	X		
NS-15	Structure Demolition/Removal Over or Adjacent to Water	X		
WASTE MANAGEMENT AND MATERIALS POLLUTION CONTROL				
WM-1	Material Delivery and Storage	X		✓
WM-2	Material Use	X		✓
WM-3	Stockpile Management	X		✓
WM-4	Spill Prevention and Control	X		✓
WM-5	Solid Waste Management	X		✓
WM-6	Hazardous Waste Management	X		
WM-7	Contaminated Soil Management	X		
WM-8	Concrete Waste Management	X		
WM-9	Sanitary/Septic Waste Management	X		✓
WM-10	Liquid Waste Management	X		

⁽¹⁾ Implementation depends on applicability to a project

⁽²⁾ The Contractor shall select one of the five measures listed or a combination thereof to achieve and maintain the contract's rainy season disturbed soil area (DSA) requirements

⁽³⁾ The Contractor shall select one of the two measures listed or a combination thereof to achieve and maintain the contract's rainy season disturbed soil area (DSA) requirements"



SECTION 32 1216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Cold milling of existing hot-mix asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Hot-mix asphalt paving overlay.
5. Asphalt surface treatments.
6. Pavement-marking paint.
7. Traffic-calming devices.
8. Imprinted asphalt.

- B. Construct in accordance with Organization and Trade Standards of the authority having jurisdiction and in the presence of a representative of that agency.

- C. Related Sections:

1. Division 02 Section "Structure Demolition" for demolition, removal, and recycling of existing asphalt pavements, and for geotextiles that are not embedded within courses of asphalt paving.
2. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
3. Division 32 Sections for other paving installed as part of crosswalks in asphalt pavement areas.
4. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.
5. Division 32 Section "Pavement Marking" for striping and pavement marking.

1.3 DEFINITION

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
 2. Job-Mix Designs: For each job mix proposed for the Work.
- B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Samples: For each paving fabric, 12 by 12 inches minimum.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
1. Each paving fabric, 12 by 12 inches minimum.
 2. Each type and color of preformed traffic-calming device.
- E. Qualification Data: For qualified manufacturer and Installer.
- F. Material Certificates: For each paving material, from manufacturer.
- G. Material Test Reports: For each paving material.

1.5 REFERENCES

- A. Organization and Trade Standards
1. State of California, Department of Transportation (CalTrans), Standard Specifications as adopted by local jurisdictional authority, latest edition, including amendments.
 2. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones" current edition.
 3. Local jurisdictional and agency engineering and public works regulations and standards.

QUALITY ASSURANCE

- B. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction..
- C. Installer Qualifications: Imprinted-asphalt manufacturer's authorized installer who is trained and approved for installation of imprinted asphalt required for this Project.
- D. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- E. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the local agency for asphalt paving work.
1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- F. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - b. Review condition of subgrade and preparatory work.
 - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 1. Prime Coat: Minimum surface temperature of 60 deg F.
 2. Tack Coat: Minimum surface temperature of 60 deg F.
 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
 4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials 55 deg F for water-based materials, and not exceeding 95 deg F.
- C. Imprinted Asphalt Paving: Proceed with coating imprinted pavement only when air temperature is at least 50 deg F and rising and will not drop below 50 deg F within 8 hours of coating application. Proceed only if no precipitation is expected within two hours after applying the final layer of coating.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.

- B. Coarse Aggregate: Per Caltrans Standard Specifications, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- C. Fine Aggregate: Per Caltrans Standard Specifications, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: Per Caltrans Standard Specifications, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Hot Mix Asphalt (HMA) shall conform to Section 39 of the General Specifications and the following: ASPHALT CONCRETE SHALL BE 1/2" MAX. MED. (TYPE B) AGGREGATE, PG 64-16 ASPHALT BINDER IN ACCORDANCE WITH CALTRANS STANDARD SPECS. SECTION 39, 93, AND 94. ASPHALT CONCRETE SHALL BE COMPACTED TO 95% RELATIVE COMPACTION WITH AN AIR VOIDS RATIO OF 3% TO 10%. Unless otherwise requested by the Contractor and approved by the Engineer, HMA shall be placed in accordance with section 39-3 "Method Construction Process" of the Caltrans Standard Specifications. All HMA placed, whether new roadway or overlay, shall be matched to grade with an Aggregate Base shoulder. This shoulder backing shall be a minimum of 1' (one foot) wide or match the project plans, whichever is greater. The upper 8" of aggregate base shall be Class 2, 3/4" maximum grading. Where the base thickness exceeds 8", the depth below 8" may be Class 2, 1 1/2" maximum grading. Aggregate base shall conform to section 26 of the General Specifications.
- B. Prime Coat: Asphalt emulsion prime coat complying with Caltrans requirements.
- C. Tack Coat: Per Caltrans Standard Specifications requirements, emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- D. Fog Seal: Per Caltrans Standard Specifications requirements emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- E. Water: Potable.
- F. Undersealing Asphalt: ASTM D 3141, pumping consistency.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Sand: Per Caltrans Standard Specifications requirements.
- C. Paving Geotextile: AASHTO M 288, nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
- D. Joint Sealant: Per Caltrans Standard Specifications requirements, hot-applied, single-component, polymer-modified bituminous sealant.

- E. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones" current edition.
- F. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
 - 1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Base Course: Per Caltrans Standard Specifications requirements.
 - 3. Surface Course: Per Caltrans Standard Specifications requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
 - 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.
- D. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

3.2 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
 - 1. Mill to a depth of 2 inches.
 - 2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.

3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Transport milled hot-mix asphalt to asphalt recycling facility.
7. Keep milled pavement surface free of loose material and dust.

3.3 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseal pieces firmly.
 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd..
 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
- E. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.4 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.5 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
- C. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.
 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 2. Protect primed substrate from damage until ready to receive paving.
- D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..
 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.6 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 2. Place hot-mix asphalt surface course in single lift.
 3. Spread mix at minimum temperature of 250 deg F.
 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.
 - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
 - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
 - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints as shown on Drawings or as required by the District.
 - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 - 1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927, but not less than 94 percent nor greater than 100 percent.
 - 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 ASPHALT CURBS

- A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Spread mix at minimum temperature of 250 deg F.
 - 1. Asphalt Mix: Same as pavement surface-course mix.
- B. Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.10 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2 inch.
 - 2. Surface Course: Plus 1/4 inch, no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: 1/4 inch.
 - 2. Surface Course: 1/8 inch.
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.
- C. Traffic-Calming Devices: Compact and form asphalt to produce the contour indicated and within a tolerance of plus or minus 1/8 inch of height indicated above pavement surface.

3.11 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.
- B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.
 - 1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.12 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 - 1. Broadcast glass beads uniformly into wet pavement markings at a rate of 6 lb/gal..

3.13 WHEEL STOPS

- A. Install wheel stops in bed of adhesive as recommended by manufacturer.
- B. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.14 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- E. Replace and compact hot-mix asphalt where core tests were taken.

- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.15 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow milled materials to accumulate on-site.

END OF SECTION 32 12 16

SECTION 32 1313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Driveways.
- 2. Roadways.
- 3. Parking lots.
- 4. Curbs and gutters.
- 5. Walks.

- B. Related Sections:

- 1. Division 03 Section "Cast-in-Place Concrete" and "Miscellaneous Cast-in-Place Concrete" for general building applications of concrete.
- 2. Division 32 Section "Decorative Concrete Paving" for stamped concrete other than detectable warnings.
- 3. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

- C. Construct in accordance with Organization and Trade Standards of the authority having jurisdiction and in the presence of a representative of that agency.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 REFERENCES

- A. Organization and Trade Standards

- 1. State of California, Department of Transportation (CalTrans), Standard Specifications as adopted by local jurisdictional authority, latest edition, including amendments.
- 2. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones" current edition.

3. Local jurisdictional and agency engineering and public works regulations and standards.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.
- D. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:
 1. Exposed Aggregate: 10-lb Sample of each mix.
- E. Other Action Submittals:
 1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- F. Qualification Data: For qualified ready-mix concrete manufacturer.
- G. Material Certificates: For the following, from manufacturer:
 1. Cementitious materials.
 2. Steel reinforcement and reinforcement accessories.
 3. Fiber reinforcement.
 4. Admixtures.
 5. Curing compounds.
 6. Applied finish materials.
 7. Bonding agent or epoxy adhesive.
 8. Joint fillers.
- H. Material Test Reports: For each of the following:
 1. Aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- I. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").
- B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- C. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.
- D. ACI Publications: Comply with ACI 301 unless otherwise indicated.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
 2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches by 96 inches. Include full-size detectable warning.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site.
 1. Review methods and procedures related to concrete paving, including but not limited to, the following:
 - a. Concrete mixture design.
 - b. Quality control of concrete materials and concrete paving construction practices.
 2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete paving subcontractor.
 - e. Manufacturer's representative of stamped concrete paving system used for detectable warnings.

1.7 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 - 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Recycled Content: Provide steel reinforcement with an average recycled content of steel so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from galvanized-steel wire into flat sheets.
- C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.
- D. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.
- E. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- F. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.
- G. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.
- H. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- I. Plain-Steel Wire: ASTM A 82/A 82M, galvanized.
- J. Deformed-Steel Wire: ASTM A 496/A 496M.
- K. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, deformed.

- L. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.
- M. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain-steel bars.
- N. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- O. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- P. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- Q. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.
- R. Zinc Repair Material: ASTM A 780.

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
 - 1. Portland Cement: Per Caltrans Specifications.
- B. Normal-Weight Aggregates: Per Caltrans, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.
 - 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Exposed Aggregate: Per Caltrans Specifications, selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate.
- D. Water: Potable and complying with ASTM C 94/C 94M.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 CURING MATERIALS - Per Caltrans Specifications

2.5 RELATED MATERIALS

- A. Joint Fillers: Per Caltrans Specifications in preformed strips.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: Per Caltrans Specifications, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirement.
- E. Chemical Surface Retarder: Per Caltrans Specifications, water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.

2.6 DETECTABLE WARNING MATERIALS

- A. Detectable Warning Products: All truncated dome detectable warning products shall comply with Federal Access Board requirements and State of California Building Code, latest edition.

2.7 PAVEMENT MARKINGS

- A. Pavement-Marking Paint: Per Caltrans Specifications and Manual for Traffic Control Devices.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.
- G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
 2. Provide tie bars at sides of paving strips where indicated.
 3. Butt Joints: Use epoxy bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
1. Locate expansion joints at intervals of 25 feet unless otherwise indicated.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
 - a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

- a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
- 3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement dowels and joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.
- K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

- L. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

- M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.

- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
 - 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

- A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:
 - 1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
 - 2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
 - 3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of

- the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch.
1. Spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
 2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
 3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
 4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:
1. Uniformly spread per Caltrans Specifications of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
 2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
 3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
 4. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

3.9 DETECTABLE WARNINGS

- A. Blockouts: Form blockouts in concrete for installation of detectable paving units specified in Division 32 Section "Unit Paving".
1. Tolerance for Opening Size: Plus 1/4 inch, no minus.
- B. Detectable Warnings: Install detectable warning products as part of a continuous concrete paving placement and according to manufacturer's written instructions.

3.10 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.

- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing curing compound or a combination of these as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.11 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
 - 1. Elevation: 3/4 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-foot- long, unlevelled straightedge not to exceed 1/2 inch.
 - 4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
 - 5. Lateral Alignment and Spacing of Dowels: 1 inch.
 - 6. Vertical Alignment of Dowels: 1/4 inch.
 - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
 - 8. Joint Spacing: 3 inches.
 - 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
 - 10. Joint Width: Plus 1/8 inch, no minus.

3.12 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking.

- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
 - 2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal..

3.13 WHEEL STOPS

- A. Install wheel stops in bed of adhesive applied as recommended by manufacturer.
- B. Securely attach wheel stops to paving with not less than two galvanized-steel dowels located at one-quarter to one-third points. Install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.

3.14 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd., 5000 sq. ft. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no

compressive-strength test value falls below specified compressive strength by more than 500 psi.

- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

3.15 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 FENCE COMPONENTS

- A. Fabric: Hot-dip galvanized steel, 2-inch mesh.
 - 1. Selvage: Knuckled on both selvages.
- B. Posts and Rails: Hot-dip Galvanized-steel pipe complying with ASTM F 1043 requirements for heavy industrial fence.
- C. Tension Wire: Hot-dip galvanized steel, ASTM F 1664.
- D. Fittings and Accessories: Hot-dip galvanized steel, ASTM F 626, and as follows:
 - 1. Post and Line Caps: Provide weathertight cap for each post. Provide line post caps with loop to receive tension wire or top rail.
 - 2. Post Brace Assembly: Same material as top rail with 3/8-inch diameter rod and adjustable tightener.
 - 3. Bottom and Center Rail: Same material as top rail with cap on each end.
- E. Gate Posts, Swing Gates, and Accessories: ASTM F 900, same metal and finish as posts and rails, with Hot-dip galvanized steel hardware and accessories.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fence to comply with ASTM F 567.
- B. Excavation: Drill post holes 8 inches in diameter and 40 inches in depth, equally spaced, but not more than 10 feet apart.
- C. Setting Posts: Set posts in holes approximately 4 inches above bottom of excavation. Align posts vertically and align tops.

END OF SECTION 323113

END OF SECTION 323113

SECTION 32 94 00 - PAVEMENT MARKING

PART 1 - GENERAL

1 SECTION INCLUDES

A Pavement marking for vehicular traffic control and direction on asphalt and concrete surfaces.

B Pavement marking for pedestrian areas.

2 SUMMARY

A Construct in accordance with Organization and Trade Standards of the authority having jurisdiction and in the presence of a representative of that agency.

B Related Sections

1 Section 321216 - Asphalt Paving.

2 Section 321313 - Concrete Paving.

3 REFERENCES

A *State of California, Department of Transportation (CalTrans), Standard Specifications*, latest edition, as adopted by local jurisdictional authority, including all amendments.

B California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones" current edition.

C Town of Truckee - Public Improvement and Engineering Standards, current edition, with all amendments.

D Town of Truckee – Encroachment Permit

4 SUBMITTALS

A Materials List/Shop Drawing:

1 Provide complete list of proposed materials for Architect's review.

2 Provide Shop Drawing diagrams of graphics proposed for use in pavement marking, including proposed size and location.

Pool Building
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PART 2 - PRODUCTS

1 DESIGN CRITERIA

A All improvements shall be constructed per the referenced standards, the improvement drawings, and as specified in this section.

B Where criteria shown on drawings or specified in this specification exceed that of the referenced standards, the more stringent criteria shall apply.

2 PAVEMENT MARKING PAINT

A Product Characteristics:

1 Provide paint specifically formulated for use as pavement marking in automobile, pedestrian traffic and play court areas, and as required by jurisdictional authority.

2 Provide striping in size and multiple colors as selected by Architect, and as follows:

a At all pavement markings associated with accessibility for the disabled, provide Federal Blue 15090 per FS 595B color as defined in Title 24, Part 2, CCR, 4 inch width. Provide accessible aisle markings at 36 inches on center.

b Provide red color at fire lane curbs as shown on the plans.

c Provide white striping at parking space markings, 4 inch width.

d Provide directional arrows, white color, size as shown on drawings.

e Provide a minimum of four colors in deep saturated hues at play court paving graphics. Provide striping with 2 inch width, unless noted otherwise.

3 Paint products shall comply with *Section 91, CalTrans Standard Specifications*, for "rapid-dry" type paints. Paint manufacturer shall provide written certification of conformance to standard.

4 Reflectorized beading not required, except where required at public improvements.

PART 3 - EXECUTION

1 SURFACE CONDITIONS

A Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

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B Verify pavement may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.

C In the event of discrepancy, immediately notify the Architect.

D Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

2 PREPARATION

A Secure the Architect's approval of graphics design and layout prior to start of application, including compliance with accessibility standards of Title 24.

B Secure Fire Marshal approval of all striping and marking of curbs, pavement, and related signage.

C Verify that concrete curing compound and asphalt seal coat compound has become completely inert prior to painting. Remove paint by approved means for those areas where compound is still active.

3 INSTALLATION

A Using proper masking, stencils, and application equipment recommended for the purpose by the manufacturer of the approved paint, apply the approved paint in strict accordance with its manufacturer's recommendations and Section 84 of the *CalTrans Standard Specifications*.

B Provide minimum of two coats of paint at all striping, curbing, and related markings, in dry mil thickness as defined in *Section 84, CalTrans Standard Specifications*, Vary color of first coat slightly.

C Coatings installed on asphalt paving shall be applied in thin, light coats to avoid peeling.

D A minimum of ten (10) days shall elapse between seal coat application and pavement marking on asphaltic concrete.

E Repaint markings damaged by construction traffic.

F Install fire lane curb markings at locations required by Fire Marshal.

G Install markings within 1/2 inch tolerance. Maintain width to a tolerance of plus/minus 1/4 inch.

END OF SECTION

SECTION 33 4100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe and fittings.
 - 2. Nonpressure transition couplings.
 - 3. Cleanouts.
 - 4. Drains.
 - 5. Encasement for piping.
 - 6. Manholes.
 - 7. Channel drainage systems.
 - 8. Catch basins.
 - 9. Stormwater inlets.
 - 10. Stormwater detention structures.
 - 11. Pipe outlets.
- B. Construct in accordance with Organization and Trade Standards of the authority having jurisdiction and in the presence of a representative of that agency.

1.3 REFERENCES

- A. Organization and Trade Standards
 - 1. State of California, Department of Transportation (CalTrans), Standard Specifications as adopted by local jurisdictional authority, latest edition, including amendments.
 - 2. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones" current edition.
 - 3. Local jurisdictional and agency engineering and public works regulations and standards.
 - 4. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones" current edition.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Manholes: Include plans, elevations, sections, details, frames, and covers.
 - 2. Catch basins stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.
 - 3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.
- C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- D. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Construction Manager no fewer than 4 days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 Polyethylene Pipe

- A. HDPE Pipe:

1. Corrugated exterior with smooth interior, comply with Section 64 Caltrans Standard Specifications.

2.2 NONPRESSURE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.3 MANHOLES

- A. Standard Precast Concrete Manholes, per Caltrans Specifications and the following:
 1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
 2. Diameter: 48 inches minimum unless otherwise indicated.
 3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
 4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
 5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
 6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
 7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
 8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
 9. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
 10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
 11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.
- B. Designed Precast Concrete Manholes, per Caltrans Specifications and the following:
 1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
 2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
 3. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

4. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
5. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
6. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
7. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers, per Caltrans Specifications and the following:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch- minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.4 CONCRETE

A. General: Cast-in-place concrete according to Caltrans Specifications, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: 2 percent through manhole.
2. Benches: Concrete, sloped to drain into channel.
 - a. Slope: 8 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.5 CATCH BASINS

A. Standard Precast Concrete Catch Basins, per Caltrans Specifications and the following:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
8. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Designed Precast Concrete Catch Basins: Per Caltrans Specifications and the following: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for joint sealants.

1. Joint Sealants: ASTM C 990, bitumen or butyl rubber.
2. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
4. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

C. Frames and Grates: Per Caltrans Specifications and the following: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches minimum unless otherwise indicated.

2. Bicycle proof grates shall be used.
3. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.6 STORMWATER INLETS, per Caltrans Specifications and the following:

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to Caltrans Specifications.
- B. Gutter Inlets: Made with horizontal gutter opening according to Caltrans Specifications.
- C. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy duty, bicycle proof according to Caltrans Specifications.

2.7 STORMWATER DETENTION STRUCTURES, per Caltrans Specifications, Manufacturers Guidelines and the following:

- A. Stormwater Detention Structures: Stormtech SC-740 stormwater storage system with traffic loading; of depth, shape, dimensions, and appurtenances indicated.
 1. Foundation: Increase thickness of the chamber foundation in accordance with site soils bearing capacity and chamber cover height as required per manufacturers recommendations. The chamber foundation is the clean, crushed, angular stone placed between the subgrade soils and the feet of the chamber..
 2. Chamber Row Separation: StormTech SC-740 chambers must have a minimum 6" space between the feet of adjacent parallel chamber rows.
 3. Backfill: Clean, crushed, angular stone shall be placed below, between and above chambers with acceptable gradations, depth and thickness as shown on the construction drawings and per manufacturer's guidelines.
- B. Polypropylene (PP) Corrugated Stormwater Collection Chambers, Underground Detention Structures: Conform to the requirements of the American Society of Testing Materials (ASTM) F 2418 "Standard Specification for Polypropylene (PP) Corrugated Stormwater Collection Chambers". Products shall conform to American Association of State Highway and Transportation Officials (AASHTO) HS20 live load requirements per LRFD Bridge Design Specifications.
- C. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

2.8 PIPE OUTLETS, per Caltrans Specifications and the following:

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
- B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
 1. Average Size: NSSGA No. R-3, screen opening 2 inches.
 2. Average Size: NSSGA No. R-4, screen opening 3 inches.
 3. Average Size: NSSGA No. R-5, screen opening 5 inches.

- C. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.
- D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow.
 - 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
 - 3. Install piping with 36-inch minimum cover.
 - 4. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 - 5. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 6. Install PE corrugated sewer piping according to ASTM D 2321.
 - 7. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
- G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
 - 1. Ductile-iron pipe and fittings.
 - 2. Expansion joints and deflection fittings.

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
 - 1. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
 - 2. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 - 3. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
 - 4. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
 - 5. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
 - 6. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use Medium-Duty, top-loading classification cleanouts in all areas except pavement areas.
 - 2. Use Extra-Heavy-Duty, top-loading classification cleanouts in roadway or parking areas.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
 - 1. Use Medium-Duty, top-loading classification cleanouts in all areas except pavement areas.
 - 2. Use Extra-Heavy-Duty, top-loading classification cleanouts in roadway or parking areas.
- B. Embed drains in 4-inch minimum concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.
- E. Assemble trench sections with flanged joints.
- F. Embed trench sections in 4-inch minimum concrete around bottom and sides.

3.6 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
- D. Set tops of frames and covers flush 0.5 inch below finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.7 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.8 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

3.9 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

3.10 CHANNEL DRAINAGE SYSTEM INSTALLATION

- A. Install with top surfaces of components, except piping, flush with finished surface.
- B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- C. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.
- D. Fasten grates to channel sections if indicated.
- E. Assemble channel sections with flanged or interlocking joints.
- F. Embed channel sections in 4-inch minimum concrete around bottom and sides.

3.11 STORMWATER DISPOSAL SYSTEM INSTALLATION

- A. Chamber Systems: Excavate trenches of width and depth, and install system and backfill according to chamber manufacturer's written instructions. Include storage and leaching chambers, filtering material, and filter mat.
- B. Piping Systems: Excavate trenches of width and depth, and install piping system, filter fabric, and backfill, according to piping manufacturer's written instructions.

3.12 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."
- B. Connect force-main piping to building's storm drainage force mains specified in Division 22 Section "Facility Storm Drainage Piping." Terminate piping where indicated.
- C. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 - 4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- D. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
 - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 - a. Unshielded flexible couplings for same or minor difference OD pipes.
 - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.

- c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
2. Use pressure-type pipe couplings for force-main joints.

3.13 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 1. Close open ends of piping with at least 6-inch- thick, concrete bulkheads.
 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
 1. Remove manhole or structure and close open ends of remaining piping.
 2. Remove top of manhole or structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
- C. Backfill to grade according to Division 31 Section "Earth Moving."

3.14 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 1. Use warning tape or detectable warning tape over ferrous piping.
 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.15 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 1. Submit separate reports for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate report for each test.
 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping according to ASTM F 1417.
 - c. Option: Test concrete piping according to ASTM C 924.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.16 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 33 41 00