PROJECT MANUAL

SWING SPACE FINE ARTS (FA4) AND APPLIED ARTS (APL) - PHASE 1

Antelope Valley College
Lancaster, California

February 22, 2018

PREPARED BY

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SWING SPACE FINE ARTS (FA4) AND APPLIED ARTS (APL) - PHASE 1
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SEAL

DSA APPROVED

SFM APPROVED

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SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Description of the Work.

2. Work not in contract.

3. Contractor’s use of premises.

4. Specification language and interpretation.

B. The Project consists of interior renovations and minor exterior renovations to the Swing Space Fine Arts (FA4) and Applied Arts (APL) buildings on the campus of Antelope Valley College in Lancaster, California, in compliance with the Contract Documents and Code requirements.

1.2 WORK NOT IN CONTRACT

A. The following will be provided by the District under separate contracts:

1. Tests and inspections specified to be provided by the District in the Contract Documents.

2. Items noted NIC (Not In Contract) on the Drawings or in the Specifications.

1.3 CONTRACTOR'S USE OF PREMISES

A. General:

1. During the construction period the Contractor shall have full use of the work area for construction operations, and partial use of the site for staging, field offices and storage sheds.

2. Only the District’s right to perform construction operations with its own forces and to employ separate contractors on portions of the Project limits the Contractor’s use of the premises and the site.

3. Allow District access to maintain and operate temporary and existing facilities.

4. Permit unimpeded access by fire fighting or rescue equipment.

5. Access to and egress from construction site shall be in strict conformance to prearranged routes approved by the District, with the understanding that curtailment of traffic or revision of access routes may be required on short notice if the District's operations mandate such changes because of excessive noise, or problems with safety, service, or supply.

B. Partial District's occupancy: The District reserves the right to place and install equipment in areas of the Project prior to Substantial Completion provided that it doesn't interfere with the normal completion of the Work. This partial occupancy shall not constitute acceptance of the Work.

1.4 SPECIFICATION LANGUAGE AND INTERPRETATION

A. Gender: Whenever the context of the Contract Documents require, the neuter gender includes the feminine and masculine, the masculine gender includes the feminine and neuter, the singular number includes the plural, and the plural includes the singular.

B. Definitions: In addition to other definitions included in these Specifications, the following applies to the Work:

1. **Approved, approved equal**, **or equal,** mean as approved and accepted by the Architect and District as defined in the General Conditions and Section 01625 of the Specifications.

2. **As necessary** means essential to the completion of the Work.

3. **As required** means as required by the Contract Documents.

4. **As selected**, **as approved, as directed** or words of similar import mean as selected by, as approved by, or as accepted by the Architect. No implied meaning shall be interpreted to extend the Architect's responsibility into the Contractor's area of Contractor's supervision.

5. **As shown, as detailed, as indicated** and words of similar import mean as indicated on the Drawings.

6. **Basis of Design:** Product/material selection by the Architect.

7. **Building Department and Authorities Having Jurisdiction**: All agencies, individually or collectively, charged by statute with administration/enforcement of the requirements of the Building Code at the Project location.

8. **Computer Data Base** means the digital computer data issued by the Architect as a part of the Contract Documents, including 2-dimensional and 3-dimensional computer model, and drawing files in CAD format.

9. **Concealed** means embedded in masonry, concrete or other construction, installed within furred spaces, within a wall/partitions or above suspended ceilings, in trenches, in crawl spaces, or in enclosures.

10. **Division** means Division of these Specifications except where the obvious intent is the act or process of dividing. **Divisions** are groups of related Sections.

11. **Equipment** means a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping. This definition is in addition to definition in the General Conditions.

12. **Exposed** means not installed underground or concealed as defined above.

13. **Exterior** means a space that does not meet the definition for "interior" below.

14. **Fabricated** means items specifically assembled or made out of selected materials to meet individual design requirements for the Project.

15. **Factory Finished/Prefinished** means finished under controlled environmental conditions off site, and requiring no additional finish, except for touchup, at the Project site.

16. **Furnish** (materials) means to supply and deliver to the Project ready for installation and in operable condition.

17. **Include/including** means inclusion without limitation.

18. **Install** (services or labor) means to place in final position, complete, anchored, connected, and in operable condition.

19. **Installer** means the Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

20. **Interior** means a space completely enclosed by walls, solid door(s), floor and ceiling.

21. **Manufactured** applies to standard units usually mass-produced.

22. **Manufacturer's directions, instructions, recommendations, specifications** means manufacturer's written directions, instruction, recommendations, specifications.

23. **Match** means providing a portion of the Work using the same product, technique, sequence, dimensions, finishes, color, texture, and degree of craftsmanship as (a) another portion of the Work, (b) existing conditions adjacent to the new portion of the Work, (c) as an approved sample, range of samples, or mockup or sample panel, or (d) as a control sample in the District's or Architect's possession.

24. **Materials** are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

25. **Named products** are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature current as of the date of the Contract Documents.

26. **Product(s)** means new materials, machinery, components, systems, fixtures, equipment, and terms of similar intent.

27. **Provide** means to supply, fabricate, deliver, place, and connect, complete in-place, ready for operation and use. When neither **furnish**, **install** nor **provide** is stated, **provide** is implied.

28. **Section** means Section of these Specifications, except where the obvious intent is one of several components, a piece. **Section** is usually a basic unit of Work.

29. **Shall** is mandatory.

30. **Similar** means a portion of the Work that matches the whole or part of another portion of the Work but has a different geometric configuration.

31. **Submit**, **submittal**, **submission** mean submit to the Architect for review, unless otherwise stated.

32. **Symmetrical** means a portion of the Work which matches adjacent work, or itself, but reversed about centerline(s) or the axis of a surface or a space.

C. Titling and arrangements:

1. Article, Paragraph, and subparagraph titles and other identifications of subject matter in the Specifications are intended as an aid in locating and recognizing various requirements in the beginning words of a sentence or where the title establishes the subject, the titles are subordinate to and do not define, limit, or otherwise restrict the Specification text.

2. Underlining, bolding or capitalizing of words in the text does not signify or mean that such words convey special or unusual meaning.

3. Specification text shall govern over titling and shall be understood to be and interpreted as a whole.

4. The order of articles, paragraphs, subparagraphs, and sub-subparagraphs in the Specifications text is defined by the sequence of indentations.

D. Interpretation:

1. Unless otherwise stated, technical words and abbreviations contained in the Contract Documents are used in accordance with commonly understood construction industry meanings; and non-technical words and abbreviations are used in accordance with their commonly understood meanings.

2. The Contract Documents may 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.

3. The use of the word "including," when following any general statement, shall not be construed to limit such statement to specific items or matters, whether or not non-limiting language (such as "without limitation," "but not limited to," or words of similar import) is used with reference thereto, but rather shall be deemed to refer to all other items or matters that could reasonably fall within the broadest possible scope of such general statement.

4. Whenever the context so requires, the use of the singular number shall be deemed to include the plural and vice versa.

5. The captions and headings of the various subdivisions of the Contract Documents are intended only as a matter of reference and convenience and in no way define, limit, or prescribe the scope or intent of the Contract Documents or any subdivision thereof.

END OF SECTION

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SECTION 01 2513
PRODUCTS AND SUBSTITUTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

1.2 STANDARDS

A. Division 1 for applicability of industry standards to product specified.

1.3 GENERAL REQUIREMENTS

A. In agreeing to the terms and conditions of the Contract the Contractor has accepted the responsibility to schedule and verify that the specified products will be available when needed to comply with the accepted construction schedule, and to place orders for all required materials in timely manner to meet the accepted construction schedule, without delay in the Work.

1. Exceptions to the above are specified below.

B. It is the intent of the Contract Documents that products incorporated into the Project comply with the Contract Documents and the following:

1. New and undamaged.

2. Best of their respective kind.

3. Furnished in a timely manner, in ample quantities to facilitate proper and timely execution of the Work.

4. Of one manufacturer for each specific purpose, insofar as practicable.

5. Complete with all accessories, trim finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

6. Wherever possible of types that have been produced and used successfully in similar situations on other projects.

C. Minimum quantities or quality levels: In every instance the quantity or quality level shown or specified is the minimum to be provided or performed.

1. Within specified tolerances the actual installation may comply exactly with the minimum quantity or quality specified, or may exceed that minimum within reasonable limits.

2. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for the context of the requirements.

3. Refer instances of uncertainty to the Architect for decision before proceeding.

D. Compatibility of options: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the Contractor shall verify that product selected will be

compatible with the products previously selected, even if previously selected products were also options.

E. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is inconspicuous.

2. Equipment nameplates:

a. Provide a permanent nameplate on each item of service-connected or power-operated equipment.

b. Locate on an easily accessible surface that is inconspicuous in occupied spaces.

c. The nameplate shall contain the following information and other essential operating data:

1) Name of product and manufacturer.

2) Model and serial number.

3) Capacity.

4) Speed.

5) Ratings.

1.4 CONTRACTOR'S OPTIONS

A. Product selection is governed by the Contract Documents and governing regulations. Procedures governing product selection include the following.

B. When both the specified process and the guarantee of the results are specified, the Contractor shall, if in its judgment the process may not produce the required result, offer for review an alternative process that he would guarantee.

C. Where catalog numbers and specific brands or trade names not followed by the designation "or equal" are used in conjunction with material or equipment required by the Specifications, no substitutions will be approved.

D. For products specified only by reference standards, select any product meeting standards, by any manufacturer.

E. Where more than one manufacturer's product is specified, the first-named product is the basis for the design used in the Work and the use of alternative-name manufacturers' products or substitutes may require modifications in that design.

1. If such alternatives are proposed by Contractor and are approved by the District and Architect, Contractor shall assume all costs required to make necessary revisions and modifications to the design, including additional costs to District for evaluation of revisions and modifications of the design resulting from the substitutions submitted by Contractor to Architect.

F. For products specified by naming one or more products, but indicating the option of selecting equivalent products by stating "or equal," "equal to," "or approved equal," "equivalent to" before or after specified product, submit a request, as required for substitution, for any product not specifically named.

G. Where Specifications require matching an established sample or samples of a given color range, the Architect's decision will be final on whether or not a proposed product matches satisfactorily.

1. Where no visual match can be satisfactorily made, in the Architect's opinion, even though the product selected conforms to other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for non-compliance with specified requirements. Architect may reject products based solely on lack of visual match.

2. Where specified product requirements include the phrase "as selected from manufacturer's palette..." or "as selected from manufacturer's standard colors, patterns, textures..." or similar wording, the Architect will select the color, pattern and texture from the product line selected.

1.5 SUBSTITUTIONS

A. The District and Architect will consider formal requests from the Contractor for substitution of products and processes in lieu of those specified only under one or more of the following circumstances:

1. When the Contractor ascertains that the specified product is not available. Proof shall be submitted that firm orders were placed in a timely manner or that the unavailability is due to strike, lockout, bankruptcy, discontinuance of manufacture, or an act of God.

2. When, in the opinion of the Contractor, the product or process will not fulfill the design intent.

B. Submit 5 copies of requests for substitutions; include in request:

1. Reason for request.

2. Complete data substantiating compliance of proposed substitution with Contract Documents.

3. For products:

a. Product identification, including manufacturer's name and address.

b. Manufacturer's literature, including product description, performance and test data, and reference standards.

c. Samples.

d. Name and address of similar projects on which product was used, and date of their installation.

4. For construction methods:

a. Detailed description of proposed method.

b. Drawings illustrating methods.

5. Itemized comparison of proposed substitution with product or method specified.

6. Data relating to changes in construction schedule.

7. Accurate cost data on proposed substitution in comparison with product or method specified.

8. Approval from Authorities having jurisdiction of product submitted for substitution. Approval may be in the form of a research report, test report or other form acceptable to the District and Architect.

C. In making request for substitution, Contractor represents:

1. Contractor has personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified.

2. Contractor will provide the same warranty for substitution of product or method specified.

3. Contractor will coordinate installation of accepted substitution into the Work, making such changes to adjacent materials as may be required for the Work to be complete in all respects without need for re-design of adjacent and supporting materials.

4. Contractor waives all claims for extension of time or time/sequence related consequences, and additional costs, that subsequently become apparent.

5. Cost data is complete and includes all related costs under Contractor's Contract, but excludes development and implementation costs which may be incurred by the District and Architect, and costs that affect separate contracts.

D. Substitutions will not be considered if:

1. They are indicated or implied on shop drawings or project data submittals without formal request submitted in compliance with the requirements of this Section. Make request for substitutions prior to the preparation of shop drawings, product data and samples; do not prepare shop drawings, product data and samples based on substitutions that have not been accepted by the District and Architect.

2. They are requested directly by a subcontractor or supplier.

3. Acceptance will require substantial revision of Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. Certify that all materials incorporated into the Work are free from asbestos, radioactive waste, hazardous waste and any other material detrimental to human health, safety and conform to all codes for health, safety, ADA or environmental regulations and conform to the Specifications for the work.

B. Notify District, and request District's permission, before incorporating into the Project any materials specified by the Contract Documents which Contractor knows or has reason to know are contaminated by asbestos, radioactive waste, hazardous waste or any materials detrimental to human health and do not conform to all codes for health, safety, ADA or environmental regulations.

PART 3 - EXECUTION

NOT USED

END OF SECTION

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SECTION 01 2514
SUBSTITUTION REQUEST FORM

Project: _____

Location: _____

_____

Architect's project number: _____

Substitution No.____*(number consecutively)*

CONTRACTOR'S REQUEST AND SUBSTANTIATION

1. This substitution is requested for the following reasons:

_____

_____

_____

_____

_____

2. Section of specifications to which this request applies is _____

3. In support of this request, product data for proposed substitution is attached, consisting of description of product or item, reference standards, and performance and test data, sample is attached, or sample will be sent if requested. (Cross out paragraphs not applicable).

4. Following is itemized comparison of original product or item specified with proposed substitution:

	Original	Substitution
Name or brand		
Manufacturer		
Catalog /Model No.		
Significant variations_____		

5. • Unit costs, for product or item only, • Product or item furnished and installed *(check one)* are as follows:

   Original product or item: $_____ Per_____

   Substitution: $_____ Per _____

6. Proposed credit to District for this substitution: $ _____

7. Effects of the proposed substitution on other parts of the work, or on separate contracts, are described as follows. This list is all inclusive:

   _____

   _____

   _____

   _____

   _____

   _____

8. The proposed substitution will • will not • (*check one*) affect dimensions shown on the drawings.

9. The undersigned, having thoroughly investigated the proposed substitution, hereby states that he **(a)** believes that it is equal or superior in all respects to the originally specified product except for the variations described in article 2, above, **(b)** will provide the same warranty or warranties as specified, **(c)** has included all cost data and cost implications of the proposed substitution, **(d)** will pay redesign and special inspection costs caused by the use of this substitution, **(e)** will reimburse separate contractors for additional costs caused by the use of this substitution, **(f)** will coordinate the incorporation of the proposed substitution in the work, **(g)** will modify other parts of the work as may be necessary and as approved by the Architect to make all parts of the work complete and functioning, **(h)** affirms that maintenance and service parts will be locally available for the proposed substitution, and **(h)** will waive future claims for added cost(s) to any party caused by the proposed substitution.

Contractor _____ Date _____

Contractor's signatory_____

Title _____

ARCHITECT'S REVIEW AND ACTION

• Furnish additional information in the following categories and resubmit:

_____

_____

_____

• Sign contractor's statement of conformance and resubmit.

- The proposed substitution is approved subject to the following conditions:

_____

_____

- A change order reflecting a deduction from the contract sum in the amount of $_____ Will be issued.

Architect's signature_____

Date _____

END OF DOCUMENT

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SECTION 01 2613
CONTRACTOR'S REQUEST FOR INFORMATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for Contractor's Requests for Information (RFI).

1. Procedure for shop drawings, product data and samples submittals are specified in accordance with Section 01 3323.

2. Procedure for substitutions are specified in accordance Section 01 2513.

1.2 CONTRACTOR'S REQUESTS FOR INFORMATION

A. Submit a Request for Information to the Architect when:

1. An unforeseen condition or constructibility question occurs.

2. Questions regarding information in the Contract Documents arise.

3. Information not found in the Contract Documents is required.

B. When possible, request such clarification either verbally or in writing.

1. When the RFI is answered at the Project meeting, number the RFI and enter the response into the meeting minutes.

2. When the urgency of the need, or the complexity of the item makes clarification at the next scheduled Project meeting impractical, prepare and submit a formal written RFI to the Architect without delay.

C. RFI received directly from a subcontractor will be returned to the Contractor unprocessed.

1.3 SUBMITTAL

A. Submit RFIs within a reasonable time frame so as not to interfere with, or impede the progress of the Work.

1. Keep the number of RFIs to a minimum.

2. When the number and frequency of RFIs submitted becomes unwieldy, the Architect may require the Contractor to abandon the process and submit requests as either submittals, substitutions, or requests for change.

3. When an answer to an RFI has an effect on cost or time, notify the Architect in accordance with the Contract Documents when the RFI is received. Notification shall occur prior to commencing such work, so that the change order process can be initiated.

4. When submitting an RFI, alert the Architect, in writing, to the time available before the response will cause an impact to the Project.

B. When submitted in writing, submit the RFI as follows:

1. Submit a legible written request (FAX is acceptable) on a standard CSI or AIA preprinted or electronic form or another form approved in advance by the Architect. Include the following information:

a. Project name, as listed on the Contract Documents, Architect's project number or other identifying number, if any.

b. Date.

c. Name, address, telephone and FAX numbers of the Contractor.

d. Number and title of affected Specification Section or Sections.

e. Drawing numbers and detail references, as appropriate.

f. Clear, concise explanation of information or clarification requested.

g. Blank, lined spaces for Architect's written response.

C. Each page of each attachment to the RFI shall bear the RFI number in the lower right corner.

D. Number submitted RFI'S consecutively.

E. Sign and stamp all RFI forms. RFI from subcontractors or material suppliers shall be submitted through, and be reviewed by the Contractor prior to submittal to the Architect.

F. Unanswered RFI will be returned with a stamp or notation "NOT REVIEWED".

G. Prepare and maintain an RFI log. Update on a weekly basis. Log RFI number, brief description of content or subject discussed, date submitted, and date answered. Keep log current and furnish copy when so requested by the Architect.

H. Allow a minimum of 5 working days for review and response time; the response time will be increased if more information is required, when the RFI is submitted out-of-sequence, or if in the opinion of the Architect, more time is needed to answer the RFI.

1.4 QUALITY ASSURANCE

A. Carefully study the Contract Documents to assure that the requested information is not available therein.

1. RFI which requests information available in the Contract Documents may not be answered by the Architect.

2. Before submitting RFI to the Architect, verify that the information requested is not indicated in the Contract Documents, or cannot be determined from a careful review of same.

B. In all cases where a RFI is issued to request clarification of coordination issues, for example, pipe and duct routing, clearances, specific locations of work shown diagrammatically, and similar items, the Contractor shall fully lay-out a suggested solution using drawings or sketches drawn to scale, and submit same with the RFI. RFI which fails to include a suggested solution will not be answered.

C. Do not use RFI for the following purpose:

1. To request approval of submittals.

2. To request approval of substitutions.

3. To request changes to the Contract Documents and to confirm action taken by the Contractor for requested changes/substitutions to the Contract Documents.

D. If the Contractor believes that a clarification by the Architect may result in a change in Contract price, the Contractor shall not proceed with the work indicated by the RFI until a Change Order or other acceptable tracking device is prepared and approved.

1. If the Contractor believes that a clarification by the Architect results in additional cost, the Contractor shall identify in the RFI the basis of the Contractor's bid as it relates to the RFI.

2. Answered RFI shall not be construed as approval to perform extra work.

END OF SECTION

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SECTION 01 2657
CHANGE ORDER PROCEDURE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Make such changes in the Work, in the Contract Sum, in the Contract Time of Completion, or any combination thereof, as are described in written Change Orders signed by the District and the Architect and issued after execution of the Contract, in compliance with the provisions of this Section.

B. Related work:

1. Changes in the Work are described further in the General Conditions.

1.2 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such measures as are needed to assure familiarity of the Contractor's staff and employees with these procedures for processing Change Order data.

1.3 SUBMITTALS

A. Make submittals directly to the Architect at the address shown on the Project Directory in the Project Manual.

B. Submit the number of copies called for under the various items listed in this Section.

1.4 HANDLING

A. Maintain a current "Register of Bulletins and Change Orders" at the job site, accurately reflecting current status of all pertinent data.

B. Make the Register available to the Architect for review at his request.

1.5 PROCESSING CHANGES INITIATED BY THE DISTRICT

A. Should the District contemplate making a change in the Work or a change in the Contract Time of Completion, the Architect will issue a "Bulletin" to the Contractor.

1. Bulletins will be dated and will be numbered sequentially.

2. The Bulletin will describe the contemplated change, and will carry one of the following instructions to the Contractor:

a. Make the described change in the Work at no change in the Contract Sum and no change in the Contract Time of Completion.

b. Make the described change in the Work, credit or cost for which will be determined in compliance with the General Conditions.

c. Promptly advise the Architect as to credit or cost authorization to proceed with the change.

B. If the Contractor has been directed by the Architect to make the described change in the Work at no change in the Contract Sum and no change in the Contract Time of Completion, but the Contractor wishes to make a claim for one or both of such changes, the Contractor shall proceed with the change and shall notify the Architect as provided for the General Conditions.

C. If the Contractor has been directed by the Architect to make the described change subject to later determination of cost or credit in compliance with the General Conditions, the Contractor shall:

1. Take such measures as needed to make the change.

2. Consult with the Architect and reach agreement on the most appropriate method for determining credit or cost for the change.

D. If the Contractor has been directed by the Architect to promptly advise him as to credit or cost proposed for the described change, the Contractor shall:

1. Analyze the described change and its impact on costs and time.

2. Secure the required information and forward it to the Architect for review.

3. Meet with the Architect as required to explain costs and, when appropriate, determine other acceptable ways to achieve the desired objective.

4. Alert pertinent personnel and subcontractors as to the impending change and, to the maximum extent possible, avoid such work as would increase the District's cost for making the change, advising the Architect in writing when such avoidance no longer is practicable.

1.6 PROCESSING CHANGES INITIATED BY THE CONTRACTOR

A. Should the Contractor discover a discrepancy in the Contract Documents, a concealed condition as described in the General Conditions, or other cause for suggesting a change in the Work, a change in the Contract Sum, or a change in the Contract Time of Completion, he shall notify the Architect as required by the Contract Documents.

B. Upon agreement by the Architect that there is reasonable cause to consider the Contractor's proposed change, the Architect will issue a Bulletin in compliance with the provisions described in Article 1.5 above.

1.7 PROCESSING BULLETINS

A. Make written reply to the Architect in response to each Bullet-inch

1. State proposed change in the Contract Sum, if any.

2. State proposed change in the Contract Time of Completion, if any.

3. Clearly describe other changes in the Work required by the proposed change, or desirable therewith, if any.

4. Include full backup data such as subcontractor's letter of proposal or similar information.

5. Submit this response in single copy.

B. When cost or credit for the change has been agreed upon by the District and the Contractor, or the District has directed that cost or credit be determined in compliance with provisions of the General Conditions, the Architect will issue a "Change Order" to the Contractor.

1.8 PROCESSING CHANGE ORDERS

A. Change Orders will be dated and numbered sequentially.

B. The Change Order will describe the change or changes, will refer to the Bulletin or Bulletins involved, and will be signed by the District and the Architect.

C. The Architect will issue 4 copies of each Change Order to the Contractor.

1. The Contractor shall promptly sign all 4 copies and return 3 copies to the Architect.

2. The Architect will retain one signed copy and will forward 2 signed copies to the District.

D. Should the Contractor disagree with the stipulated change in Contract Sum or change in Contract Time of Completion, or both:

1. The Contractor shall promptly return 3 copies of the Change Order, unsigned by him, to the Architect with a letter signed by the Contractor and stating the reason or reasons for the Contractor's disagreement.

2. The Contractor's disagreement with the Change Order shall not in any way relieve the Contractor of his responsibility to proceed with the change as ordered and to seek settlement of the dispute under pertinent provisions of the Contract Documents.

END OF SECTION

SECTION 01 2973
SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Procedures for submitting schedule of values.

B. Submit a schedule of values to the Architect at least 10 days prior to submitting first application for payment.

C. Support values given with data substantiating their correctness upon Architect's request.

D. Use schedule of values for Contractor's application for payment.

1.2 FORM OF SUBMITTAL

A. The form of Application for Payment shall be AIA Document G702 "Application and Certification for Payment" supported by AIA Document G703 "Continuation Sheet," or equivalent format acceptable to the Architect.

B. Use table of contents of the Specifications for format for listing costs of work specified in Specification Divisions 1 through 48.

C. Identify each line item with number and title as listed in the index of these Specifications.

1.3 PREPARING SCHEDULE OF VALUES

A. Itemize separate line item cost for each of the following general cost items (if required):

1. Performance and payment bonds.

2. Field supervision and layout.

3. Temporary facilities and controls.

B. Itemize separate line item cost for work required by each Section of Specifications.

C. Break down installed costs into:

1. Delivered cost of product, with taxes paid.

2. Total installed cost, with overhead and profit.

D. For each line item which has installed value of more than $20,000.00, break down costs to list major products or operations under each item.

E. Round off figures to nearest dollar.

1.4 REVIEW AND RESUBMITTAL

A. After review by Architect, revise and resubmit schedule (and schedule of material values) as required.

B. Resubmit revised schedule in same manner.

END OF SECTION

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SECTION 01 2976
APPLICATION AND CERTIFICATE FOR PAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. This Section specifies administrative and procedural requirements governing applications for payment.

B. Related work:

1. Sections 01 3216 and 01 3323 for construction and submittal schedule.

1.2 SCHEDULE OF VALUES

A. Coordinate preparation of the schedule of values with preparation of the Contractor's construction schedule. Refer to Section 01 2973 for Schedule of Values.

B. General:

1. Correlate line items in the schedule of values with other required administrative schedules and forms, including:

a. Construction schedule.

b. Application for payment form.

c. List of subcontractors.

d. Schedule of allowances.

e. Schedule of alternates.

f. List of products.

g. List of principal suppliers and fabricators.

h. Schedule of submittals.

2. Submit the schedule of values to the Architect at the earliest feasible date, but in no case later than 7 days before the date scheduled for submittal of the initial application for payment.

3. Where the Work is separated into phases that require separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

C. Format and content: Use the Project Manual table of contents as a guide to establish the format for the schedule of values.

1. Include the following on the schedule of values:

    a. Project name and location.

    b. Contractor's name and address.

    c. Project number.

    d. Architect's name.

    e. Date of submittal.

2. Arrange the schedule of values in a tabular form with separate columns to indicate the following for each item listed:

    a. Generic name.

    b. Related Specification Section.

    c. Name of subcontractor.

    d. Name of manufacturer or fabricator.

    e. Name of supplier.

    f. Change Orders (numbers) that have affected value.

    g. Dollar value.

    h. Percentage of Contract Sum to the nearest 1/100 percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract sum in sufficient detail to facilitate continued evaluation of applications for payment and progress reports. Break principal subcontract amounts down into several line items.

4. Round amounts off to the nearest whole dollar. The total shall equal the Contract Sum.

5. For each part of the Work where an application for payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the schedule of values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

6. For unit cost allowances, show line item value of unit cost allowances as a product of unit cost times measured quantity as estimated from the best indication in the Contract Documents.

7. For margins of cost, show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in applications for payment. Each item in the schedule of values and applications for payment shall be complete including its total cost and proportionate share of general overhead and profit margin.

    a. At the Contractor's option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the schedule of values or distributed as general overhead expense.

8. Update and resubmit the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract sum.

1.3 APPLICATIONS FOR PAYMENT

A. General: Each application for payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the District.

1. The initial application for payment, the application for payment at time of Substantial Completion, and the final application for payment involve additional requirements.

B. Payment application times: Unless otherwise indicated in the Agreement, the date for each progress payment is the 15th day of each month. The period of construction work covered by each application for payment is the period ending 15 days prior to the date for each progress payment and starting the day following the end of the preceding period.

C. Payment application forms: Unless forms are provided by the District, use AIA Document G702 and Continuation Sheets G703 as the form for application for payment.

D. Application preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the District. Incomplete applications will be returned without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions have been made.

2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

E. Transmittal:

1. Submit 3 executed copies of each application for payment to the Architect so that they are received within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.

2. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.

F. Waivers of mechanics lien: With each application for payment, submit waivers of mechanics lien from every entity who may lawfully be entitled to file a mechanics lien arising out of the Contract, and related to the work covered by the payment.

1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.

2. When an application shows completion of an item, submit final or full waivers.

3. The District reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver delays:

a. Submit each application for payment with the Contractor's waiver of mechanics lien for the period of construction covered by the application.

b. Submit final application for payment with or preceded by final waivers from every entity involved with performance of work covered by the application who could lawfully be entitled to a lien.

5. Submit waivers of lien on forms, and executed in a manner, acceptable to District.

G. Initial application for payment: Administrative actions and submittals that must precede or coincide with submittal of the first application for payment include the following.

1. List of subcontractors.

2. List of principal suppliers and fabricators.

3. Schedule of values.

4. Contractor's construction schedule (preliminary if not final).

5. Schedule of principal products.

6. Schedule of unit prices, when applicable.

7. Submittal schedule (preliminary if not final).

8. List of Contractor's staff assignments.

9. List of Contractor's principal consultants.

10. Copies of building permits.

11. Copies of authorizations and licenses from governing authorities for performance of the Work.

12. Initial progress report.

13. Report of pre-construction meeting.

14. Certificates of insurance and insurance policies.

15. Performance and payment bonds, if required.

16. Data needed to acquire District's insurance.

17. Initial settlement survey and damage report, if required.

H. Application for payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an application for payment reflecting any Certificates of Partial Substantial Completion issued previously for District occupancy of designated portions of the Work.

I. Administrative actions and submittals that shall precede or coincide with the application submitted for Substantial Completion, include the following:

1. Occupancy permits and similar approvals.

2. Warranties (guarantees) and maintenance agreements.

3. Test/adjust/balance records.

4. Maintenance instructions.

5. Meter readings.

6. Start-up performance reports.

7. Change-over information related to District's occupancy, use, operation and maintenance.

8. Final cleaning.

9. Application for reduction of retainage, and consent of surety.

10. Advice on shifting insurance coverages.

11. Final progress photographs.

12. List of incomplete work, recognized as exceptions to Architect's Certificate of Substantial Completion.

J. Final payment application: Administrative actions and submittals which must precede or coincide with submittal of the final payment application for payment include the following.

1. Completion of Project closeout requirements.

2. Completion of items specified for completion after Substantial Completion.

3. Assurance that unsettled claims will be settled.

4. Assurance that work not complete and accepted will be completed without undue delay.

5. Transmittal of required Project construction records to District.

6. Certified property survey.

7. Proof that taxes, fees and similar obligations have been paid.

8. Removal of temporary facilities and services.

9. Removal of surplus materials, rubbish and similar elements.

10. Change of door locks to District's access.

END OF SECTION

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SECTION 01 3113
PROJECT COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes Contractor's responsibility for Project coordination.

1.2 DUTIES OF CONTRACTOR - GENERAL

A. Coordinate the work of all subcontractors.

B. Establish lines of authority and communication. Schedule and conduct progress meetings between District's Representative, Architect and subcontractors.

C. Verify that specified cleaning is done.

D. Verify that subcontractors have obtained all permits required for inspections and temporary facilities.

E. Administer processing of submittals (shop drawings, product data, samples, etc.).

F. Assemble documentation for handling claims and disputes.

1.3 CONSTRUCTION SCHEDULES

A. Prepare detailed schedule of operations of all subcontractors on the Project.

B. Monitor schedules as Work progresses:

1. Identify potential variances between scheduled and probable completion dates.

2. Recommend adjustments in schedules to meet required completion date.

3. Provide summary reports of each monitoring.

4. Document all changes in schedule.

C. Observe Work to monitor compliance with schedule.

1. Verify that labor and equipment are adequate for the work being performed, and to maintain the schedule.

2. Verify that product deliveries are adequate to maintain schedule.

3. Report non-compliance to Architect, with recommendation for remedy.

1.4 TEMPORARY FACILITIES

A. Allocate space for temporary structures furnished by each subcontractor.

B. Monitor use of temporary facilities.

C. Verify that adequate services are provided to comply with requirements for work and climatic conditions.

D. Verify proper maintenance and operation of temporary facilities.

E. Administer traffic and parking controls.

1.5 COST CONTROL

A. Maintain cost accounting records for authorized work performed under unit costs, actual costs for labor and materials, and other work requiring accounting records.

B. Develop and implement procedure for reviewing and processing applications for progress and final payments. Submit recommendations to Architect for certification to District for payment.

1.6 CHANGES

A. Review subcontractor's requests for changes and for substitutions; submit recommendations to Architect.

B. Process change orders.

1.7 INTERPRETATIONS OF CONTRACT DOCUMENTS

A. Consult with Architect to obtain interpretations.

B. Assist in resolution of questions that arise.

C. Transmit written interpretations to concerned parties.

1.8 MAINTAIN THE FOLLOWING AT SITE

A. Records:

1. Daily log of progress of work, available to Architect and District.

2. Contract Drawings and Specifications.

3. Contracts.

4. Purchases.

5. Materials and equipment records.

6. Applicable handbooks, codes and standards.

7. Shop drawing log.

8. Record documents.

9. Permits and test reports.

B. Deliver records to District at completion of Project.

1.9 START-UP

A. Direct the check out of utilities, systems and equipment.

B. Assist in initial start-up and testing.

C. Assist, and instruct when specified, the District's designated personnel in the operation, emergency repair and operation, and maintenance of utilities, systems and equipment.

D. Record dates of start of operation of systems and equipment.

E. Submit to District written notice of beginning of warranty period for equipment put into service.

1.10 SUBSTANTIAL COMPLETION

A. Upon determination of Substantial Completion of the Work, or portion thereof, prepare a list of incomplete or unsatisfactory items for the Architect's review.

B. Prior to Architect's certification of date of Substantial Completion, promptly make corrections noted on the list, and other corrections determined by the Architect, and complete defective and incomplete work.

1.11 FINAL COMPLETION

A. Upon determination that the Work is finally complete, submit written notice to Architect and District that Work is ready for final inspection and secure and transmit required closeout submittals to Architect.

B. Turn over to District items identified as "closeout submittals" in Divisions 2 through 48 of these Specifications and in Section 01 7700.

END OF SECTION

SECTION 01 3119
PROJECT MEETINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Scheduling and administration of progress meetings as follows:

2. Make arrangements for meetings. Prepare agendas and preside at meetings.

3. Distribute written notice of agenda of regular scheduled and called meetings a minimum of 4 days in advance of meeting date.

4. Record minutes, include significant proceedings and decisions.

5. Distribute copies of minutes to participants, within 4 days after meetings. Furnish copy of minutes to the Architect.

1.2 PRE-CONSTRUCTION MEETINGS

A. Schedule a meeting within 15 days after date of Notice to Proceed. As a minimum, preparation of the initial schedule, critical work sequence, and review and updating procedures shall be on the agenda.

1. Attendance:

a. District.

b. Architect and its consultants.

c. Major subcontractors.

d. Safety representative.

2. Minimum agenda:

a. Airport rules, regulations and procedures.

b. Distribute and discuss list of major subcontractors, and construction schedule updating frequency.

c. Insurance.

d. Critical work sequencing.

e. Designation of responsible personnel.

f. Procedure for progress payments, including handling of retainage, payments for materials on hand, and withholding of payment until shop drawings review is complete.

g. Payroll records, when needed to be submitted to the District.

h. Restrictions to site use and access.

i. Temporary facilities.

j. Testing and inspections.

k. Surveys and layout.

l. District-furnished equipment.

m. Public relations; policies regarding statements to media, and other public related activities.

n. Proceeding of field decisions, Bulletins, and Change Orders.

o. Adequacy of distribution of Contract Documents.

p. Shop drawing log. Submittal of shop drawings, product data and samples.

3. RFI log. Submittal of RFI.

a. Procedures for maintaining project record documents.

b. Use of premises, parking, office and storage areas.

c. Major equipment deliveries and priorities.

d. Safety and first-aid procedures, security procedures, and housekeeping procedures.

4. Minimum Contractor submittals:

a. Preliminary construction schedule.

b. Emergency telephone list.

1.3 PROGRESS MEETINGS

A. Thereafter schedule regular progress meetings as mutually agreed, but usually not less than monthly.

B. Meetings shall be held as job progress dictates, at construction office, or as indicated in notice.

C. Attendance:

1. General Contractor project manager.

2. General Contractor's jobsite superintendent.

3. District's Representative.

4. Architect and its consultants, as pertinent to agenda.

5. Subcontractors, as pertinent to agenda.

D. Minimum agenda:

1. Review, approve minutes of previous meeting.

2. Review work progress since last meeting.

3. Note field observations, problems and decisions.

4. Identify problems which impede planned progress.

5. Review any off-site fabrication problems.

6. Develop corrective measures and procedures to regain planned schedule.

7. Revise construction schedule as indicated.

8. Plan progress during next work period.

9. Review submittal schedules, expedite as required to maintain schedule.

10. Maintenance of quality standards.

11. Review any changes proposed for effect on construction schedule and completion date.

12. Complete other current business.

1.4 REVISIONS TO PUBLISHED MINUTES

A. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.

B. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.

C. Challenge to minutes shall be settled as priority portions of "old business" at the next regularly scheduled meeting.

END OF SECTION

SECTION 01 3216
NETWORK ANALYSIS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Prepare network analysis system using the Critical Path Method to assure adequate planning and execution of the Work so that the Work is completed within the respective number of calendar days allotted in the Contract, and to assist the Architect in appraising the feasibility of the proposed schedule and evaluating the Progress of the Work.

1.2 QUALITY ASSURANCE

A. Network analyst's qualifications: Individuals(s) thoroughly trained and experienced in compiling construction schedule data and analyzing by use of the Critical Path Method.

B. Reference standards: Perform all data preparation, analysis, charting, and updating in compliance with pertinent recommendations of the current edition of "CPM In Construction" a manual of the Associated General Contractors.

C. Submittal and resubmittal procedures: In accordance with Section 01 3323.

D. Preliminary network analysis: Within 10 days after receipt of the Notice to Proceed, submit 4 prints and electronic copy of a preliminary network analysis prepared in compliance with Article 1.3 below.

E. Network analysis: Within 60 days after receipt of Notice to Proceed, submit one reproducible and 4 prints of the network analysis prepared in compliance with Article 1.3 below.

F. Revised analyses: Within 10 days after receipt of the Architect's review comments, submit 4 prints and electronic copy of the network analysis revised in compliance with those comments.

G. Periodic reports: On the first working day of each month following submittal of the above revised analysis, submit 4 prints of analysis and 7 prints of sort number 3 (see paragraph 1.3, C, 3 below), updated in compliance with this Section.

1.3 NETWORK ANALYSIS

A. Diagram: Graphically show the order and interdependence of all activities necessary to complete the Work, and the sequence in which each such activity is to be accomplished, as planned by the Contractor and his project field superintendent in coordination with all subcontractors whose work is shown on the diagram. Activities shown on the diagram shall include, but are not necessarily limited to the following.

1. Project mobilization.

2. Submittal and approval of product data, shop drawings and samples.

3. Procurement of equipment and critical materials.

4. Projected delivery dates of all materials.

5. Activities of all Contractors.

6. Fabrication of special material and equipment, and their installation and testing.

7. Projected dates of required inspections and approvals.

8. Final cleanup.

9. Final inspection and testing.

10. All activities of the District which may affect progress and/or affect required dates for completion of all or part of the Work.

B. The detail of information shall be such that duration times of activities will normally range from 1 - 15 days.

1. The selection and number of activities shall be subject to the Architect's approval. Show on the diagram, as a minimum for each activity, preceding and following event numbers, description of each activity, cost, and activity duration in calendar days.

2. Submit diagram on a sheet size 30 -inch high x width required.

C. Mathematical analysis: Furnish the mathematical analysis of the network diagram by computer printout, including a tabulation of each activity. Show the following information as a minimum for each activity.

1. Preceding and following event numbers.

2. Activity description.

3. Estimated duration of activities.

4. Earliest start date (by calendar date).

5. Earliest finish date (by calendar date).

6. Latest start date (by calendar date).

7. Latest finish date (by calendar date).

8. Slack or float (in calendar day).

9. Monetary value of the activity.

10. Percentage of activity completed.

11. Contractor's earnings based on portion of activity completed.

D. The means used in taking the mathematical computation shall be capable of compiling the total value of completed and partially completed activities and be capable of accepting modifications approved for time and logic adjustments.

E. Computer printout: In the computer printout, list the activities in sorts as follows.

1. By the preceding event number from lowest to highest and then in the order of the following event number.

2. By the amount of float then in order of preceding event numbers, and then in order of succeeding event numbers.

3. In order of preceding event numbers, and then in order of succeeding event numbers. Show the total dollar amount and dollars spent to date for each activity.

4. All other sorts requested by the Architect.

F. The schedule shall be coordinated with the Schedule of Values per **[Section 01 2973] [the General Conditions]**.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 PERIODIC REPORTS

A. Contents:

1. Report actual progress by updating the mathematical analysis.

2. Note on the summary network or clearly show on a revised issue of affected portions of the detailed network revisions causing changes in the detailed network.

3. Revise the summary network as necessary for clarity.

4. Activities or portions of activities completed during the reporting period and their total value.

5. State the percentage of the Work actually completed and scheduled as of the report date and the progress along the critical path in terms of days ahead of, or behind the allowable dates.

6. If the Project is behind schedule, also report progress along other paths with negative slack.

7. Include a narrative report which shall, but is not necessarily limited to; a description of the problem areas, current and anticipated delaying factors and their impact; and an explanation of corrective actions taken or proposed.

8. Show the date of latest revision.

B. Submittal: Submit in accordance with paragraph above.

END OF SECTION

SECTION 01 3323
SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. A requirement for submittal of shop drawings, product data, samples and other submittals so specified below.

B. In addition to other requirements of the Contract Documents pertaining to submittals, submit shop drawings, product data, samples, and similar submittals required by the Contract Documents for the Architect's review before proceeding with the work affected by these submittals.

C. Submittals made by the Contractor to the Architect that are not required by the Contract Documents may be returned without review.

D. Do not perform any portion of the Work requiring submittal and review of shop drawings, product data and samples, and similar submittals required by the Contract Documents, until the Architect has approved the respective submittal. Such work shall be in compliance with the approved submittals.

E. Related work:

1. Section 01 3450 for coordination drawings.

2. Section 01 3216 for construction schedules.

3. Section 01 7700 for closeout submittals.

4. Section 01 7839 for record documents.

1.2 SCHEDULING

A. Designate in construction schedule, specified in Section 01 3216, dates for submittal and suggested dates when approved shop drawings, product data and samples are expected to be returned by the Architect.

1.3 LOG

A. Prepare, and update on a regular basis, a shop drawing log using AIA Form G712, or similar form acceptable to the Architect, listing all the required shop drawings by reference to Specification Section number and their submittal date coordinated with the construction schedule.

1.4 DEFINITIONS

A. The terms "shop drawings" and "product data" as used herein also include, but are not limited to, fabrication, erection, layout and setting drawings, manufacturers' standard drawings,

descriptive literature, catalogues, brochures, performance and test data, wiring and control diagrams, 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 the positions thereof conform to the Contract Documents.

1. Shop drawings are drawings, diagrams, schedules and other date specially prepared for the Work by the Contractor or a subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

2. Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

3. Product data are illustrations, schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

1.5 SUBMITTALS

A. Prior to the first submittal, submit for review the proposed submittal transmittal form and an impression of the Contractor’s approval stamp to be used on submittals.

1.6 SHOP DRAWINGS

A. Identify details by reference to sheet and detail numbers shown on the Drawings.

B. Shop drawings shall show in detail, materials, dimensions, including thickness, methods of assembly, attachments, relation to adjoining work, and all other pertinent data and information.

C. Shop drawings with the notation "VERIFY DIMENSIONS" will not be reviewed.

D. Prepare composite shop drawings and installation layout drawings, where required, to depict proposed solutions for tight or critical field conditions. These composite shop drawings or installation layout drawings shall be coordinated by the Contractor and subcontractors for proper relationship with the work of all other trades based on field conditions.

1.7 PRODUCT DATA

A. Manufacturer standard schematic drawings:

1. Modify drawings to delete information not applicable to Project.

2. Supplement standard information to provide additional information applicable to Project.

B. Manufacturer catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.

1. Clearly mark each copy to identify pertinent materials, products or models.

2. Show dimensions and clearances required.

3. Show performance characteristics and capacities.

4. Show complete wiring diagrams and controls.

1.8 SAMPLES

A. Unless otherwise specified, submit samples of sufficient size and quantity to clearly illustrate characteristics of product or material, and full range of colors and/or texture. Whenever possible provide color and texture samples on product specified.

B. Label each sample to indicate the Project name, Contractor, manufacturer, brand, quarry, job number, color, type, and similar required information. Label shall be solidly attached or adhered to the samples; samples received without labels will be returned without action.

C. Erect field samples and mockups at Project site, unless specified otherwise, in locations acceptable to the Architect. Construct each sample or mockup complete, including work of all trades required in finished work.

1.9 STRUCTURAL CALCULATIONS

A. Where required by the Contract Documents, submit calculations signed and sealed by a California-licensed civil or structural engineer for the material or assembly specified to demonstrate compliance with provisions of the Contract Documents and Code.

1.10 TEMPORARY FACILITIES AND CONTROLS

A. Submittals for temporary facilities and controls, when made to the Architect, are for information only and will not be returned.

1.11 CERTIFICATES AND AFFIDAVITS

A. Statements made by the Contractor, subcontractor, manufacturer, supplier, fabricator, or distributor to certify that certain requirements of the Specifications have been met.

B. Review certificates before submitting to Architect, to ensure that the affidavit is properly worded and signed.

C. Each certificate shall be signed by an official authorized to certify on behalf of the Contractor, subcontractor, manufacturer, supplier, fabricator, or distributor of the and shall contain the name and address of the Contractor, the Project name and location, reference to products, systems, shop drawings, and product data, and the quantity and date or dates of shipment or delivery to which the certificates apply.

1. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the dates of tests to which the report applies.

D. Certification shall not relieve the Contractor from providing satisfactory material if, after tests are performed on selection samples, the material is found not to meet the specified requirements.

1.12 SUBMITTAL REQUIREMENTS

A. Submittals dates shall be staggered to correspond to the chronological sequence of construction. Early submittals for products or assemblies, such as finishes, unless they affect the critical path, will not be reviewed and will be returned to the Contractor for later re-submittal.

B. Submittals not in compliance with the milestone dates accepted by the Architect in the construction and submittal schedule (out-of-sequence submittals), will not be reviewed and will be returned to the Contractor.

C. Review, approve, and submit shop drawings, product data and samples, and similar submittals required by the Contract Documents, to the Architect with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the District or of separate contractors, and to allow Architect ample time for review before the date approved submittals will be needed to maintain construction schedule. Contractor shall allow 10 full working days for Architect to review and return submittals; additional time may be required for certain submittal items.

D. Submit 3 prints of shop drawings, and number of copies of project data that Contractor requires for distribution, plus 3 copies, which will be retained by Architect. Bind each set in sequence.

E. Submit 3 samples, unless specified otherwise. By pre-arrangement with the Architect, or where so specified, submit a single sample for review; this sample, when approved, shall be installed in the Work where it can easily be referenced for future comparison with work of the same kind.

F. Submit 3 copies of structural calculations, bound in sequence.

G. Accompany submittals with transmittal letter, in duplicate, containing the following information. Number all submittals, and the accompanying transmittal, sequentially.

1. Date.

2. Project title and number.

3. Contractor name and address.

4. The number of each shop drawing, product data and sample submitted.

5. Notification of deviations from Contract Documents.

6. Other pertinent data.

H. Normally a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required.

1. Transmittal of a submittal for more than one item using a single transmittal form will be permitted only when the items taken together constitute a manufacturer "package" or are so functionally related that expediency indicates a review of the group or package as a whole.

2. Collate multiple-page submittal into sets and staple or bind each set as appropriate prior to transmittal to the Architect.

I. Submittals shall include the following:

1. Date and revision number.

2. Project title and number.

3. The names of: Architect, Contractor, subcontractor, supplier, manufacturer, and separate detailer, when pertinent.

4. Identification of product or material.

5. Relation to adjacent structure or materials.

6. Field dimensions, clearly identified as such.

7. Specification Section number.

8. Applicable standards, such as ASTM or Federal Specification number.

9. Two 2 -inch by 4 -inch blank spaces for the Contractor and Architect stamp.

10. Identification of deviations from Contract Documents. Contractor stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with Contract Documents.

J. By approving and submitting shop drawings, product data, samples and similar submittals the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

K. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents.

L. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications furnished by the Contractor.

1.13 RESUBMISSION REQUIREMENTS

A. Revise initial shop drawings, when required, and resubmit as specified for initial submittal. Indicate on drawings changes made, other than those requested by Architect, clearly by clouding or similar acceptable method.

B. Submit new product data and samples as required for initial submittal.

C. Submit revised calculations as required for initial submittal.

D. Identify resubmittal with the original submittal number followed by an alphabetic suffix (i.e. 10A).

1.14 DISTRIBUTION OF SUBMITTALS

A. Distribute copies of shop drawings, product data and other required submittals to Contractor Project site file and project record documents file, and to subcontractors, supplier and fabricator, as applicable.

B. Distribute samples to manufacturer, distributor, supplier or subcontractor, as applicable.

1.15 ARCHITECT DUTIES

A. The Architect will review submittals with reasonable promptness and approve them or take other appropriate action, when applicable, for design concept of Project and information given in Contract Documents.

B. Approval of separate item will not constitute review of an assembly in which item functions.

C. The Architect will stamp and initial or sign submittals indicating review of same, and will return submittals to Contractor for distribution.

D. The term “informational submittals” means that Contractor-furnished data and drawings are for Architect’s review only, and do not require Architect’s approval.

END OF SECTION

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SECTION 01 3513
SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes special project procedures.

B. Portions of the buildings will remain open to the public while the work of this Contract is being conducted.

1.2 EXISTING CONDITIONS

A. The Contractor shall accept the building and the site in the condition in which they exist at the time he is given access to begin work.

B. Before starting work, make a detailed survey of existing conditions, verify governing dimensions at the premises against the Drawings, and examine adjoining work on which the work of this Contract is dependent.

1. No "Extra" or additional compensation will be allowed on account of differences between actual measurements and dimensions shown.

2. Submit differences discovered during the Work to Architect for interpretation before proceeding with the associated work.

1.3 PROTECTION

A. While work of this Contract is in progress, protect adjacent areas, facilities, grounds, contents and occupants, whether private or public, from damage or harm due to the work of this Contract.

B. Cover and protect all surfaces of areas turned over to Contractor for the Work as required to prevent soiling or damage by dust, dirt, water, fumes or otherwise, and protect other areas where Work is performed in the same manner, all as deemed adequate by the District. Prior to District's re-occupancy of any such area, clean all surfaces as specified in Section 01 7400 and according to such other cleaning instructions as may be specified in other Sections or issued by the District.

C. Welding: Conform to following requirements where welding is performed in or on the building.

1. Protection during welding: Conform to Title 8, CCR. Further protect occupants and the public with portable solid vision barricades around locations where welding is performed plus sign warning against looking at welding without proper eye protection, or equivalent.

2. Fire extinguishers: Maintain a fully charged UL labeled, minimum 10 lb. ABC fire extinguisher at each location where welding is performed.

3. Welding smoke control: Verify locations of existing smoke detectors. Perform welding operations by methods that produce the minimum feasible smoke and fumes. Furnish portable type smoke collection and ventilating equipment as required to prevent smoke and fume nuisances. Notify the District at least 48 hours in advance if temporary deactivation of smoke detector is required to prevent false alarms from welding. District will permit deactivation of detectors only for the time welding is actually in progress.

D. Fire prevention:

1. Ensure that flammable solvents are not being used in the area. Maintain a safe distance between place of welding and source of flammable solvents.

2. In addition, examine existing construction and backing for all combustible materials and finishes and for conditions where heat conduction in metals may bring adjoining materials to ignition temperature.

3. Use positive fire prevention measures including, without limitation, removal and reinstallation of combustible materials, installation of temporary shields and/or heat sinks, and all other necessary measures.

E. No utility services, such as water, gas, sewers, electricity, telephone, communication, and fire protection system serving the Building, or parts thereof, shall be interrupted without prior written approval of the District, and other authorities having jurisdiction.

F. Damage caused by the Contractor to existing structures, grounds, pavements, utilities or flora, or work done by others, shall be repaired by the Contractor at his expense and left in as good condition as existed before the damaging, except where such existing work is shown to be removed, or replaced by new work.

1.4 ACCESS

A. During the life of the Contract, maintain access within the site to the building for fire-fighting equipment, ambulance and law enforcement vehicles.

B. Do not block required accessways, and other accessways not required but so designated by the District or the Contract Documents, so as not to interfere with access to adjacent areas, facilities or new work area and to cause the least possible interference with activities of other contractors, the District's personnel, occupants or the public.

C. The office hours are 0700 hours to 1700 hours. Contractor may access and conduct work during these hours if approved by the District. Work conducted during office hours shall not be disruptive to office operations or will need to done during closed office hours.

1.5 SURVEY AND RE-SURVEY OF EXISTING CONDITIONS

A. Intent of Drawings is to show existing site and building conditions with information developed from original construction documents, field surveys, and District's records, and to generally show the extent and type of demolition required to complete the Work.

1. The information shown on the Drawings is not a guaranty of existing conditions.

2. Contractor/Bidder is invited to survey the building-site of the work after making arrangements to do so with the District.

B. After award of Contract and before starting work, the Contractor, the District's representative, and the Architect shall together make a thorough survey of the existing building facilities, and areas to be used for staging, storage or accessways to or from the Work.

1. The Contractor may list, and photograph if he desires, existing conditions not requiring alterations, note discrepancies between Drawings and existing conditions, and shall designate areas of storage and routes of access agreed upon by the District.

2. Where necessary, the Architect will issue clarifications and instructions.

3. Do not proceed where such conflicts or discrepancies occur prior to receipt of Architect's instructions.

C. At a mutually agreed upon time before completion of the Work, the Contractor, the District and Architect shall re-survey the same areas.

1. The Contractor shall furnish a report on conditions then existing compared with conditions as first noted.

2. The report of re-survey shall be signed by the Architect, and forwarded by the Contractor to the District.

3. Damage indicated in the report that was caused by the Contractor, or anyone employed by or under contract to the Contractor, shall be repaired by the Contractor at his expense and left in as good condition as existed before the damaging.

1.6 NOISE CONTROL

A. Exercise caution to prevent generation of unnecessary noise and keep work-generated noise levels to minimum possible. Do not exceed CAL/OSHA standards at any time. Discontinue noise producing operations, when requested by the District, and reschedule at a mutually acceptable time.

B. Do not use impact tools, such as jack hammers, inside the Building when it is opened to the public.

C. Equip internal combustion engines with suitable mufflers. Do not use internal combustion engines in enclosed spaces, including the Building, without the District's written approval.

D. Mount rolling equipment on pneumatic tires.

1.7 DUST CONTROL

A. Control dust by continuous vacuuming when dust generating work is in progress, by tenting, or by other methods acceptable to the District.

B. Provide dust-tight partitions to prevent dust escaping into other parts of the building where work is not in progress, as specified in Section 01 5000.

C. After demolition and removal is completed in a room or space, use clean, tack cloth to remove dust from work to remain.

D. Assume liability for claims related to flying dust.

1.8 WATER CONTROL

A. Control the use of water to prevent damage to the existing building facilities and site improvements to remain.

B. Provide self-contained, or auxiliary wet vacuum equipment where water, such as waste cooling water from concrete sawing, is used in, and adjacent to existing building.

C. Provide impermeable floor coverings and suitable dams to prevent damage by water, and immediately clean-up and remove surplus water, and water spilled in non-working areas.

1.9 SECURITY

A. Coordinate security with the District; refer to Section 01 5000.

B. Take all necessary precautions to keep trespassers out of work and demolition areas.

C. Properly secure work and demolition areas from entry when work is not in progress but do not block required exitways.

END OF SECTION

SECTION 01 3516
ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Coordinate work of trades and schedule elements of alterations and renovation work to expedite completion of Work.

B. In addition to demolition indicated, cut, move or remove items as necessary to provide access or to allow alterations and new work to proceed. Include such items as:

1. Rerouting or offsetting existing utilities, such as piping, ducts, conduit and wiring.

2. Removal of abandoned items and items serving no useful purpose, such as abandoned furnishings and equipment, and debris such as rotted wood, rusted metal, and deteriorated concrete.

3. Removal of unsuitable or extraneous materials not marked for salvage, such as abondoned furnishings and equipment, and debris such as rotted wood, rusted metals, and deteriorated concrete.

4. Cleaning of surfaces, and removal of surface finishes as needed to install new work and finishes.

C. Patch, repair and refinish existing items to remain, to the specified condition for each material, with a workmanlike transition to adjacent new work.

D. Traffic:

1. Conduct operations removal of debris to ensure minimum infererence with roads, streets, walks, and other adjacent occupied or used facilities.

2. Do not close or obstruct streets, walks or other occupied or used facilities without permission from District. Provide alternate routes around closed or obstructed traffic ways.

1.2 ALTERATIONS, CUTTING AND PROTECTING

A. Assign work of moving, removal, cutting and patching to trades qualified to perform the work and ause the least damage, and provide means of finishing or re-finishing surfaces to appearance of new work.

B. Perform cutting and removal work to remove minimum necessary and to avoid damage to adjacent work.

C. Perfom cutting and patching as specified.

D. Explosives: Use of explosives is not permitted.

E. Protection:

1. Protect existing finishes, equipment, and adjacent work which is scheduled to remain, from damage.

2. Provide shoring, bracing or support to prevent movement or settlement or collapse of adjacent facilities to remain.

F. Provide temporary enclosures as specified, to separate work areas from existing building and from areas occupied by District, and to provide weather protection.

G. Damages: Promptly repair damages caused to adjacent facilities by demolition operations, at no change in Contract Amount.

H. Utilities services:

1. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

2. Do not interrupt existing utilities serving occupied or used facilities, except when Shutdown Request has been approved in advance by District. Provide temporary services, during interruptions to existing utilities, acceptable to District.

3. Include interruptions to existing fire sprinkler system. Minimize hazardous exposures during time sprinkler system is out of service.

1.3 SUBMITTALS

A. Notify District before welding or using other flame-producing appliances.

B. Submit time schedule of proposed alterations to District for review prior to start of work.

C. Provide a detailed sequence of alterations and removal of work to ensure the uninterrupted operations of District, as part of Construction Schedule.

PART 2 - PRODUCTS

2.1 SALVAGED MATERIALS

A. Salvage sufficient quantities of cut or removed materials to replace damaged work of existing construction, when material is not readily obtainable on current market.

B. Store salvaged items in a dry, secure place on site as directed.

C. Items not required for use in repair of existing work shall remain the property of District.

2.2 PRODUCTS FOR PATCHING, EXTENDING AND MATCHING

A. Provide same products or types of construction as that in existing structure, as needed to patch, extend or match existing work, except as otherwise indicated.

B. Generally Contract Documents do not define products or standards of workmanship present in existing construction. Contractor shall determine products by inspection and any necessary testing, and workmanship by use of the existing as a comparison.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Patch and extend existing work using skilled mechanics capable of matching existing quality of workmanship.

B. Hot work:

1. Work requiring concrete cutting, brazing, welding or soldering of metals, or work producing gases or particulate capable of activating ionization or smoke/heat detectors, shall require five days notice.

2. Failure to notify District of this work that results in Fire Department false alarm will result in pass-through of false alarm fine to Contractor.

C. Shut down requests:

1. Protect from damage active utilities existing and evident by reasonable inspection of Site, whether or not shown on Drawings. Maintain continuity of utilities services to exiting buildings or equipment.

2. Schedule all necessary service interruptions of utilities of any type or magnitude in advance with Architect and District. Schedule major utility shutdowns between 6:00 PM and 6:00 AM. Scheduling of shutdown shall be through submittal of written request at least 14 days prior to proposed shutdown, and awaiting approval. Schedule minor utility service interruptions with minimum of 5 days prior notice through submittal of written request but only if response is received.

3. Major shutdown is generally regarded as interruption of any single or group of services or utilities serving entire building, wing, floor or group of spaces where occupants normal operation would be affected by loss of service or utilities lost as result of shutdown.

4. Minor shutdown may be regarded as interruption of single or group of service or utilities to area not occupied at time of shutdown, or when services or utilities would pose not inconvenience to occupant activities, systems or equipment, or when affected utilities are restricted to areas occupied by Contractor engaged in ongoing work.

D. Items requiring concrete cutting, brazing, grinding, welding or soldering of metals, or work producing gases or particular capable of activating ionization or smoke/heat detectors, shall require five days notice. Failure to notify District of this work that results in Fire Department false alarm will result in pass-through of false alalrm fine to Contractor.

3.2 ADJUSTMENTS

A. Where partitions are removed, patch floors, walls, and ceilings with finish materials to match existing conditions.

B. Where removal of partitions results in adjacent spaces becoming one, rework floors and ceiling to provide smooth planes without breaks, steps or bulkheads.

C. Where extreme change of plane of 2 inches or more occurs, request instructions from Architect as to method of making transition.

D. Before work begins near existing roof, a meeting will be scheduled with District and Contractor. Existing roof must be maintained waterproof during the construction period. Do not use for storage of material.

3.3 TRANSITION FROM EXISTING TO NEW WORK

A. When new work abuts or finishes flush with existing work, make a smooth and workmanlike transition.

B. Patched work shall match existing adjacent work in texture and appearance so that the patch is invisible.

C. When finished surfaces are cut in such a way that a smooth transition with new work in not possible, terminate existing surface in a neat manner along a straight lien at a natural line of division, and provide trim appropriate to finished surface.

3.4 CLEANING

A. Perform periodic and final cleaning as specified.

1. Clean District-occupied areas daily.

2. Clean spillage, overspray, and heavy collection of dust in District-occupied areas immediately.

B. At completion of work of each trade, clean area and make surfaces ready for work of successive trades.

C. At completion of alterations work in each area, return space to condition suitable for use by District.

END OF SECTION

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SECTION 01 4216
DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements pertaining to reference standards and specifications listed in the Project Manual or indicated on the Drawings.

B. Work specified by reference to a published standard or specification of a government agency, technical association, trade association, professional society or institute, testing agency, or other organization shall comply with, or exceed the minimum standards of quality for materials and workmanship established by the designated standard or specification.

C. Unless the Contract Documents indicate otherwise:

1. Where conflict exists between referenced documents and Contract Documents, or between referenced documents, the one having more stringent requirements applies.

2. Refer requirements that are different but apparently equal and uncertainties as to which quality level is more stringent to the Architect for a decision before proceeding with the affected work.

D. Where both a standard and a brand name are specified for a product in the Project Manual, the proprietary product named shall conform to or exceed the requirements of the specified reference standard. The listing of a trade name in a Project Manual shall not be construed as warranting that such product conforms to the respective reference standard.

E. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entities' construction activity.

F. Copies of standards:

1. Copies of applicable referenced standards are not bound in the Project Manual.

2. Where copies of standards are needed for superintendence and quality control of the Work, obtain a copy or copies directly from the publication source and maintain in an orderly manner at the Project Site, available to the Contractor's personnel, Subcontractors, District and Architect.

G. The applicable edition of the reference standard and specification, except as listed in subparagraphs 1 and 2 below, is the latest date of issue 30 days before bids are received, when bids are requested, or on effective date of the Agreement if there is no bid.

1. Where a publication date follows the standard.

2. Issues listed in governing building code and regulations supersede the above requirements.

H. No provisions of any referenced standards or specifications, whether or not specifically incorporated by reference in the Contract Documents, shall be effective to change the duties and responsibilities of the District, the Architect, or Contractor, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor to assign to any of them any responsibility, duty or authority for safety precautions or procedures, or to supervise or direct the performance of the Work.

I. When so required by the Architect during the course of the Work, or by the Contract Documents, deliver to the Architect 3 copies of an affidavit or certificate, signed by the material manufacturer or supplier, stating that the material furnished conforms to the specification or standard specified.

J. For acronyms and full name of same, and for addresses and telephone number of the associations, societies and institutes referenced in the Specifications, refer to *"Sources of Construction Information"* published by, and available from the Construction Specification Institute (703.684.0300), *"Encyclopedia of Associations"* by Gale Research, or *"National Trade & Professional Associations of the US"* by Columbia Books.

END OF SECTION

SECTION 01 4516
CONTRACTOR QUALITY CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for quality control of the Work, including test and inspection procedures.

B. Related work:

1. Section 01 4523 for tests and inspections.

2. Divisions 2 through 48 for specific test procedures to be performed in compliance with this Section.

1.2 ADMINISTRATIVE STAFF

A. Provide a competent and adequate staff for the administration, coordination, supervision, and superintendence of the Work.

B. Do not change key members of this staff without the consent of the District, unless such staff members prove to be unsatisfactory to the Contractor and cease to be in his employ. If the Contractor intends to change a key staff member, he shall give the District written notice at least 15 days prior to the intended change.

C. Key staff members shall be full time employees, stationed at the site.

D. Project staff shall include, but shall not be limited to, the following:

1. Project Manager: The person who has responsibility for the prosecution of the work and who has the authority to act in matters for the coordination, direction, and technical administration of the work. Prior to commencement of the work, provide the District with the name of the project manager.

2. Superintendent: The person who shall be in attendance at the Project site during the performance of the work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

3. Additional staff: In addition to the general project superintendent required above, provide the services of coordinating engineer for HVAC, Plumbing, Fire Protection, and Electrical Work: The full time person who has the responsibility for the coordination of the mechanical and electrical work with the work of other trades, for the review of mechanical and electrical shop drawings, for the resolution of conflicts and interferences between trades, for directing adjustments in the work that shall be required to comply with the Contract Documents, and for commissioning the mechanical and electrical systems. This individual shall have previous experience in coordinating these areas of work on projects of similar scale and complexity.

1.3 CONTRACTOR QUALITY CONTROL SYSTEM

A. Establish a quality control system to perform sufficient inspections and tests of all items of Work, including that of all subcontractors, to ensure conformance with the Contract Documents for materials, workmanship, construction, finish, functional performance and identification.

B. Quality control system shall ensure that the Work complies with the requirements of the Contract Documents. Controls shall be adequate to cover all construction operations.

C. Apply, install, connect, erect, use, clean, adjust, and condition articles, materials and equipment in compliance with their manufacturer latest published instructions, unless more restrictive or stringent requirements are specified in the Specifications.

1. When specified or requested, furnish the Architect 2 copies of such printed instructions prior to introduction of such items.

2. If product manufacturer instructions are in conflict with the Contract Documents, notify the Architect for clarification before proceeding.

3. Keep a clean, legible copy of the various product manufacturers instructions applicable to the Work at the Project site.

D. Certificates:

1. When specified, deliver to the Architect 2 signed certificates from suppliers of materials, equipment and manufactured items stating that such materials and manufactured items meet or exceed the standards specified.

2. In lieu of such certification, the Contractor may submit reports of current tests made and attested by a reputable and recognized testing laboratory.

1.4 CONTRACTOR ASSISTANCE

A. Cooperate with individual or firm performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the individual or firm sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

1. Providing access to the work to be tested or inspected and furnishing incidental labor and facilities necessary to facilitate inspections and tests.

2. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

3. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.

4. Providing the individual or firm with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

5. Providing security and protection of samples and test equipment at the Project site.

1.5 VERIFICATION OF CONDITIONS

A. Prior to installation of any product, inspect existing supports and assemblies to receive materials to be installed and arrange for correction of defects in the existing workmanship, material or conditions that may adversely affect work to be installed.

B. Installation of materials will constitute acceptance of existing conditions as being in proper condition to receive the materials to be applied and waiver of claim that existing conditions are defective as pertains to warranty requirements.

C. Where the Specifications require a product to be installed under the supervision or inspection of the material manufacturer or its representative, manufacturer or its representative shall also inspect the work in place and issue a letter to Architect verifying that this procedure was followed without exception.

1.6 INSTALLER QUALIFICATIONS

A. Where the Specifications dictate a certain level of experience or expertise from the subcontractor/installer by requiring a minimum number of years of experience in the successful installation of a product or a minimum number of successful installations for the product specified, it shall be the Contractor responsibility to verify the installer's competence and track record before signing a subcontract to perform the affected work.

1.7 MANUFACTURER FIELD SERVICES

A. An experienced, competent, and authorized representative of the manufacturer of each item of equipment for which field services are required in the Specifications shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation.

B. In each case, the representative shall revisit the job-site as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory, in the opinion of the Architect.

C. Each manufacturer representative shall furnish to the Architect a written report certifying that the equipment has been properly installed, and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

D. All costs for these services shall be included in the Contract.

END OF SECTION

SECTION 01 4523
TESTS AND INSPECTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for quality control of the Work, including test and inspection procedures.

B. Related work includes specific test procedures to be performed in compliance with this Section and specified in Divisions 2 through 48 of these Specifications.

C. Definitions and qualifications:

1. Testing laboratory or agency: Licensed testing laboratory or agency certified as meeting the requirements of ASTM D 3666, E 329, E 543 and E 548 as applicable to the tests and inspections performed, approved by the District, and referred to hereafter as the Testing Laboratory.

2. Geotechnical Engineer: Registered professional geotechnical engineer.

3. Registered Deputy Inspector (RDI): Deputy or Special Inspector (hereinafter referred to as the Inspector) registered with the Building Department.

4. Disqualified material: Any material shipped or delivered to the site by the Contractor from the source of supply prior to having satisfactorily passed the required test and inspection, or prior to the receipt of a notice from the Architect that such test and inspection will not be required, shall not be incorporated in the Work.

1.2 CONTRACTOR'S QUALITY CONTROL SYSTEM

A. Establish a quality control system to perform sufficient inspections and tests of all items of Work, including that of all subcontractors, to ensure conformance with the Contract Documents for materials, workmanship, construction, finish, functional performance and identification.

B. Quality control system shall ensure that the Work complies with the requirements of the Contract Documents. Controls shall be adequate to cover all construction operations.

1.3 GENERAL QUALITY CONTROL REQUIREMENTS

A. Materials to be furnished under the Contract are subject to test and inspection for compliance with Contract Documents.

B. Testing required by the Contract Documents shall be performed under the supervision and control of California-licensed professional engineer(s).

C. Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned, adjusted, and conditioned in compliance with their manufacturer latest published instructions, unless more restrictive or stringent requirements are specified in the Specifications.

1. When specified or requested, furnish the Architect 2 copies of such printed instructions prior to introduction of such items.

2. If product manufacturer's instructions are in conflict with the Contract Documents, notify the Architect for clarification before proceeding.

3. Keep a copy of the various product manufacturers instructions applicable to the Work at the Project site.

D. Certificates:

1. When specified, deliver to the Architect 2 signed certificates from suppliers of materials, equipment and manufactured items stating that such materials and manufactured items meet or exceed the standards specified.

2. In lieu of such certification, the Contractor may submit reports of current tests made and attested by a reputable and recognized testing laboratory.

E. None of the firms or individuals performing tests and inspections are authorized to accept or reject any work, to modify any Contract Document requirement, to advise or instruct Contractor or his/her employees as to prosecution of the Work, or to perform any duty or service for the Contractor. Inspections shall not relieve the Contractor of the obligation to fulfill all requirements of the Contract Documents.

1.4 COORDINATION OF TESTS AND INSPECTIONS

A. Schedule, initiate and coordinate tests and inspections required by the Contract Documents and public authorities having jurisdiction over the Work.

B. Notify the firm(s) or individuals, who will perform the tests and inspections, a sufficient time in advance of the manufacture of materials to be supplied, which by requirements of the Contract Documents, must be tested at the source of supply so that the Laboratory may arrange for testing. Proceed in the same manner for tests to be performed at the site.

1.5 TEST SAMPLES AND PROCEDURES

A. Test samples:

1. Furnish and deliver samples of materials to be tested at no additional cost to District.

2. Test samples will be selected by the firm(s) or individual performing the tests and inspections.

B. Test procedures:

1. Tests shall be performed according to method(s) of test specified in these Specifications.

2. If no procedure or test method is specified, testing shall conform to material specification referenced unless otherwise directed by Architect.

3. The firm(s) or individual performing the test shall tag, seal, label, record or otherwise suitably identify the materials for testing. No such materials shall be used in the Work until the test reports are submitted and approved, excepting only the materials specified to be placed or installed prior to testing.

C. Re-testing: Applicable tests shall be repeated at specified intervals whenever the source of supply is changed, or whenever the characteristics of the materials change or vary during the course of construction.

1.6 TEST COSTS

A. In general, Contractor shall arrange and pay for materials qualification and conformance tests, concrete and masonry mix designs, and other tests specified to be paid for by the Contractor in the Contract Documents.

B. In general District will pay for tests and inspections to be performed at the jobsite, unless otherwise specified.

C. Even though not required by public agencies or the Contract Documents, the District may request that materials be tested; if materials are found to be in compliance with the Contract Documents, then the District will pay for the tests; if the materials are not, then the cost of tests shall be paid by the Contractor or deducted from payments due to him.

D. The Contractor shall reimburse the District all or any part, as the District may deem just and proper, of the test and inspection costs incurred by the District due to the following:

1. Retesting costs caused by failure of materials to pass initial tests.

2. Contractor failure to complete the Work within the Contract time, and any previously authorized extensions thereof.

3. Claims between separate contractors.

4. Covering of work before the required inspections or tests are performed.

5. Additional inspections required for Contractor's correction of defective work.

6. Overtime costs for acceleration of work done for Contractor's convenience.

1.7 TEST REPORTS

A. Firm(s) or individual performing the tests or inspections shall furnish signed and certified copies of each test result, as follows.

	Copies
District	1
Architect	1
Structural Engineer	1*
Mechanical and Electrical Engineers	1*
Civil Engineer	1*
Contractor	2
Building Department	1

* Provide when involved.

B. Reports shall include the following:

1. Date issued and date of test.

2. Project title and number.

3. Name and address of firm responsible for performing test and inspection.

4. Name and signature of individual performing test and inspection.

5. Date of inspection and sampling.

6. Record of temperature and weather.

7. Identification of product and Specification Section where test is specified.

8. Location on Project.

9. Type of inspection and test.

10. Observation regarding compliance with Contract Documents.

1.8 CONTRACTOR'S RECORDS

A. Maintain accurate, current records on an appropriate form for all inspections and tests performed, instructions received from the Architect, firm or individual performing test, and actions taken as a result of those instructions.

B. These records shall include evidence that the required inspections or tests have been performed (including type and number of inspections or tests, nature of defects, causes for rejection, etc.), proposed or directed remedial action, and corrective action taken.

C. Document inspections and tests as required by each Section of the Specifications.

1.9 APPROVAL REQUIRED BY OTHERS

A. If laws, ordinances, rules, regulations or orders of public agency having jurisdiction require work to be inspected, tested or approved by some authority other than the District, Architect or Contractor, the Contractor shall give required notices and make arrangements, deliver to the Architect the certificates of inspection, test, or approval of such public agency, and pay costs therefore unless otherwise provided in the Contract Documents.

1.10 CONTRACTOR'S ASSISTANCE

A. Cooperate with individual or firm performing required inspections, tests and similar services and provide reasonable auxiliary services as requested.

B. Notify the individual or firm sufficiently in advance of operations to permit assignment of personnel.

C. Auxiliary services required include but are not limited to:

1. Providing access to the work to be tested or inspected and furnishing incidental labor and facilities necessary to facilitate inspections and tests.

2. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

3. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.

4. Providing the individual or firm with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

5. Providing security and protection of samples and test equipment at the Project site.

1.11 VERIFICATION OF CONDITIONS

A. Prior to installation of any product, inspect existing supports and assemblies to receive materials to be installed and arrange for correction of defects in the existing workmanship, material or conditions that may adversely affect work to be installed.

B. Installation of materials will constitute acceptance of existing conditions as being in proper condition to receive the materials to be applied and waiver of claim that existing conditions are defective as pertains to warranty requirements.

C. Where the Specifications require a product to be installed under the supervision or inspection of the material manufacturer or its representative, manufacturer or its representative shall also inspect the work in place and issue a letter to Architect verifying that this procedure was followed without exception.

1.12 INSTALLER'S QUALIFICATIONS

A. Where the Specifications dictate a certain level of experience or expertise from the subcontractor/installer by requiring a minimum number of years of experience in the successful installation of a product or a minimum number of successful installations for the product specified, it shall be the Contractor's responsibility to verify the installer's competence and track record before signing a subcontract to perform the affected work.

1.13 MANUFACTURER'S FIELD SERVICES

A. An experienced, competent, and authorized representative of the manufacturer of each item of equipment for which field services are required in the Specifications shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation.

B. In each case, the representative shall revisit the job-site as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory, in the opinion of the Architect.

C. Each manufacturer representative shall furnish to the Architect a written report certifying that the equipment has been properly installed, and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

D. All costs for these services are included in the Contract.

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes furnishing, installing and maintaining temporary facilities and controls required for the performance of the Work.

B. Supervise the use of temporary facilities and controls. Enforce compliance with applicable standards. Prevent abuses of services.

C. Temporary facilities include, but are not limited to:

1. Temporary utilities:

a. Temporary electric lighting and power.

b. Temporary water.

c. Temporary heat and ventilation.

d. Temporary telecopier and telephone service.

e. Temporary sanitary facilities.

f. Temporary first aid, fire protection and other temporary facilities in compliance with legal requirements.

2. Construction aids.

3. Barriers.

4. Special controls.

5. Traffic regulations and controls.

6. Field offices and storage sheds.

7. Construction fence.

8. Temporary dust control.

9. Removal of graffiti during construction.

10. Temporary sidewalks, canopies, bridge, curbs, gutters and pavement markings.

11. Hoist use.

D. Unless otherwise noted elsewhere in the Contract Documents, costs of installation, operation, maintenance and removal of temporary facilities and controls shall be borne by the Contractor.

1. Should District occupy part of the Project during the construction period, utility costs will be shared proportionately at an agreed upon unit cost.

1.2 DESIGN REQUIREMENTS

A. Provide design and engineering for construction facilities and temporary controls (including but not limited to shoring, bracing and guying) in accordance with applicable codes, standards and industry practices.

1.3 SUBMITTALS

A. Submit the following at least 2 days before preconstruction conference, and before beginning construction of any temporary facilities.

B. Information and drawings required to fully describe the facilities, and their proposed locations on the site for review. Show the proposed activity in each portion of the Work area and identify the areas of limited use or non-use.

C. Proposed vehicle access route(s) to and from the site and expected frequency of use on adjacent streets.

D. Shop drawings of site fence showing gates.

PART 2 - PRODUCTS

AS SELECTED BY THE CONTRACTOR.

PART 3 - EXECUTION

3.1 LIGHT AND POWER

A. Furnish, install and maintain metered temporary electric power required throughout the construction period, so that power can be secured at any desired point within the building.

B. Maintain in a safe manner and utilize so as not to constitute a hazard to persons or property.

C. Comply with legal requirements.

3.2 WATER

A. Furnish, install and maintain temporary water services for drinking and construction purposes for all parts of the work.

3.3 ENCLOSURES/HEATING/VENTILATING

A. When openings in the building enclosure (roofs and walls) are unprotected, protect the building interior, finishes, and equipment, where applicable, from the elements and sudden temperature changes by covering openings with weathertight tarpaulins firmly secured in place and maintained until permanent measures are taken.

B. Furnish, install and maintain weathertight enclosures, and temporary heat and ventilation required to maintain adequate environmental conditions to:

1. Facilitate progress of the Work.

2. Meet specified minimum environmental conditions for the installation of materials.

3. Protect materials and finishes from damage due to environmental conditions.

4. And as necessary to ensure suitable working conditions for the construction operations of all trades.

C. Maintain building temperature and humidity as specified in various Sections of the Specifications, or when not specified, as recommended by the manufacturer of the material being installed.

D. Furnish, install and maintain adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.

E. Temporary heaters, when used, shall be UL listed units of type approved by governing authorities, in good working conditions, and properly vented to the exterior.

3.4 TELEPHONE AND DATA SERVICE

A. Provide and maintain telephone service to field office for duration of construction, including speaker phone capability on all telephone instruments.

B. Provide and maintain one dedicated line for facsimile service, and an automatic facsimile machine in field office.

C. Provide and maintain a dedicated high speed (DSL or cable) line for email service compatible with both District’s and Architect’s systems, and computer terminal and modem, in field office. Email service shall be in operation 24 hours a day, 7 days a week.

D. Provide telephone voice mail capabilities through local telephone company or with separate equipment.

3.5 TEMPORARY SANITARY FACILITIES

A. Furnish, install and maintain for workers on the Project as required by, and in compliance with, legal requirements.

3.6 FIRST AID/FIRE PROTECTION/OTHER TEMPORARY FACILITIES

A. Furnish, install and maintain as required by, and in compliance with, legal requirements.

3.7 PERMANENT SYSTEMS USED AS TEMPORARY FACILITIES

A. When any portion of the permanent systems is in operating condition, that part of the system may be used as a temporary facility, except as otherwise specified, provided that the Contractor:

1. Obtains the District's approval.

2. Assumes full responsibility for the system used.

3. Pays costs for operation, maintenance, cleaning and restoration of the system.

4. Operates the system under the supervision of the subcontractor responsible for the system's installation and ultimate performance.

5. Warranties required by the Contract Documents will not be shortened or otherwise affected by use of the system(s) as a temporary facility.

3.8 MISCELLANEOUS TEMPORARY CONSTRUCTION AIDS

A. Furnish, install and maintain miscellaneous temporary construction aids required for proper execution of the Work, such as stairs, ladders, ramps, railings, canopies, scaffolds and hoists, chutes, barricades, enclosures, platforms, swing staging and walks.

B. Locate in and about the Project as is practicable and where they will not interfere with the progress of the Work. Relocate when necessary during construction, and remove promptly when no longer needed.

C. Provide openings where required for moving in large pieces of equipment. Close openings after the equipment is in place. Restore finishes to match adjacent surfaces, as approved by the Architect.

3.9 BARRIERS

A. Security:

1. The District may provide such watchman service as he deems necessary to protect his interest during he progress of the work. Any protection provided by the District will not relieve the Contractor of the responsibility for the safety of the Work and the acceptance thereof.

2. The Contractor shall employ such watchman service as he may deem necessary to properly protect and safeguard the work. The District shall not in any way be liable or responsible for the damage or loss to the work due to trespass or theft.

3. Furnish, install and maintain protection for materials, tools and equipment employed on the Project including workers tools. The District shall not be held to have incurred any liability for loss of, and damage to, materials, tools and equipment of the Contractor, or of those employed by him, by contract or otherwise.

B. Protection: Continuously maintain protection as necessary to protect the Work as a whole and in part, and adjacent property and improvements from accidents, injuries or damage.

1. Properly protect the Work:

a. With lights, guard rails, temporary covers, and barricades.

b. Enclose excavations with proper barricades.

c. Brace and secure all parts of the Work against storm and accident.

d. Furnish, install and maintain such additional forms of protection which may be necessary under existing circumstances.

2. Furnish, install and maintain in good condition protective measures as may be required to adequately protect the public from hazards resulting from the work and to exclude unauthorized persons from the work. When regulated by authorities having jurisdiction, such legal requirements for protection shall be considered as minimum requirements; be responsible for the protection in excess of such requirements as required.

C. Construction fence: Furnish, install and maintain a temporary construction fence with gates as indicated on the Drawings. Construct in compliance with requirements of authorities having jurisdiction.

1. Provide a chain link fence of 11-gage (minimum) by 2-inch mesh chain link fabric attached to substantial steel pipes spaced at 8 feet o.c. maximum.

2. Provide top and bottom tension wires, unless a top rail is provided, and corner post bracing. Provide chain link gates with welded steel pipe frames and hardware required for proper operation.

3. Unless otherwise authorized by the Architect or the District, do not set posts in or on existing concrete paving, including asphalt concrete, or walls to remain.

4. Obtain and pay for required permits and inspections.

3.10 DUST CONTROL

A. The project area shall be isolated from adjacent occupied spaces during construction using barriers, air distribution, material handling and air monitoring. Close off supply and return air openings in dust areas.

B. Barriers shall be tightly sealed with tape from wall to wall, floor to structure above or acoustical ceiling where suspended ceiling will not be disturbed.

C. Barrier types:

1. Mini-enclosures where little noise or no hot work is anticipated: Fire-retardant polyethylene (Rexam or StarTex or equal) or PVC tarpaulins with a UL rated flame spread of 15 or less. Seal edges continuously with tape recommended by tarpaulin manufacturer.

2. Typical barriers:

a. Non-rated walls:

1) Below suspended ceilings: 1/4 in. thick, plastic coated, VOC compliant, fire-treated melamine panels with joints sealed with smooth surfaced vinyl tape. Barrier shall be dust and smoke tight, and be non-combustible.

2) Above suspended ceilings: Fire-retardant polyethylene or PVC as specified above.

3) No ceilings: Fire-retardant polyethylene or PVC tarpaulins as specified above. Seal edges continuously with tape. Extend barrier from concrete floor to structure above.

3. Openings:

a. Passage for Contractor or District access only: Use overlapping, translucent, nylon reinforced, laminated polyethylene or PVC fire-retardant tarpaulin doorways (2) with a pressurized intervening chamber to prevent dust from escaping.

b. Mini-enclosures defined above: Zippered openings.

c. Fire-rated walls: Provide fire rated door, hardware and seals.

D. Material handling:

1. All dirty materials including materials, debris and tools must be contained, bagged or wrapped when transported through occupied areas.

2. Debris removal must occur via approval route. After each period of debris removal, route shall be cleaned and damp mopped from entrance to work area to disposal areas as necessary. Conveyance used for debris removal must be clean on the exterior and have a tight fitting lid.

E. Additional requirements:

1. Work area entrances shall have a tacky floor mat present at all times.

2. Adjacent floor areas directly outside of work area shall be kept clean by vacuuming with HEPA filters, damp mopping, or electrostatic cloth swept clean at appropriate intervals.

F. Maintenance:

1. Barriers and openings shall be maintained on a daily basis to ensure proper appearance and effectiveness.

2. Mats shall be kept clean.

3.11 POLLUTION CONTROL

A. Comply with pollution control regulations in effect at site for materials, equipment and work procedures used on the Project.

3.12 TRAFFIC REGULATION

A. Traffic maintenance:

1. Determine the routing of construction vehicles before starting work, based on restrictions indicated on the Drawings and the safeguards and procedures necessary to carry out the work.

2. Maintain all-weather temporary access to the site and to the designated truck unloading area or areas, available to all the trades.

3. In addition:

a. Be responsible for controlling construction traffic within and adjacent to the site.

b. Provide entrances, lifts and safeguards required or necessary to the progress of the work, and effectively control such traffic to provide minimum hazard to the work and all persons.

c. Route construction equipment, trucks, and similar vehicles via existing public streets to and from the site as approved by the governing authorities.

d. Obtain and pay for permits and inspections necessitated by the use of public streets, sidewalks, curbs, and paving. Post guarantees and bonds that may be required, and repair and make good any damages thereto, acceptable to the authorities having jurisdiction.

e. Construct and maintain temporary walks and bridges for pedestrians. Keep streets adjacent to the site open to vehicular and pedestrian traffic.

f. Maintain constant access for Law enforcement agencies, fire and ambulance service.

g. Furnish, install and maintain for proper control of traffic and safety of all concerned:

1) All necessary barricades, suitable and sufficient lights, reflectors, and danger signals.

2) Warning and closure signs, directional and detour signs.

3) And whatever additional measures necessary.

h. Indicate on a 24 hour basis restricted and dangerous conditions existing on or adjacent to the site.

1) Illuminate barricades, danger signals, warning signs and obstructions at night.

2) Keep warning lights burning from one hour before sunset until one hour after sunrise.

B. Parking: Parking for workers employed on the work is available at the site where acceptable to the District, but must not interfere with District's activities or activities related to performance of the Work.

1. Maintain and control parking area.

3.13 GRAFFITI REMOVAL

A. Throughout construction, including suspension of work, and until acceptance of the Project by the District, keep the work site free from graffiti.

B. If graffiti appears, cover, repaint, refinish, or otherwise remove no later than the following day after occurrence.

C. If Contractor fails to do so, District may take steps to remove the graffiti and deduct the cost therefore from the Contract price.

3.14 FIELD OFFICES AND STORAGE SHEDS

A. Furnish, install and maintain a field office for the Contractor's use. Equip the office with lights, heat, air conditioning, desks, chairs, plan racks, telephones and other items necessary for the performance of the work.

B. Furnish, install and maintain storage sheds needed for construction.

C. Requirements of regulatory agencies: Comply with requirements of regulatory agencies having jurisdiction.

1. Obtain and pay for permits required by governing authorities.

D. Locate temporary structures to avoid interference with work in progress and relocate as required by job progress.

3.15 BUILDING VENTILATION PERIOD

A. Designate a period of 7 consecutive days prior to Substantial Completion as the “Building Ventilation Period”, and indicate such on the construction schedule.

B. Begin the Building Ventilation Period only after completion of all work for the following trades:

1. Carpet.

2. Architectural woodwork, including Plastic laminate casework.

3. Acoustical treatment.

4. Painting.

C. During the Building Ventilation Period operate the HVAC system at 100 percent outside air, or in the event of extreme outside weather conditions, the maximum practical outside air level which will not result in damage to the Work.

D. At the end of the Building Ventilation Period and before Substantial Completion, clean the ventilation system as follows:

1. Clean blowers and coils if units were operated without temporary filters at any time during construction.

2. Replace filters as specified.

3.16 REMOVAL

A. Remove temporary facilities and controls upon completion of construction operations or when they are no longer needed, whichever occurs first but no later than 15 days after Substantial Completion.

B. Before Project closeout procedures start, or earlier when they are no longer needed, remove temporary site fencing, signs, foundations, debris; grade to required elevations, clean area of debris and restore to original condition.

END OF SECTION

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SECTION 01 6600
PRODUCT HANDLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section establishes general requirements for product handling and storage, whether on or off the site, and supplements similar provisions found elsewhere in the Contract Documents.

B. Related work:

1. Section 01 5000 for storage of materials on site.

1.2 QUALITY ASSURANCE

A. In the Contractor’s quality control program include procedures required to insure protection of work and materials.

1.3 HANDLING

A. General:

1. Transport, deliver, handle, and store all materials and equipment used on the Project to prevent the intrusions of foreign matter, moisture, and to prevent damage. In all cases comply with the following.

2. Material and equipment manufacturer's instructions regarding temperature limitations.

3. Other environmental conditions required to maintain the original quality of the materials and equipment.

B. Packaging:

1. Provide packaged materials in their manufacturer's original containers with seals unbroken and labels intact until incorporating into the Work.

a. Where this information is not provided by the manufacturer on the container, it shall be provided by the supplier, fabricator or subcontractor of these materials.

2. Wrapped or bundled materials shall clearly bear the manufacturer's name and trade mark.

C. Damaged materials: Remove damaged or otherwise unsuitable material and equipment promptly from the site. Do not install damaged materials.

1.4 STORAGE

A. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.

B. Store products at the site to facilitate inspection and measurement of quantity or counting of units.

C. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.

1. Do not subject slabs-on-grade to excessive loading by shoring, storage of materials, or operation of construction equipment unless adequately protected by heavy planking. Maintenance of slabs in good condition is the responsibility of the Contractor who shall remove damaged areas of such slabs and replace them with new work, to the Architect's satisfaction, at no cost to the District.

2. Do not subject suspended slabs to construction loads exceeding their design loads, unless adequately shored with shoring designed for the Contractor by a California-licensed civil or structural engineer, who shall certify prior to imposing construction loads on slabs, that the shoring to be installed conforms with the shoring as designed.

D. Store products subject to damage by the elements above ground, under cover in weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

E. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

F. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

G. Locate storage piles, stacks or bins to avoid being disturbed, and protect from damage of any sort.

H. Store materials and equipment in accord with their manufacturer's instructions, above grade, and properly protected from weather and construction activities.

I. Payment may be withheld for improperly packaged and stored materials.

1.5 PROTECTION

A. Protect finished surfaces, including floors jambs and soffits of all openings used as passageways or through which materials and equipment must travel.

B. Carts, hand trucks, wheelbarrows and similar wheeled conveyances used on or in any portion of the structure shall be equipped with pneumatic tires, unless otherwise authorized by the Architect.

C. Keep finished surfaces clean and unmarred until the date of acceptance.

D. Refer to individual Specification Sections for additional specific product handling and protection requirements.

1.6 MAINTENANCE

A. Maintain periodic system of inspection of stored products on a scheduled basis to assure that:

1. State of storage facilities is adequate to provide conditions recommended by the product manufacturer.

2. Required environmental conditions are maintained on a continuing basis.

3. Surfaces of products exposed to the elements are not adversely affected.

B. Mechanical and electrical equipment which require servicing and/or connection of temporary power for heating and other climatic protection devices, during long term storage, shall have complete manufacturer's instructions accompanying each item, with notice of enclosed instructions shown on the exterior of the packaging.

END OF SECTION

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SECTION 01 7329
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of new work and subsequent fitting and patching required to restore surfaces to their original condition.

2. Cutting and patching is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.

3. Cutting and patching performed during erection or installation process is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching."

B. Refer to other Sections of these Specifications for specific cutting and patching requirements and limitations applicable to individual units of work.

1. Unless otherwise specified, the requirements of this Section apply to mechanical and electrical work. Refer to Divisions 22, 23 and 26 Sections for additional requirements and limitations on cutting and patching of mechanical and electrical work.

1.2 SUBMITTALS

A. Procedure: In accordance with Division One.

B. Where prior approval of cutting and patching is required, submit proposed procedures for this work well in advance of the time work will be performed and request approval to proceed. Include the following information, as applicable, in the submittal:

1. Describe nature of the work and how it is to be performed, indicating why cutting and patching cannot be avoided. Describe anticipated results of the work in terms of changes to existing work, including structural, operational and visual changes as well as other significant elements.

2. List products to be used and firms including their qualifications that will perform work.

3. Give dates when work is expected to be performed.

4. List utilities that will be disturbed or otherwise be affected by cutting and patching, including those that will be relocated and those that will be out-of-service temporarily. Indicate how long utility service will be disrupted.

5. When cutting and patching of structural work involves the addition of reinforcement, submit details and engineering calculations to show how that reinforcement is integrated with original structure to satisfy requirements.

1.3 QUALITY ASSURANCE

A. Do not cut and patch structural work where it would result in a decrease of load-carrying capacity or of load-deflection ratio. Prior to such work, obtain the Architect's approval.

B. Before cutting and patching the following categories of work, obtain the Architect's approval to proceed:

1. Structural steel.

2. Miscellaneous structural metals, including lintels, equipment supports, stair systems and similar categories of work.

3. Structural concrete.

4. Structural decking.

5. Exterior curtain wall construction.

6. Piping, ductwork, vessels and equipment.

7. Primary operational systems and equipment.

8. Water/moisture/vapor/air/smoke barriers, membranes and flashings.

9. Noise and vibration control elements and systems.

10. Control, communication, conveying, and electrical wiring systems.

C. Visual requirements:

1. Do not cut and patch work where it would, in the Architect's opinion, result in unacceptable changes to the building's aesthetic qualities.

2. Do not cut and patch work where it would result in substantial visual evidence of cut and patch work.

3. Remove and replace cut and patch work judged by the Architect to be unacceptable visually.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Except as otherwise indicated, or as directed by the Architect, use materials for finishing or filling-in cut and patched areas that are identical to existing materials.

B. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces, as approved by the Architect.

C. Use materials for cutting and patching that will result in equal-or-better performance characteristics.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting, examine the surfaces to be cut and patched and the conditions under which the work is to be performed.

B. If unsafe or otherwise unsatisfactory conditions are encountered, take immediate corrective action before proceeding with the work.

3.2 PREPARATION

A. To prevent failure, provide temporary support of work to be cut.

B. Protection: Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions of that part of the Project that may be exposed during cutting and patching operations.

1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

C. Take precautions not to cut existing pipe, conduit or duct serving the building but scheduled to be relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching work.

B. Cutting: Cut the work using methods that are least likely to damage work to remain. Where possible, review proposed procedures with the original installer and comply with original installer's recommendations.

1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as carborundum saw or core drill.

2. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.

C. Patching: Patch with seams which are durable and as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of patchwork.

2. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work to eliminate evidence of patching and refinishing.

3.4 CLEANING

A. Clean areas and spaces where work is performed or used as access to work.

B. Remove completely paint, mortar, oils, putty and items of similar nature. Clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

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SECTION 01 7400
CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for cleaning Project site and building.

B. Keep premises, and adjacent private and public properties free from accumulations of waste, debris and rubbish caused by construction operations.

C. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces. Remove remaining mockups and mockups.

1. Leave Project clean and ready for occupancy.

1.2 SAFETY REQUIREMENTS

A. Standards: Maintain Project in accord with State and local safety and insurance standards.

B. Hazard control:

1. Store volatile wastes in covered metal containers, and remove from premises daily.

2. Prevent accumulation of wastes, which create hazardous conditions.

3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on Project site.

2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains. Store in containers with tight-fitting lids and remove to legal dumpsite or to recycling center.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. As appropriate for this work, and as follows.

B. Use only commercial grade sweeping compounds with broom cleaning.

C. Use only materials recommended by manufacturers for surfaces to be cleaned.

D. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.1 DURING CONSTRUCTION

A. Keep premises, and adjacent private and public properties free from accumulations of waste materials and rubbish.

1. Remove debris and dirt from public property promptly; sweep sidewalks and adjacent streets daily when soiled by work performed under this Contract.

2. Remove waste materials, debris and rubbish from the Project site at least weekly.

3. Legally dispose of waste and rubbish at legal public or private dumping areas or recycling center off District's property.

B. Wet down materials and rubbish to lay dust and prevent it from blowing.

C. At least once a week, or more often if required, clean site and buildings, and dispose of waste materials, debris and rubbish off the site. Remove combustible materials such as paper and cardboard daily.

D. Provide on-site containers for collection of waste materials, debris and rubbish. Provide collection can at each location used as eating areas. Pick-up all garbage daily.

E. Do not allow debris and combustible materials to accumulate in, voids, cavities, interstitial spaces, and plenums created by wall, partition, and ceiling construction. These areas must be thoroughly cleaned out before being sealed or closed off by installation of finish materials.

F. Do not allow debris to clog drains. Clean roof drains, scuppers, floor drains and area drains free of debris. Verify that they drain properly. Keep drains clean of debris at all times..

G. Vacuum clean interior areas when ready to be painted. Refer to Section 09 9100 for other provisions on preparation of surfaces to be painted.

H. Handle materials in a controlled manner with as few handling as possible; do not drop or throw materials from heights.

I. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

J. Contractor shall clean every work area that construction work has occurred at the end of each work period. All debris and rubbish shall be removed and dust WIPED OFF all surfaces. The work area shall be dust free and ready for occupancy at the end of EACH work period.

K. Restore damaged, including stained materials, and finishes that cannot be satisfactorily repaired, or that show evidence of repair unacceptable to the Architect, with new, undamaged materials.

1. Repair and restoration of damaged finishes shall be done by the original installers or experienced craftsmen thoroughly familiar with the work at hand.

3.2 FINAL CLEANING

A. Except as may be otherwise specified elsewhere, "clean" for the purpose of this Article means a level of cleanliness provided by experienced workers or professional cleaners using commercial quality building maintenance equipment and materials.

B. In preparation for Substantial Completion or Occupancy conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

C. Remove non-permanent labels.

D. Clean transparent materials and mirrors, including glass in doors and windows. Remove misplaced glazing compound and other substances.

E. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances.

1. Restore reflective surfaces to their original reflective condition.

2. Leave concrete floors broom clean.

3. After cleaning resilient flooring, wax as specified in the appropriate Section(s) of Division 9.

4. Where rust is present, remove it without damaging substrate, and refinish area.

F. Vacuum carpeted surfaces. Shampoo where necessary.

G. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

1. Clean tops of equipment, both below and above ceiling spaces.

2. Clean ductwork, piping and conduit.

H. Clean the site, including landscaped areas, of rubbish, litter and other foreign substances.

1. Contaminated earth:

a. Final clean-up operation includes the removal and disposal of earth contaminated or unsuitable for support of plant life in planting areas, and filling of resulting excavations with suitable soil.

b. Contaminated areas include those used for disposal of waste concrete, mortar, plaster, masonry, and similar materials, areas in which washing out of concrete and plaster mixers or washing of tools and like cleaning operations have been performed, and areas that have been oiled, paved or chemically treated.

c. Do not dispose of waste oil, solvents, paints, solutions, or like penetrating material by depositing or burying on District's property.

2. Sweep paved areas broom clean; remove stains, spills and other foreign deposits.

3. Wash down paved surfaces.

4. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

I. Keep Project clean until occupied by District.

END OF SECTION

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SECTION 01 7516
STARTING OF SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Starting systems.

2. Demonstration and instructions.

3. Testing, adjusting, and balancing.

B. Related work:

1. Section 01 7823 for system operation and maintenance data and extra materials.

1.2 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect 7 days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage.

D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of responsible manufacturer's representative and Contractors' personnel in compliance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

1.3 DEMONSTRATION/INSTRUCTIONS

A. Demonstrate operation and maintenance of products to District's personnel 14 days prior to date of Substantial Completion.

B. Demonstrate Project equipment and instructed by a qualified manufacturers' representative knowledgeable about the Project.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within 6 months.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Districts' personnel in detail to explain all aspects of operation and maintenance.

E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled at designated location.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

G. The amount of time required for instruction on each item of equipment and system is that specified in individual Sections.

END OF SECTION

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SECTION 01 7700
PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. When Contractor determines that the Project is substantially complete, Contractor shall:

a. Submit written certification to Architect that Project, or designated portion of Project, is substantially complete.

b. Submit list of major items to be completed or corrected (punch list).

c. Submit written certification that:

1) Contract Documents have been reviewed.

2) Project has been inspected for compliance with Contract Documents.

3) Work has been completed in accord with Contract Documents.

4) Equipment and systems have been tested in Owner's presence and are operational.

5) Project is completed, and ready for final review.

2. Determination that Project is, or is not substantially complete rests with the Owner and Architect.

B. The Owner and Architect will make a review of the Project, and if they determine that the Project is substantially complete they will advise the Contractor to prepare and submit to Architect a list of items to be completed or corrected, as determined by the review.

C. The Owner will then file and record a Notice of Completion to reduce the lien period to the time prescribed by law. The Notice of Completion shall be complete with signatures of the Owner and Contractor, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect.

D. Owner occupancy of Project or designated portion of Project:

1. Contractor shall:

a. Obtain Certificate of Occupancy.

b. Perform final cleaning in compliance with Section 01 7400.

2. Owner will occupy project under provisions stated in Certificate of Substantial Completion.

3. Contractor shall complete work listed for completion or correction, within designated time.

1.2 CLOSEOUT SUBMITTALS

A. Submit the following:

1. Project record documents.

2. Operation and maintenance data.

3. Warranties and bonds.

4. Keys and keying schedules.

5. Tools, spare parts and maintenance materials.

B. Deliver evidence of compliance with requirements of governing authorities:

1. Certificates of inspection for mechanical and electrical work.

2. Certificate of Occupancy.

C. Deliver certificate of insurance for products and completed operations.

1.3 INSTRUCTIONS

A. Instruct Owner's designated personnel in operation of all systems, mechanical, electrical and other equipment.

1.4 EVIDENCE OF PAYMENTS, AND RELEASE OF LIENS

A. Submit Contractor's affidavit of payment of debts and claims and release of liens.

B. All submittals shall be duly executed before delivery to Architect.

1.5 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit final statement of accounting to Owner. Statement shall reflect the following.

1. Original Contract Sum.

2. Additions and deductions resulting from changes to the authorized Contract sum.

3. Total Contract sum, as adjusted.

4. Previous payments.

5. Sum remaining due.

B. Final Change Order shall reflect approved adjustments to Contract sum not previously made by Change Orders.

1.6 FINAL APPLICATION FOR PAYMENT

A. Submit final application in compliance with Contract requirements.

END OF SECTION

• FILENAME \p Z:\SPECS\public\(1) CSI WORKFILES\AVC SWING SPACE APPLIED ARTS\(6) 02 22 18 - BID\01 7700 mc Project Closeout.doc•

SECTION 01 7823
OPERATING AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Compilation of product data and related information appropriate for District's maintenance and operation of products furnished under the Contract.

2. Instruction of District's personnel in the maintenance of products and in the operation of equipment and systems.

B. Related work:

1. Section 01 3323 for submittals of shop drawings, product data and sample.

2. Section 01 7700 for contract closeout submittals.

3. Section 01 7836 for submittals of warranties and bond.

1.2 SUBMITTALS

A. Preliminary:

1. Submit 2 copies of proposed manual or manuals to the Architect for review and approval at least 15 days prior to request for final inspection or acceptance.

2. Show general arrangement, nature of contents in each portion, and proposed method of binding and covering for the manual.

B. Final:

1. Following instruction of operating and maintenance personnel, make necessary revisions of the manual.

2. Submit specified number of copies of approved data in final form at final inspection or acceptance.

1.3 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel trained and experienced in maintenance and operation of the described products.

1.4 FORMAT

A. Prepare data in the form of an instruction manual for use by District's personnel.

B. Text: 20 lb. white bond paper, 8-1/2 -inch x 11 -inch

C. Drawings: Provide reinforced punched binder tab. Bind drawings with text.

1. Fan-fold larger drawings to size of text pages.

D. Flyleaf: For each separate product or each piece of operating equipment provide the following.

1. Brief description of product, and major component parts of equipment.

2. Indexed tabs.

E. Cover: Identify each volume with typed or printed tile **OPERATING AND MAINTENANCE INSTRUCTIONS**. List the following.

1. Title of Project.

2. Identity of separate structures as applicable.

3. A brief and general identification of the subject matter covered in the manual.

F. Binders:

1. Commercial quality D-ring type 3-ring binders with durable vinyl covers.

2. When multiple binders are used, correlate the data into related groupings.

G. Labels: Provide front and end spine labels for each manual clearly identified with the following information.

OPERATING AND MAINTENANCE INSTRUCTION
Name and address of Work
Name of Contractor
General subject of the manual
Space for approval date

1.5 CONTENT OF MANUAL

A. Table of contents:

1. List of each product required to be included, indexed to the content of the volume.

2. List, with each product, the name, address and telephone number of (a) subcontractor and installer, (b) maintenance contractor, as appropriate, and (c) local source of supply for parts and replacement.

B. Product data:

1. Include only those sheets pertinent to the specific product.

2. Annotate each sheet to clearly identify the data applicable to the installation. Delete references to inapplicable information.

C. Drawings: Supplement product date with drawings as necessary to illustrate the following.

1. Relations of component parts of equipment and systems.

2. Project record drawings shall not be used as maintenance drawings.

D. Instructions: Written text as required to supplement product data for the particular installation.

E. Copy of each warranty, guaranty, bond, and service contract issued. Provide information sheet for District's personnel, giving the following information:

1. Proper procedures in the event of failure or emergency.

2. Instances which might affect the validity of warranties, guaranties, or bonds.

1.6 MANUAL FOR MATERIALS AND FINISHES

A. Instructions for care and maintenance including:

1. Manufacturer's recommendation for types of cleaning agents and methods.

2. Cautions against cleaning agents and methods, which may be detrimental to the product.

3. Recommended schedule for cleaning and maintenance.

1.7 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Content, for each unit of mechanical equipment and system, as appropriate:

1. Description of unit and component parts:

a. Function, normal operating characteristics, and limiting conditions.

b. Performance curves, engineering data and tests.

c. Complete nomenclature and commercial number of all replaceable parts.

2. Operating procedures:

a. Start-up, break-in, routine and normal operating instructions.

b. Regulation, control, stopping, shutdown and emergency instructions.

c. Summer and winter operating instructions.

3. Maintenance procedures:

a. Routine operations.

b. Guide to "trouble-shooting."

c. Disassembly, repair and reassembly.

d. Alignment, adjusting and checking.

4. Servicing and lubrication schedule: List of lubricants required.

5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.

7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

    a. Predicted life of parts subject to wear.

    b. Items recommended to be stocked as spare parts.

8. Control diagrams by manufacturer of controls as installed in Project.

9. Coordination drawings of color-coded piping diagrams as installed by each subcontractor.

10. Charts of valve tag numbers with the location and function of each valve.

11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.

B. Content, for each electric and electronic system, appropriate:

1. Description of system and component parts:

    a. Function, normal operating characteristics, and limiting conditions.

    b. Performance curves, engineering data and test.

    c. Complete nomenclature and commercial number of replaceable parts.

2. Circuit directories of panelboards:

    a. Electrical service.

    b. Controls.

    c. Communications.

3. As-installed color-coded wiring diagrams.

4. Operating procedures:

    a. Routine and normal operating instructions.

    b. Sequences required.

    c. Special operating instructions.

5. Maintenance procedures:

    a. Routine operations.

    b. Guide to "trouble-shooting."

    c. Disassembly, repair and reassembly.

    d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.

C. Prepare and include additional data when the need for such data becomes apparent during instruction of District's personnel.

1.8 INSTRUCTION OF DISTRICT'S PERSONNEL

A. Prior to final inspection or acceptance, instruct District's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment, and systems installed in Project.

B. Provide services of factory-trained instructors from the manufacturer of each major item of equipment or system.

C. Operating and maintenance manual shall constitute the basis of instruction.

D. Review contents of manual(s) with personnel in full detail to explain all aspects of operations and maintenance.

END OF SECTION

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SECTION 01 7836
WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Compile specified warranties and bonds, and specified service and maintenance contracts.

2. Review submittals to verify compliance with Contract Documents.

3. Submit to Architect for review and forwarding to District as specified in Section 01 7700.

B. Related work:

1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.

2. General closeout requirements are included in Section 01 7700.

3. Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in Sections of Divisions 2 through 48.

4. Certifications and other commitments and agreements for continuing services to District are specified elsewhere in the Contract Documents.

C. Disclaimers and limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the Contractor.

1.2 WARRANTY REQUIREMENTS

A. Related damages and losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

B. Reinstatement of warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement cost:

1. Upon determination that work covered by a warranty has failed, replace or rebuild the affected work to an acceptable condition complying with requirements of Contract Documents.

2. Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the District has benefited from use of that work through a portion of its anticipated useful service life.

D. District's recourse:

1. Written warranties made to the District are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on obligations, rights, or remedies.

2. The District reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

E. The District reserves the right to refuse to accept work for the Project where a special warranty, certification, or similar commitment is required on such work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.3 SUBMITTAL REQUIREMENTS

A. Assemble warranties, bonds, and service and maintenance contracts executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Submit 2 original signed copies required.

C. Furnish a typed table of contents, in orderly sequence, with the following complete information for each item:

1. Product or assembly.

2. Firm, with name of principal, address and telephone number.

3. Scope.

4. Date of beginning of warranty, bond or service and maintenance contract.

5. Duration of warranty, bond or service maintenance contract.

6. Provide information for proper procedure to be followed in case of failure, and in instances which may affect the validity of warranty or bond.

7. Name of responsible principal of Contractor, and address and telephone number.

1.4 FORM OF SUBMITTALS

A. Prepare and bind in commercial quality D-ring type 3-ring binders with durable vinyl covers.

B. Format:

1. Size: 8-1/2 -inch by 11 -inch; punch sheets for standard 3-ring binder. Refer to warranty sample form below. Fold larger sheets to fit into binders.

2. Cover: Provide spine label clearly identified with **WARRANTIES AND BONDS**, title of Project and Contractor's name typed or printed.

1.5 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during construction, submit documents within 10 days after inspection and acceptance. Otherwise make submittals as specified in Section 01 7700.

B. For items whose acceptance is delayed materially beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.6 WARRANTY FORM

A. Submit warranties on the form attached to this Section; this applies to Contractor and all subcontractors.

END OF SECTION

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WARRANTY FORM
(CONTRACTOR'S OR SUBCONTRACTOR'S LETTERHEAD)

Warranty for _____
We hereby warrant that all materials and equipment for the _____
which we have installed at _____
are new unless otherwise specified, and that all work is of good quality, free from faults and defects and in conformance with the contract documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective.

If, within one year after the date of substantial completion of the work or designated portion thereof or within one year after acceptance by the District of designated equipment or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the contract documents, any of the work is found to be defective or not in compliance with the contract documents, we agree to correct it promptly after receipt of a written notice from the District to do so unless the District has previously issued a written acceptance of such condition. This obligation shall survive termination of the contract.

If we fail to comply with the above paragraph within 7 days after receipt of written notice from the District to do so, or fail to pursue such compliance with diligence we, jointly and severally, do hereby authorize the District to proceed to have the defects repaired and made good at our sole expense including compensation for the architect's additional services made necessary by such default, and we will honor and pay the costs and charges for it together with interest at the maximum rate then permitted by governing state law, upon demand. If we fail to fulfill the preceding obligations, and if the District brings action to enforce this warranty, we agree to pay the District's reasonable attorney's fees incurred in connection therewith. This warranty is for _____ year(s).

Signed _____
(SUBCONTRACTOR)
Date _____
COUNTERSIGNED (GENERAL CONTRACTOR)

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SECTION 01 7839
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for preparation, maintenance and delivery of record documents.

1.2 SUBMITTALS

A. Deliver record documents to Architect at completion of Project

B. Accompany submittal with transmittal letter, in duplicate, containing date, Project title and number, Contractor's name and address, title and number of each record document, certification that each document as submitted is complete and accurate, and signature of Contractor or its authorized representative.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.1 DOCUMENT MAINTENANCE

A. Maintain one copy of the following in Contractor's field office at the site:

1. Contract Drawings, including the Building Department stamped set.

2. Specifications and Addenda.

3. Reviewed shop drawings.

4. Bulletins and change orders, field change authorization and notice of clarification, and other modifications to Contract.

5. Field test records.

B. File record documents apart from constructions documents and maintain in clean, dry, legible condition. Make record documents available for review by the District and Architect during regular business hours.

C. Do not use record documents for construction purpose.

D. Record documents will be subject to a monthly review by the Architect prior to approval of each progress payment.

3.2 RECORDING

A. Clearly label each document "**PROJECT RECORD**."

B. Keep record documents current.

C. Record and properly dimension deviations on the record drawings within 24 hours after work in affected area is completed. Dimensions shall be accurate to within 1 -inch

1. Use a fine felt or nylon tip pen with waterproof colored ink for marking.

2. Legibly mark to record actual construction of the following:

a. Depths of various elements of foundation in relation to first floor level.

b. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements. Cut-off points and point of connections of utilities.

c. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.

d. Field changes of dimension and detail.

e. Changes made by Change Order, Field Change Authorization and Notice of Clarification.

f. Details not on original Contract Drawings.

g. Do not permanently conceal any work until required information has been recorded.

D. Legibly mark-up each Section of the Specifications to record the following:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment installed.

2. Changes made by change order, field change authorization and notice of clarification.

3. Other matters not originally specified.

E. Maintain shop drawings as record documents. Legibly annotate to record changes made after approval.

END OF SECTION

SECTION 02 4119
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Selective demolition, dismantling, cutting and alterations as indicated, specified, and necessary for the completion of the Contract.

2. Rerouting or offsetting existing utilities, such as piping, ducts, conduit and wiring.

3. Removing demolished materials not indicated to be salvaged, from the site.

4. Preparation and cleaning of surfaces as required to install new work and finishes.

5. Patching, repairing and finishing existing items to remain to the specified condition with an invisible transition, under normal lighting conditions at the site, between new and existing.

6. Protection of work to remaining.

B. Related work:

1. Section 01 3513 for special project procedures.

2. Section 01 1500 for temporary building protection.

3. Divisions 23 and 26 for disconnecting, cutting and capping utilities.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. Protection:

1. Do not begin demolition until temporary partitions, barricades, warning signs and other forms of protection are installed.

2. Protect utilities and existing improvements that are not to be removed from injury or damage resulting from the Contractor's operation.

3. During demolition provide safeguards, including warning signs and lights, barricades, and the like, for protection of the public, Contractor's employees and existing improvements to remain.

B. Noise control: Refer to other Sections of Division One.

1. Exercise caution and care to prevent generation of unnecessary noise.

2. Keep noise levels to the minimum possible.

3. Discontinues noise producing operations, when requested by the District, and reschedule at a mutually acceptable time.

C. Dust control: Control dust at all times.

1. Provide dust-tight partitions to prevent dust escaping into other parts of the building where demolition is not in progress, as specified in other Sections of Division One.

2. Assume liability for claims related to flying dust caused by this work.

D. Water control:

1. Control the use of water to prevent damage to the existing facility and improvements to remain. Provide wet vacuum equipment where water, such as waste cooling water from concrete sawing, is used in and adjacent to existing building.

2. Provide impermeable floor coverings and suitable dams to prevent damage by water, and immediately clean-up and remove surplus water, and water spilled in non-working areas.

3. Assume liability for claims related to water seepage and leakage caused by this work.

E. Protection of existing building:

1. Install protection before activities within existing building.

2. Temporary partitions at interior of existing building: Construct of incombustible materials, with all wood materials fire retardant treated as specified in Section 06 1053. Dust-proof with tape or other acceptable means. Apply 2 coats of paint to wood surfaces visible to the public and building occupants.

3. Construct partitions indicated of gypsum board or FRT plywood.

4. Other barriers (expected to remain in place less than 45 days) may be built using flame-retardant reinforced polyethylene film.

5. Restore surfaces of existing building to original condition where damaged due to work of this Contract or due to insufficient protection. Pay for repair of damage to contents.

6. Do not allow water to enter wall insulation or roof insulation to remain. Replace when insulation has been wetted.

7. Protect interior of structure from dust and weather and conserve interior heat. Protect temporary openings in exterior walls with fire-retardant treated weatherproof plywood or reinforced polyethylene barriers.

F. Security: Coordinate security with the District; refer to Section 01 5000.

1. Take necessary precautions to keep trespassers out of demolition areas.

2. Properly secure demolition areas from entry when demolition is not in progress but do not block required exitways.

G. Safety:

1. If at any time the safety of existing construction appears to be endangered, take immediate measures to support such endangered construction; cease operations and immediately notify the Architect.

2. Do not resume demolition until Architect's instructions are received.

3.2 DEMOLITION

A. Existing conditions:

1. Intent of Drawings is to show existing conditions with information developed from field surveys and to generally show the extent and type of demolition required.

2. Make a detailed survey of existing conditions prior to commencing demolition, and report discrepancies or conflicts between Drawings and actual conditions in writing to the Architect for clarifications and instructions.

3. Do not proceed where such conflicts or discrepancies occur prior to receipt of Architect's instructions.

B. The Contractor shall be fully responsible for the adequacy and installation of temporary shoring and bracing systems used during demolition.

C. Demolition shall be performed by skilled and properly equipped personnel.

D. Remove existing construction only to the extent necessary for the proper installation of new construction and junction with existing materials. Cut back finished surfaces to straight, plumb or level lines as required.

E. If unanticipated conditions which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict.

1. Submit report to Architect in written, accurate detail.

2. Pending receipt of directive from Architect, rearrange demolition schedule as necessary to continue overall job progress without delay.

F. Where openings are cut oversize or in improper location, replace to excess removed material, to the Architect's satisfaction, at no additional cost to the District.

G. Coordinate demolition with other trades to assure the proper sequence, limits, methods and time of performance. Schedule demolition so as to impose a minimum of hardship on the present operation of the facilities and the performance of the work of other trades.

H. Whenever possible use small hand or small power tools designed for sawing or grinding; whenever possible avoid the use of tools with a hammering and chopping motion. Cut through finished surfaces from the exposed or finished side into concealed surfaces.

I. In general remove materials as follows:

1. Gypsum board: Remove to a joint line on a support.

2. Lath/plaster:

a. Saw cut plaster, but not lath and weather barrier (paper backing), cleanly.

b. Leave at least 2 -inch of lath exposed to tie into new lath, where applicable.

c. Leave sufficient undamaged weather barrier exposed to create a watertight, by proper lapping, joint with the new weather barrier or flashing.

J. Materials not mentioned to be removed that interfere with new construction, except where structural integrity of the assembly is at risk, shall be cut to clean cut lines to provide for proper interface with new construction, or patching and repair, as required.

3.3 SALVAGE

A. Title to materials:

1. Except where indicated or specified otherwise, materials and equipment removed and not reused shall become the property of the Contractor and shall be removed from the site.

2. The District will not be responsible for the condition or loss of, or damage to, such property after notice to proceed.

3. Material and equipment shall not be viewed by prospective purchasers or sold on the site.

B. Remove items to be reused, clean and store in a protected location until re-installed or turned over to the District.

3.4 PATCHING

A. Patch materials to remain when damaged by demolition. Finish material and appearance of the patch or repair shall match the existing contiguous materials and finishes in all respects, as approved by the Architect.

3.5 CLEAN-UP/DISPOSAL

A. Debris, waste, and removed materials, other than items to be salvaged, are Contractor's property for legal disposal off the site.

B. Continuously clean-up and remove these items and do not allow accumulating in the building and on the site. Refer to Section 01 7400 for additional requirements on this subject.

END OF SECTION

SECTION 02 4122
SELECTIVE PLUMBING DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removal of existing plumbing equipment, fixtures, piping and appertunances in areas to be remodeled; removal of designated construction; dismantling, cutting and alterations for completion of the Work.

2. Disposal of materials.

3. Storage of removed materials.

4. Identification of utilities.

5. Salvaged items.

6. Protection of items to remain as indicated on Drawings.

7. Relocate existing equipment to accommodate construction.

1.2 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of capped utilities, ducts, piping and equipment abandoned in place.

1.3 SCHEDULING

A. Schedule work to coincide with new construction.

B. Cease operations immediately when structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

1.4 COORDINATION

A. Conduct demolition to minimize interference with adjacent and occupied building areas.

B. Coordinate and sequence demolition so as not to cause shutdown of operation of surrounding areas.

C. Shut-down Periods:

1. Arrange timing of shut-down periods of in service panels with Owner. Do not shut down any utility without prior written approval.

2. Keep shut-down period to minimum or use intermittent period as directed by Owner.

3. Maintain life-safety systems in full operation in occupied facilities, or provide notice minimum 30 days in advance.

D. Identify salvage items in cooperation with Owner.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify piping, fixtures and equipment indicated to be demolished serve only the demo or remodel areas in scope. With no impact to other area's operation.

B. Verify termination points for demolished services.

3.2 PREPARATION

A. Erect, and maintain temporary safeguards, including warning signs and lights, barricades, and similar measures, for protection of the public, Owner, Contractor's employees, and existing improvements to remain.

B. Temporary egress signage and emergency lighting

3.3 DEMOLITION

A. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Architect before disturbing existing installation.

B. Remove all abandoned piping and appurtenances, including abandoned items above accessible ceiling finishes within the remodel area. Cut piping flush with walls and floors and patch surfaces. Clearly mark piping as "Abandoned to be Removed" for identification for subsequent phases of construction. Markings must be visible in the area adjacent to the demolition area, every 5 feet for 15 feet, to allow future removal of items.

C. Remove all unused piping and appurtenances to avoid any interference with new installation.

D. Disconnect pipes in walls, floors, and ceilings scheduled for removal.

E. Reconnect equipment being disturbed by renovation work and required for continued service to nearest available live source of the utility.

F. Disconnect or shut off service to areas where plumbing work is to be removed. Remove plumbing pipes and appurtenances which are not part of final project.

G. Install temporary pipes as needed to maintain existing systems in service during construction.

H. Remove, relocate, and extend existing installations to accommodate new construction.

I. Repair adjacent construction and finishes damaged during demolition and extension work.

J. Remove exposed abandoned components, fasteners and supports, and identification components, including abandoned components above accessible ceiling finishes within the remodel area. Cut embedded support elements flush with walls decks and floors.

K. Protect and retain services to existing active equipment remaining.

L. Cap abandoned empty pipes.

3.4 REUSABLE MECHANICAL EQUIPMENT

A. Carefully remove equipment, materials and pipes which are to be reused.

B. Disconnect, remove, or relocate existing plumbing material and equipment interfering with new installation.

3.5 CLEANING

A. Remove demolished materials as work progresses. Legally dispose.

B. Keep workplace neat.

3.6 PROTECTION OF FINISHED WORK

A. Do not permit traffic over unprotected floor surface.

END OF SECTION

SECTION 03 0130.71
REHABILITATION OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Patching existing concrete with an epoxy adhesive.

1.2 REFERENCES

A. ASTM C 881 – Standard Specification for Epoxy-Resin Base Bonding Systems for Concrete.

B. ASTM C 882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.

C. ASTM D 570 - Standard Test Method for Water Absorption of Plastics.

D. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.

E. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics.

F. ASTM D 732 - Standard Test Method for Shear Strength of Plastics by Punch Tool.

G. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

1.3 PERFORMANCE REQUIREMENTS

A. Typical properties of the epoxy resin adhesive binder:

1. Pot life: 30 minutes (60 gram mass) at 73 deg. F.

2. Color: Concrete gray.

B. Typical properties of the cured epoxy resin adhesive:

1. Compressive properties (ASTM D 695) minimum:

a. 3 days: 11,300 psi.

b. 7 days: 11,800 psi.

c. 28 days: 12,200 psi.

2. Compressive modulus minimum:

a. 7 days: 2.6×10^5 psi.

3. Shear strength (ASTM D 732):

   a. 14 days: 6,200 psi.

4. Flexural properties (ASTM D 790) minimum:

   a. 14 days: 10,700 psi.

5. Tangent modulus of elasticity in bending, minimum:

   a. 14 days: 6.9×10^5 psi.

6. Bond strength (ASTM C 882), (moist cure for 14 days) minimum:

   a. Plastic concrete to hardened concrete: 2,200 psi.

   b. Plastic concrete to steel: 2,000 psi.

7. Water absorption (ASTM D 570) maximum:

   a. 24 hours: 0.27 percent.

8. Tensile properties (ASTM D 638) minimum:

   a. 7 days:

      1) Tensile strength: 6,900 psi min.

      2) Elongation at break: 1.9 percent.

   b. 14 days:

      1) Modulus of elasticity: 5.4×10^5.

1.4 SUBMITTALS

A. Data: Manufacturer Product Data Sheets.

1.5 QUALITY ASSURANCE

A. Installer qualifications: Installers shall have a minimum of 5 years experience in the field of concrete repair and trained by a manufacturer's representative in the installation of their products.

1.6 HANDLING

A. All materials shall be delivered in original, unopened containers with the manufacturer’s name, labels, product identification, and batch numbers. Damaged materials shall be removed from the site immediately.

B. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.

C. Condition the product components as recommended by manufacturer.

1.7 JOB CONDITIONS

A. Do not apply material if it is raining or if it appears to be imminent. Minimum application temperature shall be 40 deg. F and rising.

B. Protect areas adjacent to application and mixing areas from damage.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Epoxy resin adhesive binder, conforming with ASTM C 881, Types I, II and V, Grade 2, Class C and AASHTO M-235, Sikadur 35 Hi-Mod by Sika Corp.:

1. Component “A”: Modified epoxy resin of the epichlorohydrin bisphenol A Type containing suitable viscosity control agents. It shall not contain butyl glycidyl ether.

2. Component “B: Primarily a reaction product of a selected amine blend with an epoxy resin of the epichlorohydrin bisphenol A Type containing suitable viscosity control agents, pigments, and accelerators.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 PREPARATION

A. Areas to be repaired shall be clean, sound, and free of contaminants. All loose and deteriorated concrete shall be mechanically removed.

B. For gravity feed repairs, chip out cracks to produce Vee notches. Notches shall be free of dust, dirt, oil and other contaminates.

C. Where reinforcing steel with active corrosion is encountered, sandblast the steel to a white metal finish to remove all contaminants and rust.

3.3 MIXING

A. Epoxy resin: Mix one part by volume of Component “A” and 1 part of Component “B” by volume into a clean, dry mixing pail. Mix thoroughly. Mix quantity of material that can be used within its pot life.

3.4 APPLICATION

A. Install materials in compliance with manufacturer current printed literature and the following:

1. Manual application: Apply mixed epoxy resin to the prepared surface at an approximate rate of 80 sq ft/gal. with rollers, brushes or brooms. Place portland cement mortar or concrete before the epoxy adhesive becomes tack-free to touch.

2. Spray application: Mixed epoxy resin adhesive shall be placed in a paint-type pressure pot or applied with a positive displacement pump. Spray gun shall be atomized at the nozzle. Spray uniform coat at a approximately rate of 80 sq ft/gal. Place portland cement mortar or concrete before the epoxy adhesive becomes tack-free to the touch.

B. Should placement of cement mortar or concrete be delayed, after epoxy resin becomes tack-free to touch (within a 48 hour period), clean the cured epoxy adhesive to remove any surface contaminates and re-apply the epoxy resin adhesive.

3.5 CLEANING

A. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

END OF SECTION

SECTION 05 0515
ANODIZED ALUMINUM FINISHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Anodized finishes for all exterior and interior exposed aluminum surfaces not scheduled for any other finishes.

1.2 INTENT

A. It is the intent for the base bid of these Specifications that all exposed aluminum surfaces, scheduled and/or specified to be anodized.

B. To the extent feasible, process all aluminum surfaces to receive the anodized finish in the same plant to achieve a uniform appearance in color, texture and sheen between the aluminum components after finishing.

C. Use all material to be anodized from the same mill, produced in the same heat-lot.

D. The Architect recognizes that minor differences in appearance, due to different alloys used for extrusions, plates and sheets, will occur. However, these differences shall be minimized as much as possible during the anodizing process and by selecting adjacent materials for the least possible contrast in color, texture and sheen.

E. To this end, samples showing the full range of color, texture and sheen must be approved prior to production and finishing of the aluminum components for the Project by the Architect. Samples shall incorporate welded joints to show the color range to be expected at welds. These samples shall be delivered to the job site in sufficient quantity and size for the Architect's review. Samples shall be protected and remain at the job site until no longer needed.

1.3 REFERENCES

A. AAMA 609 and 610-02, Cleaning and Maintenance Guide for Architecturally Finished Aluminum.

B. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.

C. ASTM B 117, Standard Practice for Operating Salt Spray (Fog) Apparatus.

D. ASTM B 137, Standard Test Method for of Weight of Mass per Unit Area on Anodically Coated Aluminum.

E. ASTM B 244, Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments.

F. ASTM B 457, Standard Test Method for Measurement of Measurement of Impoedanceof Anodic Coatings on Aluminum.

G. ASTM B 580, Standard Specification for Anodic Oxide Coatings on Aluminum.

H. ASTM D 523, Standard Test Method for Specular Gloss.

I. ISO 3210, Anodizing of Aluminum and Its Alloys – Assessment of Quality of Sealed Anodic Oxide Coatings by Measurement of the Loss of Mass After Immersion in Phosphoric-Chromic Acid Solution.

J. AATCC Test Method 173: Calculations of Small Color Differences for Acceptability.

1.4 SUBMITTALS

A. General Requirements.

B. Data: Manufacturer's quality control measures and anodizing methods.

C. Samples: As specified above and specified in Specification Sections in Divisions 5, 8 and 10.

D. Test reports: Applicator’s reports of tests performed in accordance with the Source Quality Control Article of this Section.

1.5 QUALITY ASSURANCE

A. Anodizer’s qualifications: Subject to the Architect’s approval.

B. Anodizer’s quality control/assurance program: Prior to starting anodizing, submit an outline of the anodizer’s quality control/assurance program. Include methodology to be used for color and reflectivity control on each façade.

PART 2 - PRODUCTS

2.1 MATERIALS

A. For aluminum extrusions, plates and sheets, refer to the appropriate Sections and the following which takes precedence.

B. Aluminum sheets shall be “Anodizing Quality Guaranteed Plate,” alloy 5052, temper H-32.

C. Welding wire: Non heat-treated alloy 5356.

PART 3 - EXECUTION

3.1 ANODIZING

A. Metal preparation and pretreatment:

1. Clean aluminum surfaces to remove all foreign matters in a nonetching solution.

2. Mechanical finish to achieve a specular (AA M11) reflective smooth finish.

3. Etch in sodium hydroxide (AA C22).

B. Anodizing: Batch process, Architectural Class I, coating complying with AAMA 611 and these Specifications.

1. Anodic thickness: 0.0007-inch minimum.

2. Anodic film color: Clear (transparent) and dark bronze.

3. Seal anodized surfaces with nickel acetate.

C. Anodized surfaces shall be uniform in thickness and color (within the range accepted during sample submittal), smooth and free from powdery areas, blemishes in the coating that might impair the serviceability or detract from the general appearance of the member when viewed from 5-foot away under normal lighting conditions, and shall match the approved samples.

3.2 QUALITY CONTROL

A. Conduct the following tests in accordance with AAMA 611.

1. Coating thickness.

2. Coating weight and apparent density.

3. Color uniformity.

4. Gloss uniformity.

5. Seal test.

6. Craze resistance.

7. Weatherring.

8. Corrosion resistance.

9. Abrasion resistance.

B. Anodized components that do not comply with Specification requirements or do not match approved samples shall be returned to the fabricator/anodizer for refinishing, and replaced with satisfactory components.

END OF SECTION

SECTION 05 4100
LOAD-BEARING METAL STUDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Load-bearing metal stud systems.

B. Related Sections:

1. Division 01 for testing and inspection.

2. Division 9 for non-structural metal framing.

1.2 SUBMITTALS

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

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

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

D. Weld Procedures: Submit weld procedures, procedure qualification records, and electrode product data for review and approval.

1.3 QUALITY ASSURANCE

A. Comply with following as a minimum requirement:

1. AISI - Specifications for Design of Cold Formed Steel Structural Members.

2. Welds shall be performed by AWS certified welders. Welding shall be performed in accordance with requirements of American Welding Society (AWS) Structural Welding Code-Steel D1.1 and D1.3. Structural welding Code-Sheet Steel.

3. Welding shall be inspected by a special inspector, approved by DSA to inspect Work of this section. The IOR shall be responsible for monitoring work of special inspector to ensure that inspection program is satisfactorily completed.

4. ASTM A 924 – Standard Specification for General Requirements for Steel Sheet Metallic-Coated by Hot-Dip Process

5. ASTM A 1003 – Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

6. ASTM A 1008 – Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability.

7. ASTM C 954 – Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks) and Bracing or Bridging for Screw Application of Gypsum Panel Products and Plaster Bases.

8. ASTM C 955 – Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.

9. ASTM A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by Hot Dip Process.

10. ASTM C 1007 – Standard Specification for Installation of Structural (Axial and Transverse) Steel Framing Members and Accessories.

11. ASTM E 488 – Standard Test Methods of Strength Anchors in Concrete and Masonry.

12. ASTM E 1190 – Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.

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

1.4 DELIVERY, STORAGE AND HANDLING

A. All materials shall be delivered in their original unopened packages and stored protected from damage. Do not store material directly on grade. Provide adequate support to prevent bowing of material prior to installation. If it is necessary to store materials outside, stack them off the ground on a platform and fully protected from the weather.

B. Store welding electrodes in accordance with AWS D12.1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide studs, tracks, joists and accessories manufactured by one of following:

1. Steel Studs Manufacturer's Association; ICC-ES ER4943P

2. California Expanded Metal Products Co.; ICC-ES ER3403-P

B. Special Connection Accessories: Products manufactured by The Steel Network, Inc., or equal.

2.2 MATERIALS

A. Light Gage Metal Framing:

1. Metal framing shall be formed from corrosion resistant-steel conforming to requirements of ASTM A 653, 50 ksi minimum. Galvanize per ASTM A924, Designation G60.

2. Metal framing shall be manufactured in conformance to ASTM C 955.

3. Install metal framing per ASTM C 1007, Standard Specification for Installation of Load-Bearing (Transverse and Axial) Steel Studs and Related Accessories.

B. Gages and properties of studs shall be as indicated on Drawings.

C. Mechanical anchors to concrete and masonry shall be metal cinch at least 3/8 inch in diameter threaded bolt head type. Anchor bolts to be installed in concrete shall be headed type 1/2 inch diameter or more. Unless otherwise indicated.

D. Mechanical anchors to metal framing shall be No. 10 self-tapping and self-drilling wafer-head screws unless noted otherwise.

E. Accessories: Special top tracks, angles, fasteners, and strips of gypsum wallboard, as required for fire rating assembly required at each condition.

F. Mineral Wool: Thermafiber Safing Insulation.

G. Galvanizing Repair Compound: High zinc dust content galvanizing repair paint meeting the requirements of ASTM A 780-00 or hot applied zinc rich material. Provide one of the following available products or another product complying with the referenced standard:

1. American Solder & Flux; Drygalv

2. Kenco Div.; Galvicon

3. Metalloy Products, Co.; Galvalloy

H. Framing Accessories:

1. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi unless noted otherwise on contract documents.

2. Provide accessories noted below, of thickness and configuration indicated on the Drawings. Where not indicated provide accessories manufacturer's standard of thickness and configuration.

a. Supplementary framing.

b. Bracing, bridging, and solid blocking.

c. Stud kickers, knee braces, and girts.

d. Hole reinforcing plates.

e. Backer plates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-

resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.2 INSTALLATION

A. Erect straight, plumb, square, true to lines, levels or elevations indicated, free from excessive twists and bends and braced against racking.

B. Anchor top and bottom runner track to ceiling or roof structure overhead and to floor structure below.

C. Install studs squarely in top and bottom runner track with firm abutment against track webs.

D. Align and plumb studs, and fasten to flanges of both top and bottom runner tracks.

E. Provide 3 studs minimum at corners of stud walls. Locate so as to provide surfaces for attachment of interior and exterior facing materials.

F. Members not indicated to be welded together shall be attached with manufacturer recommended screws with minimum one screw at each flange of stud to top and bottom track. Wire tying of framing members is not permitted.

G. Provide lateral bracing and bridging in accordance with manufacturer's written recommendations or as required by CBC.

H. Intersecting walls and partitions, whether load-bearing or not, shall be connected.

I. Splices in axially loaded studs are not permitted.

J. Splice or butt weld butt joints in runner tracks. No splices are permitted in tracks over lintels, diaphragm sheathing, or diagonal bracing.

K. Weld connections by fillet welds or plug welds in accordance with AWS recommended procedures and practices.

L. Touch up abrasions, burns, and welding, including construction activities of other trades, with primers for primed steel or with galvanizing compound if galvanized. Remove oil, grease, rust, loose scale, loose coatings, weld slag and other deleterious material before touch up.

M. Studs that frame door openings shall be clipped to floor with 14 gage angle clips. Each clip to have two fasteners into studs and two fasteners into floor.

N. Provide additional joists or blocking adjacent to exterior and interior walls, openings and elsewhere as required to provide support for indicated ceiling construction.

O. Provide an additional joist under parallel partitions where partition length exceeds 1/2 joist span and around floor and roof openings which interrupt one or more spanning members.

P. Conform to rules and practices set forth in ASTM C 1007-00, and with the manufacturer's printed instructions and recommendations, as applicable.

Q. Cut stock neat and square. Cut framing members by sawing or shearing; do not torch cut. Provide members free of kinks and twists. Do not use damaged or distorted materials.

R. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated on contract documents.

S. Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Use backing plates per the structural drawings to accommodate fastenings.

T. Use pre-punched openings in the studs wherever possible to run 1½" outside diameter or smaller conduit or plumbing lines horizontally between studs. If penetrations are required in studs reinforce studs per the Steel Stud Manufacturer's Association (SSMA) requirements or refer to contract documents for stud reinforcing details. If reinforcing details are not specifically shown on the contract documents, reinforce stud penetrations per SSMA requirements.

U. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of lath, sheathing, wallboard or other finishing materials.

3.3 CONNECTIONS TO METAL DECKING

A. Provide premolded neoprene filler strips matching flute profile for non-fire-rated walls and partitions covered on one or both sides up to metal decking.

B. Top runner track of fire-rated partitions shall be a minimum of 20 gage, unless noted otherwise, and attached to metal deck with required fasteners at spacing required for fire rating, but in no case over 16 inches on center. Areas above runner shall be friction fit with a minimum depth of 2 1/2 inches of 4 pounds per cubic foot density mineral wool insulation. A minimum of 1/2 inch of firestopping compound shall be installed to each side of mineral wool insulation for a one-hour system, and one inch of firestopping for a 2-hour system. Install required special tracks, angles, fasteners and strips of gypsum wallboard to provide required fire resistance rating.

C. Proprietary fire-rated top tracks shall be installed in accordance with manufacturer's recommendations and fire rating approval requirements.

3.4 QUALITY CONTROL

A. Welding Inspection:

1. Inspection of field welding operations shall be performed by the special inspector. All inspection and testing shall be in compliance with CBC requirements.

2. The special inspector shall inspect material, equipment, procedures, welds, and welder qualifications.

3.5 CLEAN UP

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

3.6 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 06 1053
MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Wood nailers and blockings, and plywood sheathing.

2. Rough hardware.

1.2 REFERENCES

A. APA (American Plywood Association; 1990): Form A400Q - Permanent Wood Foundation Guide to Design and Construction.

B. AWPA (American Wood Preservers' Association; 1996):

1. C20, Structural Lumber - Fire-Retardant Treatment by Pressure Processes.

2. C27, Plywood - Fire-Retardant Treatment by Pressure Processes.

C. NFPA (National Forest Products Association; 1997), Permanent Wood Foundation System - Design, Fabrication, Installation Manual.

D. ACQ-94, ACQ Preserve Quality Control Standard for all products treated with ACQ.

E. CBC, 2016 Edition.

1.3 SUBMITTALS

A. Wood treatment data: Submit treatment manufacturer's instructions for proper use of each type of treated material.

B. Pressure treatment: Submit the following,

1. For each type specified, include certification by treating plant stating chemicals and process used, net amount of preservative retained and conformance with applicable standards.

2. For water-borne preservatives, include statement that moisture content of treated materials was reduced to a maximum of 19 percent prior to shipment to project site.

1.4 HANDLING

A. Procedure: In accordance with AWPA recommendations for storage and protection of pressure-treated wood.

B. Do not store materials in wet or damp areas.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nailers and blockings:

1. No. 1 or No. 2 grade Douglas fir, S4S, seasoned to moisture content of 19 percent maximum and stamped S-Dry, graded in compliance with WCLIB Grading Rules.

2. If specifications for pressure treatment state the maximum percentages of moisture content at the time of treatment, comply with those requirements in lieu of the above.

B. Plywood: Softwood plywood APA, Exterior Grade, C-C Plugged.

C. Rough hardware:

1. General: Use hot-dip galvanized (not electro-plated) fasteners complying with G185 to attach pressure-treated wood.

2. For fastening lumber-to-lumber: Cement-coated or annular threaded nails of sufficient length to penetrate a minimum of 1-1/4-inch into adjoining members, or stove or lag bolts used with washers.

3. For fastening plywood-to-lumber: Ring shank or annular threaded nails; 8d for 1/2-inch plywood and 10d for 3/4-inch plywood.

4. For fastening plywood or lumber to steel: Minimum #10 galvanized full threaded screws driven thru 5/8-inch diameter steel washers.

5. For fastening plywood or lumber to concrete: Corrosion-resistant drilled expansion type anchors or power-driven anchors by Hilti Fastening Systems, Molly Division of USM Corp., Redhead, or equal, capable of resisting a withdrawal force of 400 lb. each without failure.

2.2 TREATMENT OF LUMBER AND PLYWOOD

A. Preservative treatment by pressure process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

2. Mark each treated item with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

3. Treatment of wood nailers used in conjunction with built-up roofing shall be compatible with the roofing bitumen; oil-based preservatives are not acceptable.

B. Application: Treat items indicated on Drawings, and the following:

1. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with concrete.

2. Wood framing members less than 18 inches above grade.

2.3 FIRE-RETARDANT TREATED WOOD

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, US Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.

C. Use treatment that does not promote corrosion of metal fasteners.

D. Use Exterior type for exterior locations.

E. Use Interior Type A High Temperature (HT).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 INSTALLATION

A. Subdrill holes in pieces where splitting may occur; size holes slightly smaller than diameter of nail.

B. Do not drive nails closer to edge of lumber than 1/4 length.

C. Remove lumber split in nailing and replace with sound members.

D. Make joints accurately and neatly, square, flush and tight.

E. Install wood screws and lag bolts with complete penetration to head. Bore lead holes equal to root diameter of the screw or bolt. Drive flush or recess with nailer face.

F. Use pressure-treated wood where required by Code and as specified above.

G. Use fire-treated wood where required for blockings and nailers located in metal-framed walls, partitions and ceilings.

H. Provide nailers and blockings where indicated and required.

1. Template and drill to match anchor bolts in steel members, concrete and masonry.

2. Where materials are applied over flush nailer surfaces, use carriage bolts with heads drawn flush into top of nailer or blockings, or counterbore holes to recess washers and heads of nuts.

3.3 ANCHORAGE

A. Fastening lumber or plywood to lumber:

1. Space nails a maximum of 12 inches o.c. and stagger across face of piece. Locate fastener also within 3 inches of each end of piece.

2. Drive nail heads flush with wood surfaces. Nails shall penetrate adjoining piece a minimum of 1-1/4-inch.

B. Fastening lumber or plywood to concrete or to masonry:

1. Space anchors a maximum of 36 inches o.c. and stagger if lumber is more than 5 inches wide.

2. Make anchor heads flat or countersunk flush with surface, but not countersunk more than 1/3 the thickness of piece to be fastened.

3. Anchor withdrawal resistance shall be a minimum of 400 lb. per anchor, or number of fasteners increased accordingly from that specified. Minimum penetration of 1-1/2-inch into concrete or masonry.

C. Fastening lumber or plywood to steel:

1. Space screws a maximum of 24 inches o.c. and stagger if lumber is more than 5 inches wide.

2. Drive screw heads flush with face of plywood or lumber.

3. Anchor shall penetrate a minimum of 1/4 inch through the steel.

3.4 CLEAN-UP

A. Comply with the requirements of Division One.

B. Do not bury wood of any type on the jobsite.

END OF SECTION

SECTION 06 4116
PLASTIC LAMINATE CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Plastic laminate clad storage cabinets.

2. Rough and finish hardware for this work.

3. Nailers and blockings for this work.

B. Related work:

1. Division 6 for nailers and blockings other than for the work of this Section.

2. Division 8 for finish hardware.

1.2 REFERENCES

A. American National Standards Institute (ANSI): ANSI A208.1 Mat-Formed Wood Particleboard.

B. American Wood Preservers Association (AWPA): AWPA C20 Structural Lumber, Fire-Retardant Pressure Treatment.

C. Builders Hardware Manufacturers Association, Inc. (BHMA):

D. ANSI/BHMA Cabinet Hardware (copyrighted by BHMA, ANSI A156.9 approved).

E. ANSI/BHMA Materials and Finishes (copyrighted by BHMA, ANSI A156.18 approved).

F. Federal Specifications (FS):

1. FS FF-N-105 Nails, Brads, Staples and Spikes: Wire, Cut and Wrought.

2. FS FF-S-111 Screw, Wood.

G. National Electrical Manufacturers Association (NEMA): NEMA LD 3 High Pressure Decorative Laminate.

H. National Particleboard Association (NPA): NPA 8 Voluntary Standard for Formaldehyde Emission from Particleboard.

I. American Laminators Association (ALA).

J. ALSC, American Lumber Standards Committee: Softwood Lumber Standards.

K. AWPA, American Wood Preservers' Association.

L. NFPA, National Forest Products Association.

M. WCLIB, West Coast Lumber Inspection Bureau, Standard Grading Rules for West Coast Lumber.

N. WWPA, Western Wood Products Association.

O. Architectural Woodworking Standards (AWS), published jointly by Woodworking Institute (WI), the Architectural Woodwork Manufacturer's Association of Canada and the Architectural Woodwork Institute (AWI).

1.3 SUBMITTALS

A. Procedure: In accordance with the requirements of AWS.

B. Data: Manufacturer's data of all specialty items required by this Section that are not manufactured by the millwork manufacturer.

C. Shop drawings:

1. Comply with these Specifications and the AWS for shop drawing policy and procedure.

2. Show location of each item, dimensioned plans and elevations, large scale details, attachment devices, finishes, and finish hardware type and location.Indicate method of seismic construction by WI-Seismic Test Codes Number.

b. Stamp each set of shop drawings with a WI Certified Compliance Certificate on the first page.

3. Coordinate the shop drawings with the work of other trades that is a part of, or will be incorporated in the millwork, such as electrical and electronic equipment. The work to be performed by other trades shall be noted, including adjacent and abutting materials to which this work is to be secured.

4. Obtain the approval of the millwork shop drawings by these related trades (as evidenced by their stamp and signature thereon) before submitting shop drawings to the Architect.

D. Samples:

1. 8-1/2- by 11-inch samples of each type, color and texture of plastic laminate.

2. Samples of each type and manufacturer of cabinet hardware.

E. Hardware list: Identify each item by manufacturers name, catalog number, size, finish, and intended use.

F. Qualifications: Information that substantiates that the manufacturer has the qualifications, experience and reputation for doing quality work in a timely manner for installations similar to that specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturer's qualifications:

1. Firm (woodwork manufacturer) with not less than 5 years of production experience similar to this Project, whose qualifications indicate the ability to comply with the requirements of this Section.

2. The woodwork manufacturer must have at least one project in the past 5 years where the value of the woodwork was within 20 percent of the cost of woodwork for this Project.

B. Installer's qualifications: Firm certified by WI under their "Certified Installer Program" or millwork manufacturer, or Firm specializing in custom millwork with 3 years experience in installation of custom millwork similar to that required for the Project.

C. Single source responsibility: Single manufacturer for all work of this Section.

D. WI monitoring:

1. An authorized representative of WI shall monitor the installation of the woodwork, on a regular basis, and shall issue a letter to the Architect after installation is completed.

2. The letter shall report the results of the monitoring, with action taken to correct non-complying work.

E. Wood product quality standards:

1. Softwood lumber standards: NIFT PS 20 and applicable grading rules of the respective grading and inspecting agency for the species and product specified.

2. Hardwood lumber standard: NIFT PS 51.

F. Referenced standards: Fabricate and install the work of this Section from materials of the species and grades specified in compliance with the American Laminators Association (ALA), ANSI A161.2, and Performance Standards for Fabricated High Pressure Decorative Laminate Countertops, and the following.

1. The Project requires WI Certified Compliance Certification for products and installation.

2. Fabricate and install architectural woodwork in accordance with the standards established in the AWS (including amendments) in the grade(s) specified below.

3. Before delivery to the jobsite, issue a WI Certified Compliance Certificate indicating that the work to be furnished will comply with all WI requirements for the grade(s) specified.

4. Each elevation of casework and plastic laminate shall bear the WI Certified Compliance Label indicating that it conforms to the grade specified.

5. If questions arise as to compliance with the reference standard of any item of work, the District may require reinspection of the questioned items as defined by "Reinspection Procedure" of Section 1 - General Information, of the AWS. Cost of reinspection, should non-compliance be found, shall be paid by the Contractor.

6. These requirements do not limit fabrication of the work of this Section to WI members.

7. If the fabricator/supplier/installer is not a WI licensee, the fabricator/supplier/installer shall arrange and pay for all necessary inspections required by WI to comply with the above requirements. Certified Compliance Certificate shall be affixed by the WI Director of Architectural Services (DAS/Inspector).

G. Mockup:

1. Before starting production work, assemble a full size storage cabinet for the Architect's review and approval.

2. Locate at the Project site.

3. Finish the mockup as intended for the finish work.

4. Approved mockup will be used as a standard for the Work.

1.5 HANDLING

A. Procedure: In accordance with AWS Section 2 "Care and Storage".

B. Delivery: Deliver materials to project site in protective wrappings clearly labeled with identification of manufacturer, item name, and specific installation location.

C. Storage: Store work in original undamaged protective wrapping, set flat, blocked off ground to prevent sagging and warping.

PART 2 - PRODUCTS

2.1 LUMBER

A. Seasoning: Wood shall be properly kiln-dried according to accepted methods for the thickness and species required in compliance with AWS.

B. Pressure-treatment: As specified in Section 06 1053.

C. Species and grade: Any grade and specie complying with AWS provisions for the woodwork grade specified.

2.2 PANEL PRODUCTS

A. Core: Particleboard core stock, medium density, complying with ANSI A 208.1, Table I, Grade 1-M-3.

2.3 PLASTIC LAMINATE

A. General: HPDL, AWS Premium Grade complying with NEMA LD-3. Unless otherwise noted, the face color of laminate edge exposed in the Work shall run through the full thickness of the laminate.

1. Horizontal surfaces: HGS 1.2 mm. When post-forming in radius less than 6 inches, use HGP one mm.

2. Vertical surfaces: HGL one mm.

3. Cabinet liner: CLS 0.5 mm.

4. Backer: BKM one mm.

B. In fire-rated assemblies, plastic laminate shall not exceed flame spread prescribed by Code. The Architect will select colors and surface finishes.

2.4 ADHESIVES

A. Type II as recommended by AWS.

2.5 ROUGH HARDWARE

A. Wood screws, nails and anchors: As selected by the Contractor.

B. Toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete work for anchorage.

2.6 FINISH HARDWARE

A. General:

1. As required for a complete installation, as indicated and specified, and as listed in WI's current Approved Hardware Listings, except as herein modified.

2. Hardware finish shall match door hardware specified in Section 08 7100, unless otherwise noted.

3. Operable parts for accessible casework shall comply with CBC Section 11B-309.

B. Locks: 6-pin tumbler lock with single bitted keys. Unless otherwise instructed by the Owner, key all keyways in the same room or space alike.

C. Hinges:

1. Grade 2, concealed (European style) with 3-way independent adjustment.

2. Self-closing, 170-degree opening, except 90-degree where door opens against a wall, or otherwise limited to 90-degree.

3. Provide at least 3 hinges where doors exceed 24-inch wide and 36-inch high.

D. Adjustable shelving: Prebored 5mm diameter holes at 32mm on center on 3/4 in. shelf clips with a 5mm and 1/8 in. hole, or they may be mounted on K-V No. 225 ZC adjustable shelf standard with No. 239 shelf supports.

E. Pulls: Wire type, 5 inches center-to-center.

F. Door bumpers: Drilled-in, clear, soft plastic.

2.7 FABRICATION

A. General:

1. Fabricate woodwork to the dimensions, profiles and details shown in compliance with Section 6 of the AWS, except as specified.

2. The Drawings indicate form and profile concept only. Fabrication and construction details shall comply with the AWS, unless specified otherwise.

3. Exposed surfaces shall be faced with plastic laminate. Semi-exposed surfaces may be faced with plastic laminate, except that top surface of shelving, and bottom surface of cabinets, and toe base are considered to be an "exposed surface" for the purpose of this Section, unless the toe base is indicated to receive a resilient base.

4. Shop assemble work in as large units as practicable to minimize field cutting and jointing. Where necessary to fit at site, provide ample allowance for cutting and fitting.

5. Provide sufficient scribe where casework and tops intersect walls and partitions.

6. Conceal means of fastening various parts and members together.

7. Assemblies shall be free from open joints, hammer and machine marks, structural defects and surface blemishes.

B. Casework: Fabricate casework using flush overlay AWS, Section 10, Style A (frameless), Type II construction (single length Section) in compliance with AWS Custom Grade.

1. End panels and back panel: Recessed or flush, provided for all cabinets.

C. Shelving: Comply with Section 10, Appendix B of AWS, loading 40 psf, 3/4-inch minimum thickness, maximum deflection L/144, except that all shelving shall be of the same thickness.

D. Finish hardware:

1. Fit hardware accurately and install in compliance with the hardware manufacturer's printed instructions.

2. Accurately fit doors with uniform clearance at all edges.

3. Doors shall operate freely, but not loosely, without sticking or binding, with all hardware adjusted and functioning properly.

2.8 FINISHING

A. This Article applies to surfaces not covered with plastic laminate.

B. In preparation for finish, clean woodwork and fill nail holes. Use matching wood filler.

C. Finish surfaces at the mill, smoothly dressed, belt-sanded and hand-sanded.

D. Finish surfaces to be concealed after the millwork is in place with a coat of clear or opaque sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.

3.3 INSTALLATION

A. General:

1. Install woodwork in compliance with AWS, plumb, level, with tight, flush joints.

2. Shim as required using concealed shims.

3. Comply with Code requirements for seismic attachment and bracing.

B. Casework:

1. Install in a manner consistent with the specified quality grade, plumb, level, true and straight with no distortions.

2. Secure to ground, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a satisfactory installation. Scribe and cut for accurate fit to adjacent finished surfaces.

3.4 REPAIRING/CLEANING/PROTECTING

A. Replace woodwork damaged beyond satisfactory field repair, as determined by the Architect, with satisfactory millwork at no additional cost to the District.

B. Clean exposed interior and exterior surfaces. Touchup finish, where repairs are acceptable to the Architect, as required, otherwise remove and refinish damaged or soiled areas of finish.

C. Protect woodwork against damage during remainder of construction period, complying with manufacturer's directions.

D. Before inspection for Substantial Completion, remove protective covering and clean surfaces using procedures and materials recommended by manufacturer.

3.5 PLASTIC LAMINATE SCHEDULE

A. PLAM-1: Linen D427-60 with matt finish by Wilsonart or equal.

END OF SECTION

SECTION 07 2100
BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Thermal insulation at following locations unless otherwise indicated or specified:

a. In all patched exterior walls.

2. Supplementary parts and components, such as clips, fasteners, supplementary framing, and other miscellaneous accessories required for a complete installation.

B. Related work:

1. Division 7 for firestopping.

2. Division 7 for acoustical insulation.

3. Divisions 22 and 23 for pipe and duct insulation.

1.2 SUBMITTALS

A. Data: For materials specified below.

B. Samples:

1. Of each type of insulation, 24 inches square.

1.3 HANDLING

A. Packaging: Provide unopened containers and packages with labels bearing producer(s) name and source of product and date of manufacture, with UL classification on package.

B. Storage:

1. Keep insulation protected while stored; keep dry during application.

2. Outdoors, store off ground on pallets, protected with breathing type covers.

3. Insulation shall be dry when installed.

4. Remove insulation that becomes wet or damp immediately from the job site.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Install insulation in dry weather, unless building is enclosed.

B. If insulation will be exposed to the elements after installation, cover with waterproof membrane each day.

PART 2 - PRODUCTS

2.1 THERMAL INSULATION

A. “R” value: Minimum of 19.

1. Type: Glass fiber or mineral wool batt or blanket insulation complying with ASTM C 665, Type III, Class A, flame spread 25 or less, formaldehyde-free by Johns Manville, Knauf, or equal.

2. Width: Batt width shall match the stud spacing and be sized for a friction-fit to be self-supporting.

2.2 INSTALLATION MATERIALS

A. Staples, zinc-coated wires and other devices for fastening insulation: As recommended by the insulation manufacturer.

B. Insulation tape: "FSK Copolymer" by Compac Corp., (800. 631.9347), General Purpose FSK Facing Tape by Venture Tape, (800.343.1076) or equal FSK-faced cold weather tape a minimum of 2 inches wide.

C. Supplementary metal framing where required for insulation support: As specified in Section 05 4100.

PART 3 - EXECUTION

3.1 EXAMINATION/PREPARATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct detrimental conditions before proceeding with installation.

C. Before installing insulation in stud walls, thoroughly clean space of debris. Also clean spandrel cavities of debris.

3.2 INSTALLATION

A. Install insulation where shown and specified. Cut to fit irregular spaces, butt edges into firm contact with each other and adjoining surfaces.

1. Hand pack around pipes, ducts, conduits, electrical boxes, and other penetrations as required to thoroughly fill all voids and spaces between framing members and to form a continuous thermal barrier.

2. Do not compress insulation more than 10 percent.

3. Install foil-faced insulation with foil facing the building interior.

B. Where insulation in stud walls is not self-supporting, hold it in place with wires spaced not more than 16 inches o.c. horizontally or by other methods acceptable to the Architect.

C. After installation is complete, tape penetrations and ruptures in vapor barrier and tape joints between batts continuously.

3.3 FIELD QUALITY CONTROL

A. Prior to closing-in of insulated assemblies, or prior to Substantial Completion for insulation that will remain exposed in the building, refit, reinstall and/or replace wet, damaged and displaced insulation.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Penetrations through fire-resistance-rated floors construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

4. Sealant joints in fire-resistance-rated construction.

B. Related work:

1. Division 7 for sealants.

2. Division 23 for basic mechanical requirements and materials.

3. Division 26 for basic electrical requirements.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide firestopping systems with the following characteristics produced and installed to resist the spread of fire and passage of smoke and other gases in compliance with CBC.

1. F-rated through-penetration firestop systems: Through-penetration firestop systems with F rating, determined in compliance with ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.

2. T-rated through-penetration firestop systems: Through-penetration firestop systems with T rating, in addition to F rating, determined in compliance with ASTM E 814, where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist.

a. Where firestop systems protect penetrations located outside of wall cavities.

b. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.

c. Where firestop systems protect penetrating items larger than a 4 in. diameter nominal pipe or 16 sq. in. in overall cross-sectional area.

B. Fire-resistive joint sealants: Joint sealants with fire-resistance rating determined in compliance with ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.

C. For firestopping exposed to view, traffic, moisture, and physical damage: Products that will not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing systems: Moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 in. or more in any dimension, and exposed to possible loading and traffic: Firestop system capable of supporting the floor load involved.

3. For penetrations with insulated piping: Through- penetration firestop systems not requiring removal of insulation.

D. For firestopping exposed to view: Products with flame- spread values of less than 25 and smoke-developed values of less than 450, as determined in compliance with ASTM E 84.

1.3 SUBMITTALS

A. Data: Manufacturer's product data for all materials and prefabricated devices and manufacturer's installation instructions.

B. Certification: Letter of certification, or certified laboratory test report that the material or combination of materials proposed for use meets the requirements specified in ASTM E 814, are so classified in UL Building Materials Directory, and are approved by the State Fire Marshal.

C. Shop drawings: Detail materials, installation methods, and interface with adjoining construction for each through-penetration firestop system, each kind of construction condition penetrated, and kind of penetrating item.

1. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.

D. Documentation: Include illustrations, from a qualified testing and inspecting agency, applicable to each through- penetration firestop configuration for construction and penetrating items.

1. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, obtain State Fire Marshal’s acceptance of the modification prior to submitting shop drawings.

E. Certificates: Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.

F. Reports: Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

1.4 QUALITY ASSURANCE

A. Reference standards: The applicable provisions of the following govern the work of this Section.

1. ASTM E 84, Test Method for Surface Burning Characteristics of Building Materials.

2. ASTM E 119, Standard Method of Fire Tests of Building Construction and Materials.

3. ASTM E 814, Fire Tests of Through-Penetration Fire Stops.

4. UL 1479, Fire Tests of Through-Penetration Firestops.

5. UL Building Materials directory: Through-Penetration Firestops Systems (XHEZ), and Fill, Void or Cavity Materials (XHHW).

B. Installer's qualifications:

1. Firm with at least 2 years experience with systems proposed for use, and who has successfully completed firestopping installations similar in material, design, and extent to that indicated for Project on at least 5 comparable projects.

2. Where firestopping manufacturer selected has training/certification program, insure that installer is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's products as specified.

C. Single-source responsibility: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.

D. Certifications and Code approvals: Materials proposed for use shall be approved by the State Fire Marshal for their intended use.

E. Pre-installation meeting: Prior to start of installation, arrange a pre-installation meeting between the manufacturer of the firesafing/firestopping materials and the trade responsible for their installation.

1. If more than one trade will be responsible for the work of this Section, these trades shall attend the meeting.

F. Compatibility: Provide firestop systems compatible with one another and with substrates under conditions of application and service, as demonstrated by manufacturer, based on testing and field experience.

1.5 HANDLING

A. Storage: In a manner to prevent material deterioration or damage. Do not use damaged and contaminated materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. One or a combination of the following, as selected by the manufacturer, depending on the condition of use:

1. 3M Fire Protection Products.

2. Hilti Construction Chemicals, Inc.

3. Specified Technologies, Inc.

4. Tremco Fire Protection Systems.

5. Equal.

2.2 MATERIALS

A. Accessories:

1. As required to install fill materials and complying with Article 1.2 above.

2. As specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems.

3. Permanent forming/damming/backing materials: The following is not all inclusive.

a. Semi-refractory fiber (mineral wool) insulation.

b. Ceramic fiber.

c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.

d. Fire-rated form board.

e. Joint fillers for joint sealants.

4. Temporary forming materials: The following is not all inclusive.

a. Substrate primers.

b. Collars.

c. Steel sleeves.

2.3 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Ceramic-fiber and mastic coating: Ceramic fibers in bulk form formulated for use with mastic coating, and ceramic fiber manufacturer's mastic coating.

B. Ceramic-fiber sealant: Single-component formulation of ceramic fibers and inorganic binders.

C. Endothermic, latex compound sealant: Single-component, endothermic, latex formulation.

D. Intumescent, latex sealant: Single-component, intumescent, latex formulation.

E. Intumescent putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent wrap strips: Single-component, elastomeric sheet with aluminum foil on one side.

G. Job-mixed vinyl compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.

H. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogenous mortar.

I. Silicone foam: 2-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.

J. Silicone sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant.

K. Solvent-release-curing intumescent sealant: Solvent release curing, single-component, synthetic polymer based sealant.

L. Color: Where firestopping/firesafing material is exposed to view, provide material color selected by the Architect from the manufacturer's palette, unless material will be field painted.

2.4 MIXING

A. For products that require mixing prior to application, comply with firestopping manufacturer's directions.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean surfaces to be in contact with firesafing and firestopping materials of dirt, grease, oil, loose materials, rust, and other substances that may affect proper fitting or the required fire resistance.

B. Verify conditions and measurements affecting the work of this Section at site. Make sure that detrimental conditions are corrected before proceeding with installation.

3.2 INSTALLATION - GENERAL

A. General: Install materials in compliance with their manufacturer's instructions and to comply with printed instructions of UL Fire Resistance Directory.

B. Surface cleaning: Clean-out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following.

1. Remove foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form release agents from concrete.

C. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

D. Masking tape:

1. Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials.

2. Remove tape as soon as it is possible to do so without disturbing firestopping seal with substrates.

3.3 INSTALLING THROUGH-PENETRATION FIRESTOPS

A. Forming/damming materials and accessories:

1. Install as required to support fill materials during their application to produce the cross-sectional shapes and depths required to achieve fire ratings of firestop systems.

2. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

B. Install fill materials for through-penetration firestop systems to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

A. Install joint fillers to provide support of sealants during application and produce the cross sectional shapes and depths of installed sealants for optimum sealant movement capability and develop fire-resistance rating required.

B. Install sealants so they will directly contact and fully wet joint substrates, completely fill recesses provided for each joint configuration, and provide uniform, cross- sectional shapes and depths relative to joint width. Install sealants at the same time joint fillers are installed.

C. Tool non-sag sealants immediately after sealant application and before skinning or curing begins. Form smooth, uniform beads. Eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint.

1. Remove excess sealant from surfaces adjacent to joint.

2. Do not use tooling agents that would discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.5 FIELD QUALITY CONTROL

A. Examine firestopped areas to ensure proper installation prior to concealing or enclosing firesafed and firestopped areas.

B. Repair damaged areas and restore the integrity of the assembly.

C. Keep areas of work accessible until inspection and approval by OSHPD inspector.

3.6 CLEANING

A. Clean-up spills of liquid components.

B. Cut and trim excess materials neatly, flush with adjacent surfaces.

END OF SECTION

SECTION 07 9200
JOINT SEALERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Exterior joints in vertical surfaces and non-traffic horizontal surfaces as indicated below:

a. Control and expansion joints in Portland cement plaster.

b. Joints between different materials listed above.

c. Perimeter joints between materials listed above and frames of doors and glazed assemblies.

d. Other joints as indicated and required to make the building weathertight.

2. Interior joints in vertical surfaces and horizontal non-traffic surfaces as indicated below:

a. Perimeter joints of exterior openings.

b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.

c. Other joints as indicated.

3. Interior joints in horizontal traffic surfaces as indicated below:

a. Other joints as indicated.

B. Related work:

1. Division 7 for firestopping sealants.

2. Division 7 for acoustical sealants.

3. Division 8 for storefronts and glazing sealants.

4. Division 23 for duct sealants.

1.2 SYSTEM DESCRIPTION

A. Joint sealants are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, with recognized limitations of wear and aging as indicated for each application.

1.3 DEFINITIONS

A. Substrates:

1. M type substrates: Concrete, concrete masonry units, brick, mortar, natural stone. The term "masonry" means brick, stone, and concrete masonry work.

2. G type substrates: Glass and transparent plastic glazing sheets.

3. A type substrates: Metals, porcelain, glazed tile, and smooth plastics.

4. O type substrates: Wood, unglazed tile; substrates not included under other categories.

1.4 SUBMITTALS

A. Data:

1. Data sheets and published instructions for each type of sealant, backing, bond breaker, and other accessory materials, together with statement that the proposed materials comply with these Specifications.

2. Include manufacturers' recommendations for surface preparation and priming for all substrates to be in contact with sealant on the Project.

B. Certification: Sealant manufacturer certification that sealants, backing rods, and other materials proposed for use in the application of sealants, are chemically compatible with the materials which will come in contact with the sealants and will not cause deterioration, premature aging and staining of adjacent materials, or the sealants.

C. Test results: Results of adhesion and staining tests performed on same materials as those intended for use on the Project.

D. Samples: Cured samples of the various types and colors of materials proposed for use, approximately 12 inches long, mounted on hardboard backing.

1.5 QUALITY ASSURANCE

A. Uniformity: All sealants used in or on the exterior walls of the building shall be made by the same manufacturer.

B. Installer's qualifications: Firm with a minimum 5 years of experience with joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

C. Color selection:

1. Final color selection of sealants to be used for exterior locations will be made by the Architect from job-applied samples on in-place materials.

2. The Architect will select locations and extent of these samples, but length of sealant joints will not exceed 20-foot for vertical surfaces and 10-foot for horizontal surfaces.

D. Quality control by sealant manufacturer:

1. Submit statements on the manufacturer's letterhead, dated no earlier that one year prior to submittal, for tests listed below.

2. Test data more than a year old will be acceptable provided manufacturer states that formulations or manufacturing methods have not changed sufficiently to change test results.

3. Submit samples of materials to be used for the Project to the manufacturer as required for tests.

4. Test methods:

    a. ASTM C 794: Sealant compatibility and adhesion to each substrate to be encountered on the Project.

    b. Compliance with ASTM C 920 for elastomeric sealants. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (ASTM C 719), low temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.

    c. ASTM C 1087: Sealant compatibility with backing.

    d. ASTM C 1087: Sealant compatibility and lack of adhesion to bond breaker.

    e. ASTM C 1247: Durability of sealants exposed to continuous water immersion.

    f. ASTM C 1248: Stain Testing.

5. Include identification of any special substrate cleaning process, and required adhesion promoter or primer.

E. Preconstruction field testing: Prior to installation of joint sealants, field-test their adhesion to joint substrates as follows:

1. Locate test joints where indicated or, if not indicated, as directed by Architect.

    a. Each type of sealant and joint substrate indicated.

2. Notify Architect one week in advance of the dates and times when mockups will be erected.

3. Test method: Test joint sealants by hand pull method described below:

    a. Install joint sealants in 5-foot joint lengths using same materials and methods for joint preparation and joint sealant installation required for completed Work. Allow sealants to cure fully before testing.

    b. Make knife cuts horizontally from one side of joint to the other followed by 2 vertical cuts approximately 2 inches long at side of joint and meeting horizontal cut at top of 2-inch cuts. Place a mark 1 inch from top of 2-inch piece.

    c. Use fingers to grasp a 2-inch piece of sealant just above 1-inch mark; pull firmly down at a 90-degree angle or more while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.

4. Report whether or not sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.

5. Evaluation of field test results: Sealants not evidencing adhesive failure from testing, in absence of other indications of non-compliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.6 HANDLING

A. Storage:

1. Store sealant containers in a protected location in compliance with their manufacturer's instructions until their use. Do not store at temperature higher than 80-degree F.

2. Do not use sealants whose shelf life has expired.

1.7 JOB CONDITIONS

A. Do not install sealants under adverse weather conditions, or when temperatures are beyond manufacturer's recommended limits.

B. Proceed with the installation only when forecasted weather conditions are favorable for proper sealant cure and development of early bond strength.

1.8 WARRANTY

A. Warrant sealants against defective materials and workmanship for 5 years after Substantial completion.

B. Warranty shall further state that installed sealants are warranted against the following:

1. Water leakage through exterior sealed joints.

2. Adhesive or cohesive failure of sealant.

3. Staining of adjacent surfaces caused by migration of sealants or primer.

4. Chalking or visible color change of the cured sealants.

C. Make repairs during the warranty period at no cost to the District.

PART 2 - PRODUCTS

2.1 SEALANTS

A. Colors: Match sealant color to color of adjacent materials as closely as possible using colors selected from the manufacturer's standard palette, as approved by the Architect.

B. Compatibility: Provide joint sealers, joint fillers and other related materials as follows:

1. That will not cause staining, degradation and premature aging of the adjacent surfaces and the sealant itself, when in contact with these surfaces.

2. Compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

C. Bulk sealants:

1. For interior and exterior horizontal application subject to pedestrian traffic: Multi-component pourable urethane sealant.

a. Type and grade: M (multicomponent) and P (pourable).

b. Class: 25.

c. Use related to exposure: T (traffic).

d. Uses related to joint substrates: M, A, and, as applicable to joint substrates indicated, O.

e. Products:

1) Pecora Corp.: Urexpan NR-200.

2) Sika Corp., Inc.: Sikaflex 1CSL.

3) Tremco: THC-900.

4) Tremco: Vulkem 245.

2. For all other exterior applications:

a. Type and grade: S (single component) and NS (nonsag), neutral- and basic-curing silicone sealant.

b. Class: 100/50.

c. Use related to exposure: NT (non-traffic).

d. Uses related to joint substrates: M, G, A, and, as applicable to joint substrates indicated, O.

e. Products:

1) Dow Corning 795, 790, 756 SM.

2) General Electric - Silpruf, Silpruf LM, Silpruf NB.

3. For all other interior vertical applications: Latex sealant complying with ASTM C 834, Type P, Grade NF.

a. Products:

1) Pecora Corp.: AC-20+.

2) Schnee-Morehead, Inc.: SM 8200.

3) Sonneborn, Division of ChemRex Inc.: Sonolac.

4) Tremco: Tremflex 834 or Acrylic Latex 384.

4. Tape sealants:

a. Norton Specialties Plastics Div.: Norseal 730 or 770.

b. Protective Treatments, Inc.: PTI 606.

c. Or equal.

2.2 JOINT CLEANER, PRIMER AND SEALER

A. As recommended by the sealant manufacturer, for the surfaces to be cleaned, primed or sealed.

2.3 BOND BREAKER TAPE

A. Polyethylene or other plastic tape recommended by the sealant manufacturer to prevent 3-sided adhesion where backer rod cannot be used.

B. Use self-adhering tape wherever possible.

2.4 BACKER ROD

A. General:

1. Provide size, density and shape of rod which will control the joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back, and provide a highly compressible backer to minimize the possibility of sealant extrusion when joint is compressed.

B. Type: ASTM C 1330, of type indicated below:

1. Type C: Closed-cell material with a surface skin, Nomaco SOF ROD/Dual Rod, or equal.

2. For fillet and cove joints, Nomaco HBR 1/4-inch Round.

C. Elastomeric tubing sealant backings:

1. Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, non-absorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F.

2. Provide products with low compression set.

2.5 MASKING TAPE

A. Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct detrimental conditions before proceeding with installation.

3.2 JOINT PREPARATION

A. Clean out joints immediately before installing sealants to comply with recommendations of joint sealant manufacturer and the following.

B. Remove foreign material from joint substrates that could interfere with adhesion of sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water-repellents, water, surface dirt, and frost.

C. Clean concrete and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.

1. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

D. Remove laitance and form release agents from concrete.

E. Clean metal, glass and other non-porous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

F. Do not proceed with sealant installation over surfaces that have been painted, waterproofed or treated with water-repellent or other coating unless specifically approved in writing by the sealant manufacturer.

G. Use masking tape or other protection to limit coverage of sealant to joints to be sealed. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

A. Comply with sealant manufacturer's instructions and ASTM C 1193, except where more stringent requirements are specified herein. At the Architect's option, ASTM C 1193 may also be used for rejection of unacceptable installations.

B. Prime or seal surfaces when recommended by the sealant manufacturer; when the manufacturer's instructions on priming are optional, prime the surface. Do not allow primer/sealer to spill or migrate onto adjacent surfaces.

C. Install backer rod for all sealants, except where the size of joint prevents the insertion of a backer rod, and where recommended otherwise by the sealant manufacturer.

1. Install backer rods with blunt or rounded tools to avoid puncturing the material.

2. Do not twist, stretch or braid the backer rod.

D. Install bond breaker tape where space limitation does not permit use of a backer rod.

E. In no case shall sealant have 3-sided adhesion.

F. Employ only proven installation techniques that will ensure that sealants are installed in uniform, continuous ribbons without gaps or air pockets and with complete "wetting" of the rabbet surfaces equally on opposite sides.

1. Fill concave joints to the configuration shown on Figure 8A of ASTM C 1193.

2. Provide flush joints to the configuration shown on Figure 8B of ASTM C 1193.

3. Provide recessed joints configuration as shown on Figure 8C of ASTM C 1193, unless otherwise indicated or required to match adjacent non-moving joint.

4. Where horizontal joints occur between horizontal and vertical surfaces, fill joints to form a slight cove to prevent trapping moisture and dirt.

5. Immediately after sealant application and prior to beginning of skinning or curing, tool sealant using tooling agents that will not discolor sealants or adjacent surfaces and are approved by sealant manufacturer.

G. Do not allow sealant or other compound to overflow, spill or migrate into voids of adjacent construction.

H. Remove excess sealant spillage promptly as this work progresses. Clean adjacent surfaces by recommended means to remove sealant, but not damage the surfaces.

3.4 CURING/PROTECTING

A. Cure sealants in compliance with their manufacturer's instructions to obtain high early bond strength, internal cohesive strength and durability. Do not disturb seals until completely cured.

B. Protect sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion.

END OF SECTION

SECTION 07 9219
ACOUSTICAL BLANKET INSULATION AND SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Acoustical insulation in interior partitions where indicated.

2. Acoustical sealants and related materials.

3. Supplementary parts and components, such as clips, fasteners, supplementary framing, and other miscellaneous accessories required for a complete installation.

B. Related work:

1. Division 7 for weather-sealing sealants.

2. Divisions 22 and 23 for pipe and duct insulation.

1.2 SUBMITTALS

A. Data: Submit manufacturer's product data for materials specified below.

B. Samples: Submit 12-inch square samples of each type of insulation; 12-inch long samples of tape and sealants; full size samples of acoustical pad.

1.3 HANDLING

A. Store materials under cover, protected from moisture and off the ground or floor. Remove insulation that becomes wet or damp immediately from the job site.

PART 2 - PRODUCTS

2.1 BATT INSULATION

A. Formaldehyde-free, unfaced blankets "Sound Control Batts" by Johns Manville, "Greenguard" by Knauf, "Sound Attenuation Batt Insulation" by Owens-Corning or equal.

B. Unless other indicated, provide insulation of same thickness as the stud depth.

2.2 ACOUSTICAL SEALANTS

A. Pecora Corp.: AC-20.

B. US Gypsum Co.: Sheetrock Acoustical Sealant.

C. Tremco, Inc.: Acoustical Sealant.

D. WW Henry Co.: Henry 313.

E. Tremco: Acoustical Sealant.

F. Fire-resistive acoustical foam tape: Compressible, closed cell polyvinyl chloride foam with pressure sensitive adhesive, in rolls with protective release liner on non-adhesive face, 6 pcf density, 1 inch wide by not less than 1/4 inch thick, self-extinguishing, UL 94 recognized, Norseal V740FR by Norton Performance Plastics Corp., or equal.

2.3 ACOUSTICAL PADS

A. Fire-rated walls: Putty Pads by International Protective Coatings (800) 334-8796), Flamesafe FSP 1077 by WR Grace (800) 334-8796, Hilti CP617 by Hilti (800) 879-6000, 3M Fire Barrier Moldable Putty Pad by 3M (800) 328-1687, Metacaulk Putty Pads by RectorSeal (800) 231-3345 or Putty Pads by Specified Technologies, Inc. (800) 992-1180.

B. Elsewhere: Lowry Box Pads by Henry A. Lowry Co. (800) 225-8231, Sound Pad #68 by LH Dottie Co. (323) 725-1000, or Type FSP Firestop Putty Pads by Nelson Electric (800) 331-SEAL.

2.4 ACCESSORIES

A. Staples, zinc-coated wires and other devices for fastening insulation: As recommended by the insulation manufacturer.

B. Supplementary metal framing where required for insulation support: As specified in Section 09 2216.

PART 3 - EXECUTION

3.1 EXAMINATION/PREPARATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Before installing insulation in stud walls, thoroughly clean space of debris.

C. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 ACOUSTICAL PADS

A. Cover the back and sides of all electrical, telephone and CATV boxes in sound-insulated walls with the acoustical pad specified.

B. Verify that all unused knockouts are plugged before installing the pads.

C. Mold pads tightly to the boxes and to the adjacent surfaces.

3.3 INSULATION

A. Cut to fit irregular spaces, butt edges into firm contact with each other and adjoining surfaces.

1. Hand pack around pipes, ducts, conduits, electrical boxes, etc., as required to thoroughly fill all voids and spaces between framing members and to form a continuous acoustical barrier.

2. Comply with the California Electrical Code (CEC) for installation in proximity to light fixtures. Do not install insulation closer than recommended by CEC.

B. In stud walls more than 8 feet high, and where the insulation is not self-supporting, attach to gypsum board using staples with divergent points placed at each corner and at 24 inches o.c. thereafter.

3.4 ACOUSTICAL SEALANT

A. Comply with ASTM C 919 and the following.

B. Clean space to be calked of debris, dust and powdered materials which would prevent the sealant from adhering properly.

C. Seal openings between gypsum board and the perimeter of items penetrating gypsum board, such as electrical boxes, continuously using sealant specified.

D. Seal openings between the gypsum board and floors and ceilings along sound-insulated walls continuously, and along those intersecting walls for a minimum distance of 3-foot from insulated walls. When multiple layers occur, seal the perimeter of each layer continuously.

E. Seal gypsum board edges in contact with door frames continuously.

3.5 FIELD QUALITY CONTROL

A. Prior to closing-in of insulated assemblies, or prior to Substantial Completion for insulation that will remain exposed in the building, refit, reinstall and/or replace wet, damaged and displaced insulation.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Flush steel doors.

2. Steel door frames.

3. Vision panel frames in steel doors.

4. Installation of salvaged hollow metal doors and frames.

5. Supplementary parts and components, such as inserts, clips, fasteners, anchors, and other miscellaneous supports and accessories required for a complete installation.

B. Work installed but furnished in other Sections: Division 8 for finish hardware.

C. Related work:

1. Division 8 for aluminum storefronts and entrances.

2. Division 8 for glazing vision panels in steel doors.

3. Division 9 for finish painting the work of this Section.

1.2 REFERENCES

A. ANSI 250.8, Recommended Specifications for Standard Steel Doors & Frames.

B. SDI 105, Recommended Erection Instructions for Steel Frames.

C. SDI 117, Manufacturing Tolerances Standard Steel Doors and Frames.

1.3 SUBMITTALS

A. Shop drawings:

1. Door schedule indicating opening identification symbol, door and frame types, sizes, including thickness, swing, vision panels, and undercuts.

2. Door and frame elevations, materials, construction, finish, anchoring for each wall condition, conditions of openings**,** vision panel size and locations, and accessories.

3. Location and size of reinforcement for finish hardware.

4. Locations of field splice joints, including associated details to assure proper assembly at Project site.

5. Identify work that cannot be permanently factory assembled before shipment.

6. Use same reference numbers for openings and details as shown on Contract Drawings.

B. Samples: Corner section of frame, approximately 8-inch long.

C. Data: Manufacturer product data for doors and frames.

1.4 HANDLING

A. Procedure: In accordance with SDI recommendations.

B. Delivery:

1. Inspect doors, frames, and accessories delivered to the site for damage. Unload and store, as specified, with a minimum of handling.

2. Unless frames are packaged head to toe, provide temporary steel spreaders securely fastened to the bottom of each frame.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. One of the following, or equal:

1. Door Components, Inc.

2. Los Angeles Fireproof Door Co.

3. Pacific Steel Products, Inc.

4. CECO.

5. Curries Co.

6. Security Metal Products.

7. Steelcraft Manufacturing Co.

8. Stiles Hollow Metal.

2.2 MATERIALS

A. Galvanized steel sheets: ASTM A 653, QC classification, with a G60 or A60 zinc coating, mill-phosphatized.

B. Inserts, bolts and fasteners: Manufacturer's standard units, except hot-dip galvanize all items in exterior walls.

C. Paints:

1. For touchup of damaged galvanized surfaces: SSPC Paint No. 20, Type II (Organic) zinc-rich primer by Tnemec, or equal be Porter International, Valspar Corp., Ameron Protective Coatings or DuPont Co.

D. Door filler: In compliance with SDI 100.

2.3 FABRICATION - GENERAL

A. Do not begin fabrication until the fabricator receives and accepts the hardware schedule approved by the Architect and submitted by the hardware supplier.

B. Fabricate work of this Section to required profiles by roll-forming, brake-forming and welding to produce hollow metal work with straight and square edges, with surfaces free from warp, wave, buckle, oil-canning and other defects.

C. Comply with SDI 100 and SDI 117, Manufacturing Tolerances Standard Steel Doors and Frames.

D. Conform to AWS standards for welding. Face weld frames with exposed welds ground flush and smooth with parent metal.

E. Fabricate doors and frames from galvanized steel.

F. Locate hardware as indicated on approved shop drawings or, if not indicated, according to ANSI A250.8.

G. Provide 16-gage (0.053 inch) reinforcement for pull plates and bars; through bolt are not permitted. Provide reinforcement for closers on all door frames.

H. Provide minimum 26-gage (0.0179 inch) steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

I. Steel members shall be pre-straightened, free of wind or twist. Factory-align to a diagonal tolerance of plus or minus 1/16 inch.

2.4 FLUSH DOORS

A. Standard: Complying with SDI 100, Recommended Specifications Standard Steel Doors and Frames, except as specified.

B. Steel doors:

1. SDI Level 3 and Physical Performance Level A (Extra Heavy Duty), model 2 (Seamless), 16-gage (0.053 inch). Provide doors with seamless welded edges ground to be invisible from adjacent surfaces; do not use Bondo or similar material to close gap between face sheets at door edge.

2. Doors shall be internally reinforced using welded metal stiffeners.

3. Close the top of out-swinging exterior doors with an inverted flush channel.

4. Provide exterior doors with a U factor of 0.24 BTU/hr. by square foot by degree F when tested in compliance with ASTM C 236.

2.5 FRAMES

A. Standard: Complying with SDI 100, Recommended Specifications Standard Steel Doors and Frames, except as noted.

B. Steel door frames: Fabricate of steel 2-gage heavier than door face in same opening, minimum 14-gage (0.067 inch), corners reinforced, mitered, interlocked and/or welded, and all visible joints continuously welded and ground smooth; non-welded joints visible in the finish work are not permitted.

2.6 VISION PANELS IN DOORS

A. Make cutouts for vision panels square and parallel with door edges.

B. Provide integrally-formed glass stops on security side of doors and removable glass stops on opposite side.

1. Size rabbet to fit glass thickness indicated.

2. Attach removable glass stops securely in place with countersunk oval head machine screws spaced equally at not more than 12 inches o.c. and 2 inches from corners.

2.7 SHOP PRIMING

A. After assembly, clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before painting.

1. Grind welds and fabrication marks flush and smooth with parent metal.

2. Fill depressions with metal filler before applying the shop primer.

3. Apply one or more coats of epoxy mineral filler to conceal spot welds.

4. Where galvanized coating is damaged, touchup with zinc-rich primer.

B. Acid-etch galvanized surfaces before pretreating.

C. Apply shop primer, within time limits recommended by pretreatment manufacturer, to provide a smooth coat of even consistency and to produce a dry film thickness of not less than 1-1/2 mils DFT.

D. Door assemblies with visible spot welds before or after application of finish paint will be unacceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction and supports.

B. Verify that openings are within allowable tolerances, plumb, level, clean, will provide a solid anchoring surface.

C. Correct other conditions detrimental to the proper or timely completion of this work before proceeding with installation.

3.2 INSTALLING FRAMES

A. Set frames accurately in their scheduled locations, plumb, straight, square and rigid.

1. Comply with these Specifications, the Drawings, SDI 105, Recommended Erection Instructions for Steel Frames, the approved shop drawings and UL tested procedures for fire-rated openings; when in conflict, the most restrictive provision applies.

2. Brace frames to prevent their displacement during erection of adjacent walls.

3. Coordinate the installation of built-in anchors for wall and partition construction with related trades. Refer to Section Division 4 for frames in CMU walls.

4. Provide 2 anchors at head of frames exceeding 42 inches wide for frames mounted in steel stud walls.

5. Provide 3/8-inch by 2-inch vertical steel struts extending from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry, continuous boxed studs, or to other structural support at each jamb.

a. Bend top of struts to provide flush contact for securing to supporting construction above.

b. Provide adjustable wedged or bolted anchorage to frame jamb members in compliance with UL 63.

B. Frame anchors: 18-gage (0.0478 inch) galvanized steel.

1. Insert “nail-on” type with notched clip to engage stud, welded to back of frames. Provide at least 4 anchors for each jamb for frames up to 90 inches high; 5 anchors up to 96 inches high; one additional anchor each 24 inches or fraction thereof over 96 inches. Attach jamb anchors to studs with a minimum of four 3/8-inch diameter self-tapping screws or bolts (2 per side).

C. Provide UL tested adjustable floor clips for all frames. Anchor clips to floor with powder-driven pins or bolts in expansion shields.

D. Leave frame spreader bars intact, wherever possible, until frames are set perfectly square and plumb and all anchors are securely attached and grouted where required.

E. Installation tolerances: Adjust door frames for squareness, alignment, twist, and plumb to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

3.3 HANGING DOORS

A. Install finish hardware in compliance with its manufacturer's templates and instructions.

B. Hang doors in compliance with their manufacturer's instructions, and adjust to the clearances specified in ANSI publication A250.8, paragraph 2.2.1, except where more stringent clearances are indicated on the Drawings.

C. Do not install doors warped, bowed, dented or otherwise damaged.

D. Adjust hardware so that doors operate freely for their entire travel, but not loosely, without sticking or hinge binding, with hardware adjusted and functioning properly.

E. Fit doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-fire-rated standard steel doors:

a. Jambs and head: 1/8-inch plus or minus 1/16-inch.

b. Between edges of pairs of doors: 1/8-inch plus or minus 1/16-inch.

c. Between bottom of door and top of threshold: Maximum 3/8-inch.

d. Between bottom of door and top of finish floor (no threshold): Maximum 3/4-inch.

F. Glazing:

1. Comply with installation requirements in Section 08 8100 and with standard steel door and frame manufacturer's instructions.

2. Secure stops with countersunk flat- or oval-head machine screws spaced equally and symmetrically not more than 8 inches o.c., and not more than 2 inches o.c. from each corner.

3.4 TOUCHUP

A. Clean damaged primer, sand smooth, re-clean and spot-prime with paint compatible with the primer and the scheduled finish coats.

B. Before application of primer, touchup galvanized surfaces with zinc-rich coating where zinc coating has been removed or damaged.

END OF SECTION

SECTION 08 1423
PLASTIC LAMINATE FACED WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Plastic laminate faced flush wood doors.

2. Vision panel frames in wood doors.

B. Work installed but furnished in other Sections:

1. Division 8 for finish hardware.

C. Related work:

1. Division 8 for glazing wood doors.

1.2 REFERENCES

A. AWI, Architectural Woodwork Quality Standards.

B. DHI Wood Door Hardware Standards, Series WDHS-1/WDHS-3 and series W1/W9, Installation Guide for Doors and Hardware.

1.3 SUBMITTALS

A. Data: Manufacturer's data for doors and vision panel frames.

B. Shop drawings: Show the following.

1. Door schedule indicating opening identifying number, door type, grade, size, thickness, swing, label requirements, and undercuts.

2. Door elevations indicating type of construction, and conditions at cutouts for vision panels.

3. Prefitting and premachining requirements, including hardware locations.

4. Use same reference numbers for openings and details as Contract Drawings.

C. Samples:

1. 6-inch square samples of plastic laminate of each color.

2. Corner samples showing face veneer, edge and core construction for each type of door specified.

1.4 QUALITY ASSURANCE

A. Fire resistance:

1. Provide fire-rated doors bearing the label of a testing agency acceptable to DSA and SFM for the fire resistance indicated. Permanently attach label on top rail, indicating the testing agency's approval for the rating classification required.

B. Uniformity: All wood doors for the Project shall be made by the same manufacturer.

1.5 HANDLING

A. For mineral core doors, comply also with the door manufacturer's instructions to prevent moisture deterioration of fire-retardant salts.

B. Delivery:

1. Deliver doors factory-wrapped in polyethylene bags, unitized and palletized. Shrink-wrap each pallet and provide corner guards for protection.

2. Mark each door with architectural opening number in distribution and installation.

3. Do not deliver doors to the Project until proper storage space is available.

C. Storage:

1. Store doors in an assigned space having controlled temperature and humidity as recommended by AWI, flat, on factory pallets or on 3 full 2 by 4s, one centered and the other two 12 inches from each end.

2. Protect doors from construction activity with plywood and store away from direct sunlight.

D. Handling:

1. Handle doors with clean hands.

2. Do not drag doors across one another.

3. Maintain factory packaging or other means of protection of doors until Substantial Completion.

1.6 JOB CONDITIONS

A. Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period.

B. Comply with referenced AWI quality standard including section 100-S-3 "Moisture Content".

1.7 WARRANTY

A. Provide manufacturer's warranty against doors delaminating, telegraphing core through face veneer or do not conform to tolerance limitations of referenced quality standards for 5 years after installation.

B. Warranty shall also include reinstallation required due to repair or replacement of defective doors where defect was not apparent prior to hanging.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Essex Industries, Inc Haley Bros., Weyerhaeuser Co., Algoma Hardwoods, Inc. Eggers Industries, and Vancouver Door, Inc.

2.2 DOORS AND TRANSOM PANELS

A. Doors:

1. Model: AWI Type PC-HPDL.

2. Style: Flush.

B. Grade: AWI Custom. Doors are avialable either 3- or 5-ply, except that fire rated doors are always 5-ply.

1. Face: 0.05-inch high pressure decorative laminates selected by the Architect from door manufacturer's standard colors.

2. Core: Fully bonded, mat-formed particleboard complying with CS 236, Type I, Density C, Class 1.

3. Stile edge: SCL clad with plastic laminate, laminate edges before door faces.

4. Rail edge: Mill option softwood bonded to core, 1-1/8-inch thick minimum after trimming.

C. Labeled plastic laminate doors:

1. Model: AWI Type FD.

2. Style: Flush.

D. Grade: AWI Custom.

1. Face: 0.05-inch high pressure decorative laminates selected by the Architect from door manufacturer's standard colors.

2. Core: As required by the fire rating. Where mineral core are provided, assemble doors with solid fire-retardant wood rails and lokblocks for hardware attachment without the use of through bolts (Chicago Bolts).

3. Stile edge: 5/8-inch thick after trimming treated hardwood.

4. Rail edge: Treated wood, top 1/2 inch thick minimum treated; bottom: 1-1/2-inch thick minimum.

5. Rating: As scheduled.

2.3 ACCESSORIES

A. Vision panel frames:

1. By Air Louvers, Inc., Airolite Co., Anemostat Products Div. /Dynamics Corp. of America or Ventilouver Co.

2. Formed of 18-gage minimum furniture steel, fabricated with mitered and welded square corners, and provided with tamper-proof Chicago type bolts.

3. Finish by cleaning, treating for paint bond and shop priming.

2.4 FACTORY MACHINING/FINISHING

A. Factory-machine doors by manufacturer or qualified distributor for cutouts, hinges, locks and all hardware requiring routing or mortising. Refer to Article 3.2 below for door clearances.

B. Use caution to avoid voiding the manufacturer's warranty and the fire rating when making cutouts for hardware preparation.

C. Factory prepare doors to receive vision panels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction and supports.

B. Verify that frames are within allowable tolerances, plumb, level, clean, will provide a solid anchoring surface, and that other condition’s detrimental to the proper or timely completion of this work are corrected before proceeding with installation.

3.2 INSTALLING FINISH HARDWARE/HANGING DOORS

A. Install finish hardware in compliance with its manufacturer's instructions and the requirements of Section 08 7100.

1. Fit accurately to doors.

2. Locate as specified for steel doors in Section 08 1113.

3. Locate hardware as recommended in Table V of SDI 100, except where ADA regulations are in conflict, in which case comply with ADA regulations.

B. Install vision panels square and parallel with door edges, with flush, hairline joints.

C. Condition doors to average prevailing humidity in installation area prior to hanging.

D. Bevel door stile 1/8 inch in 2 inches. Accurately fit doors to frames with clearances not exceeding the following:

1. 1/8 inch at lock, hanging stile and top.

2. 1/4 inch at door bottom, except that where noted in the door schedule, undercut doors 1 inch above finish flooring as applicable.

E. Hang doors to operate freely for their entire travel, but not loosely, without sticking or hinge binding, with all hardware adjusted and functioning properly.

F. Comply with NFPA No. 80 and DSA and SFM requirements for installation of fire-rated doors.

3.3 REPLACING DAMAGED DOORS

A. Replace doors showing chips, scratches, unbonded face veneers, glue stains, excessive warp or other damage that cannot be satisfactorily repaired, as determined by the Architect, with acceptable doors.

3.4 PLASTIC LAMINATE SCHEDULE

A. To be selected by Architect.

END OF SECTION

SECTION 08 4113
ALUMINUM-FRAMED STOREFRONTS AND ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Aluminum storefront framing.

2. Aluminum-framed glass doors.

3. Mullion covers, subframes, reinforcement and anchors, and sealants for the work of this Section.

4. Glass and glazing for the work of this Section.

5. Supplementary parts and components, such as inserts, clips, fasteners, anchors, bracing and other miscellaneous supports required for a complete, weatherproof installation.

B. Work installed but furnished in other Sections:

1. Division 8 for finish hardware on doors.

C. Related work:

1. Division 8 for glazing requirements for the work of this Section.

1.2 REFERENCES

A. AA, Aluminum Standards and Data.

B. AISC, Steel Construction Manual.

C. AISI, Cold-Formed Steel Design Manual.

D. AWS D1.1, Structural Welding Code.

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

A. General: Provide aluminum storefront and entrance systems capable of withstanding loads, and thermal, seismic and structural movement indicated without failure, based on testing manufacturer standard units in assemblies similar to those indicated for this Project. Failure includes the following.

1. Air infiltration and water penetration exceeding specified limits for exterior assemblies.

2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.

B. Glazing: Physically and thermally isolate glazing from framing members.

C. Wind loads:

1. Provide assemblies in exterior walls, including anchorage, capable of withstanding wind-load design pressures prescribed by Code, but not less than 20 psf inward and outward.

2. Provide interior assemblies, including anchorage, capable of withstanding a lateral pressure of not less than 5 psf.

3. Limit deflection of framing members in a direction normal to wall plane to 1/175 of clear span or 3/4 inch, whichever is smaller.

4. Static-pressure test performance for exterior assemblies: Provide assemblies that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.

a. Test pressure: 150 percent of inward and outward wind-load design pressures.

b. Duration: As required by design wind velocity; fastest 1 mile of wind for relevant exposure category.

D. Seismic loads: Provide assemblies, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction.

E. Dead loads:

1. Provide glazing members that will not deflect an amount, which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.

2. Provide a minimum 1/8 inch clearance between members and top of glazing or other fixed part immediately below.

3. Provide a minimum 1/16 inch clearance between members and doors.

F. Live loads: Provide assemblies, including anchorage, that accommodate the supporting structure deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.

G. Air infiltration:

1. Provide exterior storefront systems with permanent resistance to air leakage of not more than 0.06 cfm/square foot of fixed wall area when tested according to ASTM E 283 at a static air pressure difference of 6.24 psf.

2. Provide exterior single acting offset doors with air infiltration not exceeding 0.50 cfm/lineal foot of perimeter crack. A pair of 6-foot by 7-foot doors and frame shall not exceed 1 cfm/linear foot of perimeter crack.

H. Water penetration:

1. Provide exterior storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 8 psf.

2. Water leakage is defined as uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation.

3. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

I. Thermal movements:

1. Provide exterior assemblies, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.

2. Temperature change (range): 120-degree F. ambient, 180-degree F. material surfaces.

J. Movements of the structural-support: Provide assemblies that accommodate structural movements including, but not limited to, sway and deflection.

K. Dimensional tolerances: Provide entrances and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

L. Performance requirements for doors: Resistance to corner racking shall be tested by the "Dual Moment Load" test as follows.

1. Test section shall consist of a standard top door corner assembly. Side rail section shall be 24 inches long; top rail section shall be 12 inches long.

2. Anchor "top rail" positively to test bench so that corner protrudes 3 inches beyond the bench edge.

3. Anchor a lever arm positively to "side rail" at a point 19 inches from the inside edge of "top rail." Attach weight support pad at a point 19 inches from inner edge of "side rail".

4. Test section shall withstand a load of 170 lb. on the lever arm before reaching the point of a 1/18 inch gap at the stile/rail, joint or a 3-degree rotation in the stile. Further failure, defined as a rotation of the lever arm in excess of 45, shall not be reached before 270 lb.

1.4 SUBMITTALS

A. Data: List of manufactured and fabricated products and components proposed for use.

B. Shop drawings:

1. Large scale dimensioned shop and erection drawings for the work of this Section showing the following:

a. Elevations.

b. Detail sections of typical composite members.

c. Hardware mounting heights.

d. Hardware schedule and indicate operating hardware types, quantities, and locations.

e. Expansion provisions.

f. Glazing details.

2. Show relative layout of adjacent beams, columns, and slabs, all correctly dimensioned.

3. Identify shop and field sealants by product name and locate on shop drawings.

4. Identify welds, both shop and field, by AWS welding symbols.

C. Samples:

1. Cutaway sample: Of each vertical-to-horizontal framing intersection of systems, made from minimum 6-inch lengths of full-size components and showing details of the following.

a. Joinery.

b. Anchorage.

c. Expansion provisions.

d. Glazing.

e. Identify samples gage, alloy, color and finish.

f. Flashing and drainage.

2. Structural-sealant joints construction, with specified finish and color.

3. Glazing gaskets: 12-inch long samples.

D. Calculations: The following for the work of this Section.

1. Prepare calculations in compliance with current design rules of AA, AISC, AISI, and ACI. Include analysis for wind and dead load on framing members, anchors, and concrete inserts.

2. Show section property computations for framing members. Show vertical and horizontal loads on curbs and other supports. Existing test reports will be acceptable substitute for calculations. Calculations shall be signed and sealed by a California-licensed professional engineer.

3. Do not increase allowable stresses or decrease applied loads for design wind loads, or wind loads in combination with other loads, where not permitted by Code, or if resultant allowable stress after increase is greater than or equal to yield stress.

E. Certification: Certified test results showing that entrances and storefront systems have been tested by a recognized testing laboratory or agency and comply with specified performance characteristics.

1.5 QUALITY ASSURANCE

A. Fabricator/installer's qualifications: Single firm with a minimum of 5 years of successful experience fabricating and erecting work similar to that required for this Project.

B. Engineering responsibility:

1. Engineer, fabricate, assemble and erect the work of this Section to meet or exceed the specified design and performance criteria, and to provide watertight, structurally sound, self-draining assembly conforming to governing codes and regulations.

2. The assemblies shown on the Drawings and specified herein are intended to define design intent and minimum performance requirements. Do not change indicated profiles without the Architect's written consent.

3. Fasteners and connections are shown schematically. A California-licensed civil or structural engineer employed by the Contractor shall determine final types and sizes.

a. In no case shall the fasteners or connections conflict with or require revision of the finish profiles of the assemblies specified herein or the supporting work.

b. Connections to the structural frame shall not impose any eccentric loading, or induce twisting or warping.

c. Connections to the structural frame shall be able to accommodate misalignment of the steel structure within limits allowed by the AISC tolerances.

1.6 HANDLING

A. Procedure: "Care and Handling of Architectural Aluminum from Shop to Site" published by AAMA.

1.7 WARRANTY

A. Warrant the work of this Section against defective materials and workmanship for 2 years after Substantial Completion. Refer to Section 07 9200 for sealant warranty.

B. Repair or replace, when repairs are acceptable to the Architect, defective materials and workmanship during the warranty period at no cost to the District.

PART 2 - PRODUCTS

2.1 MANUFACTURE

A. Acceptable manufacturer: One of the following meeting the requirements specified.

1. Arcadia Inc. (basis of design).

2. Efco Corp.

3. Kawneer North America.

4. US Aluminum Corp. (CR Laurence Co.)

5. Oldcastle Building Envelope.

6. Wausau Window and Door.

B. Fixed storefront sections:

1. WW-1: Glazed exterior aluminum storefront: Center glazed, thermally broken, storefront system, 2 in. x 6 in. total depth, AG601T by Arcadia Inc. (basis of design), or equal by US Aluminum (CR Laurence Co. Inc.), Wausau Window and Door, Kawneer North America, Oldcastle Building Envelope or EFCO Corp. or approved equal.

2. SF-1: Glazed interior aluminum storefront: Center glazed, storefront system, 2 in. x 4-1/2 in. total depth, AR450 by Arcadia Inc. (basis of design), or equal by US Aluminum (CR Laurence Co. Inc.), Wausau Window and Door, Kawneer North America, Oldcastle Building Envelope or EFCO Corp. or approved equal.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by the manufacturer for strength and application of required finish, complying with ASTM B 221, alloy 6063-T6 for extrusions and ASTM B 209 for sheet or plate not less than 0.125 in. thick.

B. Steel mullion reinforcement, if required by wind loading and other considerations: Proprietary bent steel plate or structural steel shape complying with the following.

1. Hot-rolled sections: ASTM A 36.

2. Structural tube framing: ASTM A 500, Grade B.

C. Fasteners: 300 Series (18-8) non-magnetic stainless steel for all screws, bolts, nuts, washers and rivets, except for the following applicable to Self-drilling and self-tapping screws.

1. Comply with SAE J78, except shanks and heads of fasteners shall comply with SAE i429, Grade 5 with 827 MPa (120 ksi) tensile strength and Rockwell C34 maximum hardness.

2. Where additional corrosion resistance is required, such as where fastener heads are exposed to aggressive environments, shanks and heads of fasteners shall be made of Series 300 (18-8) stainless steel complying with ASTM F 593, Condition CW (i.e. cold-worked), 689 to 1034 MPa (100 to 150 ksi) tensile strength, Rockwell 895 to C32 hardness.

3. Emboss fastener heads with manufacturer’s mark for inspection purpose and to indicate fasteners comply with Specifications.

4. Carbon steel fasteners shall have corrosion-resistant, hexavalent chrome-free coating with a zinc-rich base coat and an aluminum-pigmented organic topcoat. Fastener shall withstand 800 hours test, without forming red rust, when tested according to ASTM B 11 7.

5. Emboss 300 series stainless steel fasteners with the manufacturers mark for inspection purpose and to indicate fasteners comply with Specifications and applicable standards. Fasteners shall have a galvanically-compatible finish and coating, hexavalent chrome-free, zinc plate base and an aluminum-pigmented organic topcoat.

D. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125-inch thick, reinforce the interior with aluminum or non-magnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.

1. Welding electrodes: As recommended by AWS for the type of metal to be welded and the conditions of use.

E. Brackets: Where feasible, provide high-strength aluminum brackets and reinforcements; otherwise provide non-magnetic stainless steel or steel complying with ASTM A 386.

F. Compression weatherstripping: Manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded silicone of the color selected by the Architect.

G. Sliding weatherstripping: Manufacturer's standard replaceable weatherstripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.

H. Glass and glazing materials: As indicated on the Drawings and specified in Section 08 8100.

I. Sealants and backup rods:

1. Within assemblies: Manufacturer standard non-drying, non-skinning sealant complying with AAMA 809.2.

2. Between assemblies and adjacent materials: As specified in Section 07 9200.

3. Glazing sealants: Refer to Section 08 8100.

J. Paint:

1. Shop primer for ferrous metal: Manufacturer or fabricator standard, fast-curing, lead-free, universal rust-inhibitive alkyd primer complying with performance requirements of FS TT-P645.

2. Shop primer for concealed aluminum surfaces: Alkyd barium metaborate made by one of the manufacturers listed in Section 09 9100, or bituminous paint.

3. Galvanizing repair paint: SSPC Paint No. 20, Type II (Organic), by Tnemec, Porter International, Valspar Corp., Ameron Protective Coatings, or DuPont Co.

4. Bituminous paint: Cold-applied asphalt mastic complying with SSPC Paint 12, but containing no asbestos fibers.

2.3 FABRICATION

A. Furnish shop drawings, inserts and similar items to other trades, at appropriate times as required for proper sequence of construction.

1. Verify dimensions of the supporting structure and other elements that precede this work before fabrication of the required components.

2. Provide erection tolerances corresponding with specified tolerances for other work wherever field measurements cannot be obtained.

B. Maintain the visual design concept shown, including member sizes, profiles and alignment of components.

C. Fabricate and assemble components with proper and acceptable provision for noiseless thermal expansion and contraction, fabrication and erection tolerances, adjoining building component tolerances, and dynamic movements.

D. Fabricate and assemble components with minimum perimeter clearances and shim spacing, but enable installation and dynamic movement of perimeter seals.

E. Removable members such as glass stops, fillers or closures shall be extruded, and securely engaged into adjacent components. Fabricate extrusions to eliminate edge projection, bowing, and misalignment at joints.

F. Design and construct expansion joints so that they will be, and remain, permanently watertight, and will accommodate weather and building dynamics.

G. For surfaces exposed to view employ only materials which are free from alloy defects, die marks, scratches, streaks and other surface blemishes.

H. When using aluminum sheets, use material light enough to permit workability but heavy enough to accurately retain the brake shape or contour without oil-canning when fastened to backing or blocking.

I. Complete the fabrication and assembly of the components in the shop to the greatest extent possible to minimize field cutting, splicing, fastening, sealing and finishing.

1. Maintain provisions for expansion and movement.

2. Disassemble only as necessary for shipment and erection.

3. Provide secure attachment and support at joints, with hairline, flush fit between contacting members.

J. Complete the cutting, fitting, forming, drilling and grinding of metal before cleaning and applying specified finish. Remove arrises from cut edges and ease edges and corners to a radius of approximately 1/64 inch minimum, 1/32 inch maximum.

K. Welding:

1. Comply with industry standards for assembly and fabrication using system and rods for exposed metals that will provide texture match with materials being joined.

2. Grind exposed welds smooth and flush with parent metal using clean grinding wheels of a type that will not result in stains or discoloration.

L. Hardware:

1. Cut, reinforce, drill and tap doors and frames at the factory to receive hardware.

2. Provide hardware reinforcement of stainless steel or hot-dip galvanized steel secured by welding or stainless steel screws.

M. Door fabrication:

1. Make proper allowance for clearances at jambs, head and threshold thickness and clearance.

2. Close the top of out-swinging doors with a plate or inverted channel.

3. Cut, reinforce, drill and tap doors and frames at the factory to receive hardware. Provide hardware reinforcement of stainless steel or hot-dip galvanized steel secured by welding or stainless steel screws.

N. Finishing:

1. Finish aluminum surfaces with an anodized, batch process, Architectural Class I, coating complying with AAMA 607.1 and these Specifications. Refer to Section 05 0515.

a. Anodic thickness: 0.0007 inch minimum.

b. Anodic film color: Clear (transparent) for interior locations and dark bronze for exterior locations.

c. Seal anodized surfaces with hot deionized water at 210-degree F with a pH between 6.0 and 6.4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction and supports.

B. Verify that openings are within allowable tolerances, plumb, level, clean, will provide a solid anchoring surface, and conditions detrimental to the proper or timely completion of this work are corrected before proceeding with installation.

3.2 INSTALLATION

A. General:

1. Do not install defective components, including warped, bowed, dented, abraded and broken members, and glass with damaged edges.

2. Remove and replace members that have been damaged during installation or thereafter before final acceptance.

3. Do not cut, trim, or weld components during erection in a manner that would damage the finish, decrease their strength, or result in a visual imperfection or a failure in performance of the work.

4. Return components that require alteration to the shop for refabrication or replacement.

5. Install components level, plumb, true to line and with uniform tight joints and reveals. Attach to structure with non-staining and non-corrosive shims, anchors, fasteners and spacers.

6. Provide all accessories such as fastenings, sealants and concealed anchorage needed for a complete weatherproof installation.

B. Erection tolerances:

1. Provide adjustment within the assemblies to accommodate job variations.

2. Install the work of this Section within the following tolerances:

a. Deviation from established vertical, horizontal, or designed position shall not exceed 1/8 inch in 12 feet of length of any member, or 1/4 inch in any total run in any line.

b. Maximum offset from true alignment between 2 consecutive members placed end-to-end shall not exceed 1/16 inch.

c. Maximum offset between glass framing members at corners of glazing pocket must not exceed 1/32 inch.

C. Assembly and anchorage:

1. Anchor components securely by bolting, welding or other permanent mechanical attachments system that will comply with specified requirements and permit movements that are intended or necessary.

2. Install slip-joint linings where required to ensure movement without damage of the components.

3. Provide tape separator between contact surfaces of dissimilar materials where there is a possibility of corrosive or electrolytic action.

4. Remove weld slag and apply primer over welds. Touchup shop applied paint damaged by welding or other causes.

D. Glazing:

1. Glaze assemblies as specified in Section 08 8100.

2. Carefully match joints of glazing beads. Drive screws securing such beads fully and tighten with heads firmly seated.

E. Hanging doors:

1. Install finish hardware on doors in compliance with its manufacturer's instructions.

2. Hang doors with minimum clearance to frame and threshold to meet the performance criteria specified.

3. Hang doors and adjust hardware so doors operate freely for their entire travel, without sticking or binding, and with minimum clearance to frame to comply with performance criteria specified.

3.3 SEALANTS

A. The requirements of Section 07 9200 apply to sealants used in this work. Seal all joints between the work of this Section and adjacent construction to be weathertight.

3.4 FIELD QUALITY CONTROL

A. Field water tests may be performed on completed glazed portions of the storefronts at the District's option in compliance with ASTM E 1105.

1. Provide hose and sufficient personnel to conduct the tests.

2. In the event that such testing should result in uncontrolled leakage, eliminate the causes of such leakage at no additional cost to the District.

B. Touchup: Touchup damaged finish as specified in Section 05 0515 until results are satisfactory to the Architect, otherwise return the damaged component to the shop for refinishing.

3.5 ADJUSTING

A. Adjust door hardware for smooth operation according to hardware manufacturers' instructions.

B. Adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Door hardware.

B. Related Divisions:

1. Division 06 – door hardware installation.

2. Division 07 – sealant at exterior thresholds.

3. Division 08 – metal doors and frames, interior aluminum frames, wood doors, integrated security systems, specialty doors, storefront and glazed curtainwall systems.

4. Division 21 – fire and life safety systems.

5. Division 28 – security access systems.

C. Specific omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.

2. Cabinets, including open wall shelving and locks.

3. Signs, except where scheduled.

4. Toilet accessories, including grab bars.

5. Installation.

6. Rough hardware.

7. Conduit, junction boxes and wiring.

8. Folding partitions, except cylinders where detailed.

9. Sliding aluminum doors, except cylinders where detailed.

10. Access doors and panels, except cylinders where detailed.

11. Corner guards.

12. Welded steel gates and supports.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

2. Installation templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

3. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

4. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

5. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

B. Preinstallation Meetings:

1. Keying Conference: Conduct conference at Project site to comply with requirements in Divisions 00 and 01 In addition to Owner, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.

b. Preliminary key system schematic diagram.

c. Requirements for key control system.

d. Requirements for access control.

e. Address for delivery of keys.

2. Preinstallation Conference: Conduct conference at Project site.

a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

b. Inspect and discuss preparatory work performed by other trades.

c. Inspect and discuss electrical roughing-in for electrified door hardware.

d. Review sequence of operation for each type of electrified door hardware.

e. Review required testing, inspecting, and certifying procedures.

1.3 REFERENCES

A. Use date of standard in effect as of Bid date.

1. American National Standards Institute.

a. ANSI 156.18 – Materials and Finishes.

b. ICC/ANSI A117.1 - 1998 – Specifications for making buildings and facilities usable by physically handicapped people. [omit for CA work – not applicable]

2. BHMA – Builders Hardware Manufacturers Association.

3. 2016 California Building Code:

a. Chapter 11B – Accessibility To Public Buildings, Public Accommodations, Commercial Buildings and Public Housing.

4. DHI – Door and Hardware Institute.

5. NFPA – National Fire Protection Association:

a. NFPA 80 2013 Edition – Standard for Fire Doors and Other Opening Protectives.

b. NFPA 105 – Smoke and Draft Control Door Assemblies.

c. NFPA 252 – Fire Tests of Door Assemblies.

6. UL – Underwriters Laboratories:

a. UL10C – Positive Pressure Fire Tests of Door Assemblies.

b. UL 305 – Panic Hardware.

7. WHI – Warnock Hersey Incorporated State of California Building Code.

8. Local applicable codes.

9. SDI – Steel Door Institute.

10. WI – Woodwork Institute.

11. AWI – Architectural Woodwork Institute.

12. NAAMM – National Association of Architectural Metal Manufacturers.

B. Abbreviations:

1. Manufacturers: See table at 2.1.A of this Section.

2. Finishes: See 2.7 of this Section.

1.4 SUBMITTALS AND SUBSTITUTIONS

A. SUBMITTALS: Submit six copies of schedule per D. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Minimum 10pt font size. Include following information:

1. Type, style, function, size, quantity and finish of hardware items.

2. Use BHMA Finish codes per ANSI A156.18.

3. Name, part number and manufacturer of each item.

4. Fastenings and other pertinent information.

5. Location of hardware set coordinated with floor plans and door schedule.

6. Explanation of abbreviations, symbols, and codes contained in schedule.

7. Mounting locations for hardware.

8. Door and frame sizes, materials and degrees of swing.

9. List of manufacturers used and their nearest representative with address and phone number.

10. Catalog cuts.

11. Point-to-point wiring diagrams.

12. Manufacturer's technical data and installation instructions for electronic hardware.

B. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.

C. Deviations: Highlight, encircle or otherwise identify deviations from "Schedule of Finish Hardware" on submittal with notations clearly designating those portions as deviating from this Section.

D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

E. Substitutions per Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.

F. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.

G. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, riser and point-to-point wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Hardware supplier: Direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.

a. Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions and code requirements.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery: Coordinate delivery to appropriate locations (shop or field).

1. Permanent keys and cores: Secured delivery direct to Owner's representative.

B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.7 PROJECT CONDITIONS AND COORDINATION

A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.

B. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.

C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

D. Environmental considerations: Segregate unused recyclable paper and paper product packaging, uninstalled metals, and plastics, and have these sent to a recycling center.

1.8 WARRANTY

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties.

B. Include factory order numbers with close-out documents warranty information:

C. Minimum warranties:

1. Locksets: Three years.

2. Exit Devices: Three years mechanical.

3. Closers: Thirty years mechanical.

4. Hinges: One year.

5. Other Hardware: Two years.

1.9 COMMISSIONING

A. Conduct these tests prior to request for certificate of substantial completion:

1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.

2. With installer, access control contractor and electrical contractor present, test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.

3. With installer and electrical contractor present, test hardware interfaced with fire/life-safety system for proper operation and release.

1.10 REGULATORY REQUIREMENTS

A. Locate latching hardware between 34 inches to 44 inches above the finished floor, per 2016 California Building Code, Section 11B-404.2.7.

1. Panic hardware: Locate between 36 inches to 44 inches above the finished floor.

B. Handles, pull, latches, locks, other operable parts:

1. Readily openable from egress side with one hand and without tight grasping, tight pinching, or twisting of the wrist to operate. 2016 California Building Code Section 11B-309.4.

2. Force required to activate the operable parts: 5.0 pounds maximum, per 2016 California Building Code Section 11B-309.4.

C. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2016 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.

1. Exception: Exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.

D. Door closing speed shall be as follows: CBC 11B-404.2.8

1. Closer shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum

2. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum

E. Smooth surfaces at bottom 10 inches of push sides of doors, facilitating push-open with wheelchair footrests, per 2016 California Building Code Section 11B-404.2.10.

1. Applied kickplates and armor plates: Bevel the left and right edges; free of sharp or abrasive edges.

2. Tempered glass doors without stiles: Bottom rail may be less than 10 inches if top leading edge is tapered 60 degrees minimum.

F. Door opening clear width no less than 32 inches, measured from face of frame stop, or edge of inactive leaf of pair of doors, to door face with door opened to 90 degrees. Hardware projection not a factor in clear width if located above 30 inches and below 80 inches, and the hardware projects no more than 4 inches. 2016 California Building Code Section 11B-404.2.3.

1. Exception: Doors not requiring full passage through the opening, that is, to spaces less than 24 inches in depth, may have the clear opening width reduced to 20 inches. Example: Shallow closets.

2. Door closers and overhead stops: Not less than 78 inches above the finished floor or ground, per 2016 California Building Code 11B-307.4.

G. Thresholds: Floor or landing no more than 0.50 inches below the top of the threshold of the doorway, per 2016 California Building Code Section 11B-404.2.5. Vertical rise no more than 0.25 inches, change in level between 0.25 inches and 0.50 inches: Beveled to slope no greater than 1:2 (50 percent slope). 2016 California Building Code Section 11B-303.2 & ~.3.

H. Floor stops: Do not locate in path of travel. Locate no more than 4 inches from walls, per DSA Policy #99-08 (Access).

I. Pairs of doors with independently-activated hardware both leafs: Limit swing of right-hand or right-hand-reverse leaf to 90 degrees to protect persons reading wall-mounted tactile signage, per 2016 California Building Code Section 11B-703.4.2.1

J. Door and door hardware encroachment: When door is swung fully-open into means-of-egress path, the door may not encroach/project more than 7 inches into the required exit width, with the exception of door release hardware such as lockset levers or panic hardware. These hardware items must be located no less than 34-inches and no more than 48-inches above the floor/ground. 2016 California Building Code, Section 1005.7.1.

1. In I-2 occupancies, latch release hardware is not permitted to project in the required exit width, regardless of its mounting height, per 2016 California Building Code, Section 1005.7.1 at Exception 1.

K. Hardware (including panic hardware) shall not be provided with "night latch" (NL) function for any accessible doors or gates unless the following conditions are met per DSA interpretation 10-08 DSA/AC (external), revised 4/28/09. Such conditions must be clearly demonstrated and indicated in the specifications:

1. Such hardware has dogging feature.

2. It is dogged during the time the facility is open.

3. Such dogging operation is performed only by employees as their job function (non-public use).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Listed acceptable alternate manufacturers: These will be considered; submit for review products with equivalent function and features of scheduled products.

ITEM:	MANUFACTURER:	ACCEPTABLE ALTERNATE:
Hinges	(IVE) Ives	Bommer
Key System	(SCH) Schlage	Owner standard
Mechanical Locks	(SCH) Schlage	Owner standard
Exit Devices	(VON) Von Duprin	Owner standard
Closers	(LCN) LCN	Owner standard
Kickplates	(IVE) Ives	Rockwood, Trimco
Stops & Holders	(IVE) Ives	Rockwood, Trimco
Thresholds	(NGP) NGP	Zero, Reese
Seals & Bottoms	(NGP) NGP	Zero, Reese

2.2 HINGING METHODS

A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise Architect if 8-inch width is insufficient.

B. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.

C. Conventional hinges: Steel or stainless steel pins and approved bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.

1. Outswinging exterior doors: Non-ferrous with non-removable (NRP) pins and security studs.

2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.

2.3 LOCKSETS, LATCHSETS AND DEADBOLTS

A. Mortise Locksets and Latchsets: As scheduled.

1. Chassis: Cold-rolled steel, handing field-changeable without disassembly.

2. Universal lock case – 10 functions in one case.

3. Floating mounting tabs automatically adjusts to fit a beveled door edge.

4. Latchbolts: 0.75 inch throw stainless steel anti-friction type.

5. Lever Trim: Through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.

a. Spindles: Security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.

b. Inside lever applied by screwless shank mounting – no exposed trim mount screws.

c. Levers rotate up or down for ease of use.

d. Vandalgard locks: Locked lever freely rotates down while remaining securely locked. This feature prevents damage to internal lock components when subjected to excessive force.

6. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.

7. Turnpieces: Accessible offset turn-lever design not requiring pinching or twisting motions to operate.

8. Deadbolts: Stainless steel 1-inch throw.

9. Electric operation: Manufacturer-installed continuous duty solenoid.

10. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.

11. Scheduled Lock Series and Design: Schlage L series,

12. Certifications:

a. ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.

b. ANSI/ASTM F476-84 Grade 31 UL Listed.

13. Accessibility: Require not more than 5 lb to retract the latchbolt or deadbolt, or both, per CBC 2013 11B-404.2.7 and 11B-309.4.

2.4 EXIT DEVICES / PANIC HARDWARE

A. General features:

1. Independent lab-tested 1,000,000 cycles.

2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.

3. Deadlocking latchbolts, 0.75 inch projection.

4. End caps: Impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.

5. No exposed screws to show through glass doors.

6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.

7. Releasable in normal operation with 15-pound maximum operating force per UBC Standard 10-4, and with 32-pound maximum pressure under 250-pound load to the door.

8. Exterior doors scheduled with XP-series devices: Static load force resistance of at least 2000 pounds.

9. Accessibility: Require not more than 5 lb to retract the latchbolt, per CBC 2013 11B-404.2.7 and 11B-309.4.

   a. Mechanical method: Von Duprin "AX-" feature, where touchpad directly retracts the latchbolt with 5 lb or less of force.

B. Specific features:

1. Rated and Non-Fire Rated Devices: 2SI feature.

2. Lever Trim: Breakaway type, forged brass or bronze escutcheon min. 0.130 inch thickness, compression spring drive, match lockset lever design.

3. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware". Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.

2.5 CLOSERS

A. Surface Closers: 4011/4111

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.

2. ISO 2000 certified. Units stamped with date-of-manufacture code.

3. Independent lab-tested 10,000,000 cycles.

4. Non-sized and adjustable. Place closers inside building, stairs and rooms.

5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.

6. Advanced Variable Backcheck (AVB): Where scheduled, these units commence backcheck at approximately 45 degrees.

7. Adjustable to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per California Building Code, Section 1133B.2.5 and 1008.1.3, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.

8. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2013 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.

   a. Exception: Exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.

9. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.

10. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units. EDA arms: Rigid main and forearm, reinforced elbow.

11. Exterior door closers: Tested to 100 hours of ASTM B117 salt spray test, furnish data on request.

12. Exterior doors: Seasonal adjustments not required for temperatures form 120 degrees F to -30 degrees F, furnish checking fluid data on request.

13. Non-flaming fluid, will not fuel door or floor covering fires.

14. Pressure Relief Valves (PRV) not permitted.

2.6 OTHER HARDWARE

A. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

B. Door Stops: Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.

2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum: 90deg stop / 95deg deadstop. Note degree of opening in submittal.

C. Thresholds: As scheduled and per details. Comply with CBC 2013 11B-404.2.5. Substitute products: Certify that the products equal or exceed specified material's thickness. Proposed substitutions: Submit for approval.

1. Saddle thresholds: 0.125 inches minimum thickness.

2. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Minimum 0.25 inch diameter fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors. National Guard Products' "COMBO" or Pemko Manufacturing's "FHSL".

3. Fire-rated openings, 90-minutes or less duration: Use thresholds to interrupt floor covering material under the door where that material has a critical radiant flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, include a 0.25in high 5in wide saddle in the bid, and request direction from Architect.

4. Fire-rated openings, 3-hour duration: Thresholds, where scheduled, to extend full jamb depth.

5. Acoustic openings: Set units in full bed of Division-7-compliant, leave no air space between threshold and substrate.

6. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.

7. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive.

Sheet metal and wood screws: Full-thread. Sleeve nuts: Full length to prevent door compression.

D. Through-bolts: Do not use. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.

1. Exception: Surface-mounted overhead stops, holders, and friction stays.

E. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Leave no unfilled/uncovered pre-punched silencer holes. Intent: Door bears against silencers, seals make minimal contact with minimal compression – only enough to effect a seal.

2.7 FINISH

A. Generally: BHMA 626 Satin Chromium.

1. Areas using BHMA 626: Furnish push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise scheduled.

B. Door closers: Factory powder coated to match other hardware, unless otherwise noted.

2.8 KEYING REQUIREMENTS

A. Key System: Schlage Everest Primus 29 high-security utility-patented keyway, interchangeable core throughout. Utility patent protection to extend at least until 2029. Key blanks available only from factory-direct sources, not available from after-market keyblank manufacturers. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner and Allegion representatives to determine system keyway(s), keybow styles, structure, stamping, degree of physical security and degree of geographic exclusivity. Furnish Owner's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner. Contractor will install permanent cylinders/cores.

1. Existing factory-registered master key system.

2. Primus Level 9G.

3. Construction keying: Furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cylinders/cores in Owner's presence. Demonstrate that construction key no longer operates.

4. Temporary cylinders/cores remain supplier's property.

5. Furnish 10 construction keys.

6. Furnish 2 construction control keys.

7. Key Cylinders: Furnish 6-pin solid brass construction.

B. Cylinders/cores: Keyed at factory of lock manufacturer where permanent records are maintained. Locksets and cylinders same manufacturer.

C. Permanent keys: Use secured shipment direct from point of origination to Owner.

1. For estimate: 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.

2. For estimate: VKC stamping plus “DO NOT DUPLICATE”.

D. Bitting List: Use secured shipment direct from point of origination to Owner at completion.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS

A. Can read and understand manufacturers’ templates, suppliers’ hardware schedule and printed installation instructions. Can readily distinguish drywall screws from manufacturers’ furnished fasteners. Available to meet with manufacturers’ representatives and related trades to discuss installation of hardware.

3.2 PREPARATION

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation. Installation denotes acceptance of wall/frame condition.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.

1. Notify Architect of Code conflicts before ordering material.

2. Locate latching hardware between 34 inches to 44 inches above the finished floor, per California Building Code, Section 1008.1.9.2 and 1133B.2.5.2.

3. Locate panic hardware between 36 inches to 44 inches above the finished floor.

4. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

C. Overhead stops: Before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

3.3 INSTALLATION

A. Install hardware per manufacturer’s instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.

1. Gaskets: Install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.

2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.

3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.

4. Replace fasteners damaged by power-driven tools.

B. Locate floor stops no more that 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.

C. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.

D. Locate overhead stops for minimum 90 degrees at rest and for maximum allowable degree of swing.

E. Drill pilot holes for fasteners in wood doors and/or frames.

F. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.4 ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.

1. Hardware damaged by improper installation or adjustment methods: Repair or replace to Owner's satisfaction.

2. Adjust doors to fully latch with no more than 1 pound of pressure.

a. Door closer valves: Turn valves clockwise until at bottom – do not force. Turn valves back out one and one-half turns and begin adjustment process from that point. Do not force valves beyond three full turns counterclockwise.

3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.

4. Adjust door closers per 1.9 this section.

B. Inspection of fire door assemblies and means-of-egress panic-hardware doors: Per 2013 NFPA-80 5.2.1: Hire an independent third-party inspection service to prepare a report listing these doors, and include a statement that there are zero deficiencies with the fire-rated assemblies and the openings with panic hardware. Certification, Testing and Quality Control shall be in accordance with Division 01 45 23 Testing and Inspection services. All doors hardware and installation will be inspected by a third party selected by the Architect/Owner

Div 01 45 23:

1. Per 2013 NFPA-80 5.2.1: Use a third party inspector not associated with the construction, supply or installation of this project to develop a field survey of the doors and hardware. Survey is to be done by a member certified as a FDAI (Fire Door Assembly Inspector), Certified AHC (Architectural Hardware Consultant) or a certified testing laboratory: UL or Intertek. Certified Inspectors may be found at DHI.org, Intertek, or CAFDI.org.

C. Fire-rated doors:

1. Wood doors: Adjust to 0.125 inches clearance at heads, jambs, and meeting stiles.

2. Steel doors: Adjust to 0.063 inches minimum to 0.188 inches maximum clearance at heads, jambs, and meeting stiles.

3. Adjust wood and steel doors to 0.75 inches maximum clearance (undercut) above threshold or finish floor material under door.

D. Final inspection: Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following:

1. Has re-adjusted hardware.

2. Has evaluated maintenance procedures and recommend changes or additions, and instructed Owner's personnel.

3. Has identified items that have deteriorated or failed.

4. Has submitted written report identifying problems.

3.5 DEMONSTRATION

A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.6 PROTECTION/CLEANING

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.

B. Clean adjacent wall, frame and door surfaces soiled from installation / reinstallation process.

3.7 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

B. Do not order material until submittal has been reviewed, stamped, and signed by Architect's door hardware consultant.

SPEXTRA: 379978

HW SET: 01

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 03A L583-363 L283-711	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	WALL STOP	WS401/402CVX	US26D	IVE

PERIMETER SEAL BY ALUMINUM FRAME MANUFACTURER.

HW SET: 02

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	PA-AX-98-L-F-2SI-03	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	RIM CYL THUMBTURN	XB11-979	626	SCH
1	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
1	EA	PROTECTION PLATE	8400 12" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/438 AS REQ'D	626	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

HW SET: 03

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1HW SH 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	PA-AX-98-L-2SI-03	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	RIM CYL THUMBTURN	XB11-979	626	SCH
1	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
1	EA	PROTECTION PLATE	8400 12" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18L	BLK	IVE
1	EA	GASKETING	429AA-S	AA	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	AS DETAILED	A	ZER

INSTALL GASKETING PRIOR TO CLOSER ARM BRACKET AND PANIC STRIKE.

HW SET: 04

REUSE EXISTING DOOR AND HARDWARE.

HW SET: 05

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	ELECTRIC STRIKE	6111 FSE DS	613	VON
1	EA	SURF. AUTO OPERATOR	9542 HL/D MS	ANDKB	LCN
1	EA	WIRELESS ACTUATOR	8310-836TW	630	LCN
1	EA	ACTIVATION RECEIVER	8310-865	630	LCN

REUSE BALANCE OF EXISTING HARDWARE.

HW SET: 06

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CLASSROOM SECURITY LOCK	ND75TD TLR	613	SCH
2	EA	PRIMUS CORE	20-740-XP	606	SCH

REUSE BALANCE OF EXISTING HARDWARE.

END OF SECTION

SECTION 08 8100
GLASS AND GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. All glass and glazing for the Project except as noted below.

2. Glazing accessories.

3. Glazing sealants.

B. Related work:

1. Division 7 for sealants other than required for the work of this Section.

1.2 REFERENCES

A. Glazing publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA "Glazing Manual".

2. SIGMA TM-3000, "Vertical Glazing Guidelines".

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following; defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat-treated) required to meet or exceed the following criteria.

1. Glass thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

a. Specified design wind loads: Per Code.

b. Probability of breakage for vertical glazing: 8 lites per 1000 for lites set vertically or not more than 15-degree off vertical and under wind action. Assume load duration of 60 seconds.

1) Provide heat-treated glass where annealed glass would be vulnerable to thermal breakage.

c. Maximum lateral deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or one inch, whichever is less.

1) For monolithic-glass.

2) For insulating glass.

d. Minimum glass thickness for exterior lites: 6 mm.

e. Thickness of tinted glass: Provide the same thickness for each tint color indicated throughout Project.

2. Thermal movements:

a. Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

b. Temperature change (range): Minimum material temperature increase of 100-degree F and decrease of 50-degree F relative to nominal condition 120-degree F, ambient; 180-degree F material surfaces.

1.4 SUBMITTALS

A. Samples:

1. Twelve-inch square labeled samples of each type and color of glass, with taped or ground edges.

2. Coated glass samples shall show extremes of color range.

3. Glass indicated or required to be “heat-treated” need not be when submitting samples.

B. Certification: Glass manufacturer’s certification as specified.

1. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements. Include wind pressure analysis, thermal stress analysis, including shading effects, and review of shop drawings stating that details are suitable for proposed glass products.

2. Separate certifications are not required for glazing materials bearing the manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

C. Glazing schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

D. Preconstruction adhesion and compatibility test report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

E. Product test reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:

1. Tinted float glass.

2. Insulating glass.

3. Glazing sealants.

4. Glazing gaskets.

F. Labels: Provide NFRC Rating Labels as required by 2005 California Energy Code. Reference 2005 compliance guide for information required

1.5 QUALITY ASSURANCE

A. Glazier's qualifications: Experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

B. Fabricator's qualifications: When the glass manufacturer has a certification program, the fabricator shall have a current "Certified Fabricator" certificate form the glass manufacturer.

C. Source limitations for clear glass: Obtain clear float glass from one primary glass manufacturer.

D. Source limitations for tinted glass: Obtain tinted, heat absorbing, and light reducing float glass from one primary glass manufacturer for each tint color indicated.

E. Source limitations for coated glass: Obtain coated glass from one manufacturer for each type of coating and each type and class of float glass indicated.

F. Source limitations for insulating glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.

G. Source limitations for glazing accessories: Obtain glazing accessories from one source for each product and installation method indicated.

H. Safety glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

I. Insulating glass certification program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency.

1. Insulating Glass Certification Council.

2. Associated Laboratories, Inc.

3. National Accreditation and Management Institute.

J. Mockups: Before glazing, build mockups for each glass product indicated below in accordance with the following requirements, using materials indicated for the completed Work.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.

2. Build mockups with the following kinds of glass to match glazing systems required for Project, including typical lite size, framing systems, and glazing methods:

   a. Heat-strengthened coated glass.

   b. Fully tempered glass.

   c. Coated insulating glass.

3. Obtain Architect's approval of mockups before starting fabrication.

4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

5. Demolish and remove mockups when directed.

6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

K. Manufacturer’s certification: Submit manufacturer certification that.

1. All materials to be used in the glazing system such as sealants, setting blocks, spacers, backing rods, metal finishes, etc. have been reviewed by the glass manufacturer.

2. These materials are compatible with the glass supplied to the Project site.

3. These materials will not cause deterioration, premature aging, and staining of adjacent materials.

L. Labeling:

1. Submit a certificate stating that the glass furnished for the Project complies with the Specifications.

2. Label each piece of heat-treated glass with a permanent logo etched in one corner to identify the fabricator.

1.6 HANDLING

A. Storage: Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, run-off, and other causes.

1.7 PROJECT CONDITIONS

A. Do not proceed with installation of bulk sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.

1.8 WARRANTY

A. Warrant insulating glass against fogging, loss of transparency and frost build-up between the glass panes due to defective materials or sealant failure for 5 years after Substantial Completion.

B. Warrant coating against cracking, peeling, wrinkling, color fading, blistering, flaking, delaminating, staining and discoloration for 10 years after Substantial Completion.

C. Glass shall not experience spontaneous breakage.

1. This Specification defines nickel sulfide stones as a glass material defect.

2. Installed tempered glass which breaks due to nickel sulfide stones shall be included in the warranty.

D. Replace defective materials and workmanship during the warranty period at no cost to the Owner.

PART 2 - PRODUCTS

2.1 GLASS

A. General:

1. Float glass shall comply with ASTM C 1036; heat-treated glass shall comply with ASTM C 1048.

2. ASTM C 1376 Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass

3. ASTM E 2190 Standard Specification for Insulating Glass Unit Performance and Evaluation.

4. ANSI Z97.1 American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications Method of Test.

5. US Consumer Product Safety Commission CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials

6. Glass shall be free from bubbles, smoke vanes, air holes, scratches and other defects.

7. Fabricate tempered glass by horizontal (roller hearth) process with roll wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

8. Comply with Code and the Drawings for glass in hazardous locations..

9. Unless otherwise indicated or specified, overall thickness of each glass type and composite thickness of multiple layer glass types shall be consistent throughout the Project.

10. Provide insulating glass assemblies CBA rated by IGCC when tested in compliance with ASTM E 774, and permanently labeled with the appropriate certification label of IGCC, ALI or NCTL.

B. Glass types: Refer to the schedule at the end of this Section.

2.2 GLAZING MATERIALS

A. Setting block: Neoprene or, in the case of structural silicone glazing, dense extruded silicone; both with a hardness of 85 ±5 durometer Shore A with a minimum length of 4" or as required by GANA guidelines. [For flush glazed skylights, provide L shaped setting blocks.]

B. Side blocks: Neoprene or dense silicone with a harness of 65 ±5 durometer Shore A.

C. Spacer: Neoprene, silicone, or EPDM, 50 to 60 durometer hardness, compatible with sealants used.

D. Sealants:

1. For structural glazing: High modulus (structural) silicone sealant, 2-component, non acidic, neutral curing silicone which meets or exceeds Federal Specification TT-S-00227, Type II, Class B and ASTM C920, Type M, NS, Class 12.5.

a. Color: Black or clear as selected by Architect.

b. Acceptable products:

1) Dow Corning 995 and 795 (DC 983 is not acceptable for use with painted substrate without incorporation of special substrate preparation requirements utilizing Scotch Brite pads, alcohol and barrier primer).

2) General Electric Ultra Glaze SSG 4400 and Ultra Glaze 4000.

3) Tremco Proglaze SSG.

4) Pecora 895 or 2-Part Fast Cure.

c. Painted surfaces in contact with structural silicone must be primed with a primer approved for use by the sealant manufacturer.

2. For primary seal of insulating units: Manufacturer standard sealant.

3. For all other conditions: Medium and low modulus (weatherseal) silicone sealant, one-part, non acidic, neutral curing, Type S, Grade NS, Class 25, Use NT, capable of withstanding movements from plus 50 to minus 50 for medium modulus and plus 100 to minus 50 percent for low modulus based on original joint design.

a. Color: Match Architect's paint color for sealant.

b. Acceptable products:

1) Dow Corning 795 and 790.

2) General Electric - Silpruf, Silpruf LM.

c. Only low modulus sealant, such as Dow 790 or GE Silpruf LM, shall be used when sealing to cementitious substrate.

E. Glazing gasket: Resilient, continuous neoprene, (except as specified below) extrusions, 40 to 60 Shore A durometer hardness, meeting the requirements of ASTM C 509 for cellular (closed-cell) material, and AAMA SG-1 for non-cellular (dense) material[, with molded corners].

1. Gaskets shall have a continuous mechanical engagement to framing members and factory molded corners.

2. Gasket corners, whether molded or not, shall be bedded in elastomeric sealant compatible with glazing gaskets.

3. When in direct contact with silicone sealants, gaskets, spacers and setting blocks shall be heat cured silicone rubber based material chemically compatible with the silicone sealant and with sufficient hardness for the specific purpose intended. Compatibility testing by the silicone sealant supplier/manufacturer shall be required.

4. Design interior and exterior gasket profiles to produce a glass edge pressure of 12 psf unless otherwise recommended by the glass manufacturer.

F. Compressible filler rod:

1. Closed-cell or waterproof jacketed rod stock of synthetic rubber or plastic foam compatible with sealants used, flexible and resilient, with 5 to 10 psi compressive strength at 25 percent deflection.

2. Do not use vinyl foam stock.

G. Cleaner, primer and sealer: Type recommended by sealant or gasket manufacturer.

2.3 FABRICATION

A. Cutting:

1. Obtain sizes from shop drawings or by field measurement. Cut glass to fit each opening with at least the minimum edge clearance and bite on glass recommended by glass manufacturer.

2. When glass will be precut to sizes obtained from shop drawings, take field measurements of each opening before glazing to verify adequate bite on glass and minimum edge clearance.

3. Glaze openings, which do not fall within tolerances for which precut glass has been sized only with glass specially cut to fit such openings.

4. Do not nip glass edges. Edges may be wheel cut or sawed and seamed at manufacturer's option.

B. Edge quality of annealed and heat-strengthened glass:

1. Shark teeth shall not penetrate more than half of glass thickness.

2. Serration hackle shall not penetrate more than 10 percent of glass thickness.

3. Flare shall not exceed 0.062-inch as measured perpendicular to glass surface edge.

4. Bevel shall not exceed 0.062-inch.

5. Flake chip depth shall not exceed 0.031-inch and length or diameter shall not exceed 0.25-inch.

6. Rough chips are not permitted. Rough chips are those that exceed dimensional limits for flake chips.

7. For glass to be cut at site, provide glass 2-inch larger than required, in both dimensions, to facilitate cutting of clean-cut edges without seaming or nipping.

8. Do not cut, seam, nip, or abrade tempered and heat strengthened glass after tempering.

9. Provide flat ground edges with arised corners where glass edge is not covered by a metal stop.

C. Insulating glass:

1. Provide black aluminum spacers with bent (not mitered or spliced) corners; only one seam is allowed in each spacer of each unit.

2. The date of the manufacture of the unit shall be discretely identified on the spacer (top of unit, left or right corner).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Verify that openings and frames to be glazed are within allowable tolerances, plumb, level and square.

C. Inspect framing joint intersections to insure that the offset in the joinery will not impose undue edge pressure on the glass in compliance with GANA, Glazing Manual, and Sealant Manual, guidelines.

D. Correct other detrimental conditions before proceeding with glazing.

3.2 STANDARDS AND PERFORMANCE

A. Watertight and airtight installation is required for each piece of glass installed in an exterior wall.

B. Each installation must withstand normal temperature changes, wind loading, and impact from normal operation for doors, without failure of any kind including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the Work.

C. Installed glass shall be free from rattle.

D. Protect glass from damage at all times during handling, installation and operation of the building until Substantial Completion.

E. Comply with combined recommendations of glass manufacturer and manufacturer of sealants and other materials used in glazing, except where more stringent requirements are specified.

F. Comply with GANA, Glazing Manual, and Sealant Manual guidelines, except as otherwise.

G. Except as recommended otherwise by the manufacturers of the glass and glazing materials, comply with GANA Glazing Manual and the following:

1. Provide minimum nominal glass bite of 0.375-inch on monolithic lites; 1/2 inch on insulated glass units.

2. Where joint movement will result in variable glass bite, increase nominal bit to provide 0.375-inch minimum bite and 0.25-inch minimum edge clearance.

H. Inspect each piece of glass immediately before installation, and eliminate those with edge damage or face imperfections.

I. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other pieces.

3.3 PREPARATION FOR GLAZING

A. Immediately before glazing, clean the glazing channel and other framing members to receive glass.

1. Remove coatings not firmly bonded to the substrate.

2. Verify that framing is satisfactory to receive the glass.

B. Apply primer or sealer to joint surfaces when recommended by sealant manufacturer.

3.4 GLASS INSTALLATION

A. Erect each pane of glass square, plumb, and with uniform clearances between panel and rebates.

B. Follow glass manufacturer's instructions and GANA Standards. Provide minimum nominal glass bite of 0.375 inch on monolithic lites, and 1/2 inch on insulating glass units. Maintain minimum bed clearance between glass and frame.

C. Do not nip glass. Do not install glass with edge damage.

D. Install glass with required glass markings right side up so they can normally be read from the exterior.

E. Setting blocks:

1. Minimum length of 4 inches or as required by GANA guidelines; minimum width shall correspond to the glass thickness and retaining member but, in no case less than the glass thickness at point of contact.

2. Locate at quarter points, or in accordance with GANA glazing guidelines.

3. Secure against migration.

4. Shims used in conjunction with setting blocks must be of the same material, hardness, length and width as the setting blocks.

F. Side blocks:

1. Locate side blocks where required within the upper half of each jamb for each light.

2. Install block with 1/8-inch clearance between block and glass bearing surface.

3. Block shall be sufficient length to prevent point loading on the glass.

4. Side blocks are not required where an individual glass light is continuously sealed with silicone at 2 or more edges, when the sealant is installed immediately following the setting of the glass.

G. Provide spacers inside and out unless continuous gaskets are used. Use glass manufacturer recommended size and spacing.

H. Prevent exudation of sealant or compound by forming voids or installing filler rods in the channel at the heel of jambs and head (do not leave voids in the sill channels, except as needed for drainage and weep holes) depending on light size, thickness and type of glass, and complying with manufacturer's recommendations.

I. Force sealants into channel to eliminate voids and to assure complete "wetting" or bond of sealant to glass and channel surfaces.

J. Tool exposed surfaces of sealants to provide a substantial "wash away" from the glass.

K. Install pressurized gaskets to protrude slightly out of the channel, so as to eliminate dirt and moisture pockets.

L. Clean and trim excess glazing materials from the glass, stops and frames promptly after installation, and eliminate stains and discolorations.

M. Where wedge shaped gaskets are driven into one side of the channel to pressurize the sealant or gasket on the opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when subjected to dynamic movement.

1. Anchor gasket to stop with matching ribs, or with adhesive.

N. Clean, prime and mask structural silicone joints the same day when silicone is applied.

3.5 CURING/PROTECTING/CLEANING

A. Cure glazing sealants and compounds in compliance with their manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.

B. Protect glass from breakage immediately upon installation. Do not apply markers of any type to glass.

C. Before Substantial Completion, remove and replace glass which is broken, chipped, cracked, abraded, stained or damaged in other way, including natural causes, accidents and vandalism.

D. Maintain glass in a clean condition during construction so that it will not be damaged by corrosive action and will not contribute (by wash-off) to the deterioration of glazing materials and other work.

E. Remove remaining labels and wash and polish glass on both faces not more than 4 days prior to Owner's acceptance of the work in each area. Comply with GANA 01-0300 and the glass manufacturer's recommendations.

3.6 GLASS SCHEDULE

A. Type GL-1: 1/4 inch thick, clear glass.

B. Type GL-1A: 1/4 inch thick, tempered, clear glass.

C. Type GL-2: 1 in. thick insulating unit consisting of 1/4 in. thick clear, tempered glass with low-E coating on surface 2; 1/2 in. dehydrating air space; 1/4 in. thick clear, tempered, float glass for the interior lite. Tint on exterior glass shall match existing.

D. Type GL-3: 5/16 in. thick, laminated, fire rated and impact rated, polished, glass ceramic, Premium Grade Firelite Plus by Nippon Electric Glass Co. or equal.

END OF SECTION

SECTION 09 2216
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior steel studs and furring.

2. Backing plates not provided by other trades for support of items attached to metal framing system.

3. Replacing steel framing damaged due to the work of this Contract.

B. Work installed but furnished in other Sections:

1. Access panels furnished by electrical and mechanical trades for access to their work.

2. Backing plates furnished with fixtures and equipment attached to, or supported by metal framing system.

C. Related work:

1. Division 5 for cold-formed steel framing.

1.2 REFERENCES

A. Lath and plaster framing: Specifications for Metal Lathing and Furring, and Specification Guide For Cold-Formed Lightweight Steel Framing published by the Steel Studs Manufacturers Association.

B. Gypsum board framing: ASTM C 754, Installation of Steel Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board or Water-Resistant Backing Board.

C. Welding: AWS D1.1, Structural Welding Code, Steel, and D1.3, Structural Welding Code, Sheet Steel.

D. Studs and runners:

1. ASTM C 955, Specifications for Load Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging, for Screw Application of Gypsum Board and Metal Plaster Bases.

2. ASTM C 645, Specifications for Non-Load (Axial) Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.

1.3 SUBMITTALS

A. List of materials: Submit complete list of materials together with brochures and descriptive data of all items proposed for use.

B. Load tables: Submit complete load tables and deflection table properly annotated for anticipated use for all studs.

C. Shop drawings: Submit the following.

1. Large scale, dimensioned, for assemblies engineered by the Contractor.

2. Indicate component details, framing layout, framed openings, anchorage to structure, seismic bracing, type, and location of fasteners and welds, and accessories required of related work.

1.4 QUALITY ASSURANCE

A. Fire resistance: Where a fire resistance classification is indicated, provide materials, accessories, and application procedures listed by UL, or tested according to ASTM E 119 for the type of construction shown, and approved by authorities having jurisdiction.

B. Qualifications for welding work:

1. Qualify welding procedures and welding operators in compliance with AWS "Qualification" requirements for AWS D1.3.

2. Verify that welders to be employed in this work have satisfactorily passed AWS qualification tests.

3. If recertification of welders is required, retesting will be Contractor's responsibility.

1.5 HANDLING

A. Storage: Under cover, off the ground or floor, in a dry, ventilated space.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. General: One of the following systems of the size indicated and gage required to comply with criteria specified.

1. Cemco.

2. Clark Dietrich Building Systems.

3. Marino Industries, Inc.

4. Scafco Corp.

5. Superior Steel Studs, Inc.

2.2 STUDS, RUNNERS AND FURRING

A. Studs:

1. General: ASTM C 645, punched web, of the size, gage (thickness), and spacing indicated on the Drawings and specified, complying with the following, as applicable.

2. Protective coating: ASTM A 653, G40 zinc coating.

3. Bracing: Where the wall finish does not adequately brace both flanges of studs, bracing shall be added or allowable stresses shall be reduced in computing stud heights in compliance with Code.

B. Top and bottom runner, and bridging:

1. As recommended by the manufacturer of each stud type and of same-gage as stud in same wall or partition, unless otherwise indicated on the Drawings. Provide unpunched, screwable tracks, gage to match studs, 1-1/2-inch flanges.

2. For other fire-rated partitions: Use “Fire Trak” by Fire Trak Corp., "Sliptrack Systems, Inc. "Slip-Trk" for fire-rated partitions, Fire Trak Corp. “VertiTrack VTD or VTX” by the Steel Network, or other Code-compliant assemblies acceptable to the Architect.

3. Elsewhere: Use either “Slip Track 250” by Clark Dietrich Building Systems or equal track matching the stud gage in same wall but with a 2-1/2 inch leg, or a deep leg 54 mils thick (16-gage) minimum slip connection to accommodate slab deflection.

C. Furring channels: 18 mils thick (25-gage) minimum, galvanized, hat-shaped.

D. Horizontal stiffener, runner channels and bridging: 54 mils thick (16-gage) channels fabricated of cold-rolled steel, ASTM A 366, with flanges not less than 7/16-inch wide. Minimum weights as follows:

Channel Size	Flange Width	Pounds/1000 linear foot
3/4-inch	7/16-inch	300
1-1/2-inch	7/16-inch	475
2-inch	19/32-inch	590

2.3 FASTENERS AND ACCESSORIES

A. Screws: ASTM C 1002 for metal framing 18 mils thick (25-gage) and lighter, ASTM C 954 for heavier metal framing, 3/8-inch head diameter, corrosion-resistant pan head screws; length and gage required by Code, or recommended by the metal framing manufacturer when not prescribed by Code.

B. Shot pins: 0.140-inch diameter low velocity powder-actuated drive pins equivalent to Ramset/Red Head No. 1508, or equal, with 7/8-inch minimum penetration into concrete.

C. Expansion shields: FS FF-S-325, except do not use lead, fiber and plastic shields.

D. Welding electrodes: ASTM A 233, as recommended by AWS for the conditions of use and the metals to be welded.

E. Wire: ASTM A 641, galvanized, soft-annealed steel, minimum gage as follows.

1. Furring channel to runner channel: 16 BW gage.

2. Ties and splices in channels: 18 BW gage.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 INSTALLATION VERTICAL FRAMING

A. General:

1. Erect metal framing systems in compliance with their manufacturer's recommendations, the reference standards, the Drawings and these Specifications.

2. Use minimum 33 mils thick (20-gage) studs at door openings and for studs supporting backing plates and wall-supported cabinets.

3. Do not attach metal framing to ducts, conduits or pipes. Do not allow metal framing and suspension wires to contact pipes.

4. Isolate framing from transfer of structural loading, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.

5. Cut framing components squarely for a tight fit against abutting members. Erect framing plumb and level to provide solid backing for finish materials. Install all steel studs in a wall/partition so that their flanges point in the same direction.

6. Do not exceed a 1/8-inch in 10 feet deviation (non-cumulative) from true lines and levels, nor 1/4-inch from true position. Perform necessary remedial work on framing to achieve specified tolerances.

B. Wall/partition framing:

1. Layout partitions and mark on slabs.

2. Align and securely anchor ceiling and floor tracks to building construction.

3. Space anchors within 6-inches of ends of each track segment and at 24-inches o.c. maximum. Do not drive fasteners closer than 2-inches to slab or curb edge.

4. Frame all openings in stud walls. Provide double studs, closer spacing, and additional reinforcement as detailed or required at door frames and borrowed light frames (interior windows).

5. Frame both sides of control joints in gypsum board surfaces with separate studs and discontinuous runner; do not bridge the joint with system components or accessories.

6. Assemble corners using a minimum of 3 studs.

7. Install studs in single length, without joints, extending from floor to underside of floor or roof structure above, except where indicated on the Drawings to stop at or above suspended ceilings. Splicing studs is not permitted without the Architect's approval.

8. Where studs stop at or above suspended ceilings, unless otherwise indicated, brace every fourth stud (maximum) with opposite stud bracing at 45-degree angle securely anchored to the floor or roof above.

9. Attaching studs to runner:

a. Attach studs to tracks by friction fit for single stud gypsum board partitions.

b. Attach the following studs to runner tracks with screws except where indicated to be welded.

c. Attach corner studs, partition intersections, studs on each side of door jambs, and other openings in walls/partitions with screws.

10. Unless otherwise indicated, provide horizontal stiffeners consisting of 3/4-inch channels spaced at not more than 54-inches o.c. maximum in all partitions/walls supporting wall supported cabinets. Tack-weld stiffeners to each stud.

a. Provide an additional 3/4-inch channel 6-inches above door head and extend 2 stud spaces beyond jamb studs.

b. Install channels in longest possible lengths; lap 12-inches and wire-tie at joints. Do not tie channels on opposite sides of staggered and double stud partitions together.

11. Double gypsum board studs (face to face to form a tube) adjacent to doors and openings. Extend studs at door openings to slab or deck above and anchor securely to bottom track and to top slab or deck with clip angles.

a. Locate additional studs not more than 2-inches from door and window frames, abutting partitions, partition corners, and other construction.

b. Install a section of track over door and window frames with a clip angle at each end and attach securely to the adjacent vertical studs.

c. Install cut-to-length studs at the location of vertical joints and at standard spacing over the door frame header extending to the ceiling track.

12. Install studs 2-inches away from abutting steel columns or other structural elements. Extend the horizontal stiffeners and attach it to the structural element.

13. Provide additional framing, as required, for attachment of electrical boxes and similar items located in stud walls.

C. Resilient furring channels:

1. Install, with mounting flange down, at right angle to studs, starting within 2-inches of floor and 6-inches from ceiling.

2. Splice channels directly over studs and attach through both flange to studs.

3. Space channels as indicated on the Drawings.

4. Drive screws through channel attachment flange and studs at each intersection.

3.3 FURRING

A. Provide furring attached to concrete and metal framing to conceal utilities and other furring as indicated.

B. Furring to receive gypsum board shall be screw-on channels directly attached to backing material, or applied over runner channels as applicable.

C. Space furring as indicated for studs.

3.4 WELDING

A. Perform welding in compliance with AWS recommendations. Welders shall be qualified to weld lightgage metal. Provide stitch plates where studs are burned-through.

3.5 BACKING PLATES

A. Backing plates may be omitted if anchorage for wall-hung items is directly into steel studs of 43 mils thick (18-gage) or heavier, or items are furnished with equal mounting devices.

B. Wall-mounted and wall-hung items that require backing plates, without limitation, include the following:

1. Wall and base cabinets.

2. Marker boards and tack boards.

C. Unless otherwise indicated, plates not provided with fixtures and equipment shall be long enough to span, as a minimum, across 3 studs and may be one of the following:

1. 54 mils thick (16-gage) minimum steel plate by 4-inches wide.

2. 54 mils thick (16-gage) unpunched wide flange stud by 4-inches wide.

D. Notch studs so that backing plate will be flush with exterior face of stud.

E. Weld plates continuously along all contact surfaces at each stud crossing, or secure with 2 countersunk machine screws at each stud.

END OF SECTION

SECTION 09 2900
GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Gypsum board.

2. Fasteners, joint reinforcing and finishing compound.

3. Patching gypsum board damaged due to the work of this Contract.

B. Related work:

1. Divisions 5 and 9 for metal framing supporting gypsum board.

1.2 REFERENCES

A. ASTM C 475, Specification for Joint Compound and Joint Tape for Finishing Gypsum Wallboard.

B. ASTM C 840, Specification for Installation and Finishing of Gypsum Board.

C. ASTM C 954, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 inch to 0.110 inch in Thickness.

D. ASTM C 1002, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Stud

E. ASTM C 1396, Standard Specification for Gypsum Board

F. ASTM E 119, Test Method for Fire Tests of Building Construction and Materials

G. ASTM E 497, Installing Sound Isolating Lightweight Partitions.

H. GA-216, Application and Finishing of Gypsum Board.

1.3 SUBMITTALS

A. Data: Manufacturer's data for all materials to be used in gypsum board construction.

1.4 QUALITY ASSURANCE

A. Requirements of regulatory agencies:

1. Comply with fire resistance ratings indicated and required by Code.

2. Provide materials, accessories and application procedures listed by UL or tested in compliance with ASTM E 119 for the type of construction shown.

B. Mockup:

1. Where directed, construct a mockup of a gypsum board wall and ceiling inside the building. Make mockup full height (minimum 8 feet high by 8 feet wide) with a 4-foot return.

2. Tape and finish joints, trim and screw heads as specified for Level 5 herein. Refer to Section 09 9100 for painting of the mockup with a semi-gloss paint.

3. The Architect will review the mockup under various light conditions for defects and improperly finished joints, trim and screw heads. Provide a portable light for that purpose when so requested if permanent lighting is not available.

4. Make corrections requested by the Architect, or remove and replace mockup when the corrective work is not acceptable to the Architect.

5. The approved mockup shall remain in the building until its removal is directed, and will be used as a standard for the gypsum board work for the Project.

1.5 HANDLING

A. Procedure: In accordance with GA 801 "Handling Gypsum Board."

B. Storage: Do not overload the floors with localized concentration of gypsum board.

1.6 JOB CONDITIONS

A. Comply with the gypsum board manufacturer's recommendations and GA “Application and Finishing of Gypsum Board” for temperature limitations and ventilation before, during and after installation of gypsum board.

B. Protect installed materials from drafts during hot, dry weather.

C. Illuminate work areas during installation to provide the same or greater level of illumination required to properly perform the work and as will occur in the room or space after the building is in operation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. US Gypsum Co.

B. Goldbond Building Products/Div. National Gypsum Co.

C. G-P Gypsum Products.

D. PABCO Gypsum.

2.2 GYPSUM BOARD

A. General:

1. Provide boards complying with ASTM C 1396 as follows and in maximum lengths available to minimize end butt joints.

2. Unless otherwise acceptable to the Architect, no end-to-end butt joints are allowed on walls or ceilings less than 12-foot in length or width.

B. Exposed gypsum board surfaces (Type X or C as applicable to the assembly): Provide boards with paper face suitable to receive decorative finish, and long edges tapered to receive joint compound.

2.3 ACCESSORIES

A. Screws: The following sized in compliance with the gypsum board manufacturer's instructions and Code requirements.

1. ASTM C 954 for fastening to supporting studs and furring.

2. ASTM C 1002, Type G for gypsum board-to-gypsum board.

B. Metal trim: Galvanized steel of the types specified hereafter complying with ASTM C 840 and ASTM C 1047.

1. LC-Bead: J-shaped; exposed long flange to receive joint compound; use at exposed panel edges.

2. L-Bead: L-shaped; exposed long leg to receive joint compound; use where indicated.

3. U-Bead: J-shaped; exposed short flange not to receive joint compound; use at exposed panel edges.

4. Expansion (Control) Joint: Use where indicated.

5. Control joint: USG No. 093, Goldbond Building Products E-Z Strip or Trim-Tex 093V.

C. Joint tape, compound and laminating adhesive: ASTM C 475, low or very low shrinkage, type recommended by the manufacturer, by Westpac Materials, basis of design, USG or one of the gypsum board manufacturers named above.

1. Taping, and fastener and metal trim concealment: Sheetrock Brand Taping Joint Compound, Ready-Mixed by USG, Westpac Materials or equal.

2. Topping, finish and skim coats: Sheetrock Brand Topping Joint Compound, Ready-Mixed by USG, Westpac Materials or equal.

3. Joint tape complying with ASTM C475: Sheetrock Joint Tape – Heavy by USG, Westpac Materials or equal.

D. Sealants: As specified in Section 07 9219.

PART 3 - EXECUTION

3.1 EXAMINATION/PREPARATION

A. Examine conditions affecting the work of this Section at site.

B. Verify framing members' straightness and alignment.

C. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

D. Before enclosing stud walls, thoroughly clean floor tracks of debris.

3.2 GYPSUM BOARD INSTALLATION - GENERAL

A. Comply with the applicable provisions of the references standards and the following.

B. Use only full size boards above door and window openings; joints at corners of heads are not acceptable.

C. Minimize butt joints and avoid butt joints centered on walls, over protruding studs, and above doors and windows. Avoid abutting end joints in the central area of each ceiling.

D. Install all panels, including those in non-rated applications, with joints in moderate contact.

E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints.

F. Position adjoining panels so that tapered edges abut tapered edges, and field-cut edges abut field-cut edges and ends.

1. Do not place tapered against cut edges or ends.

2. Where square (non-tapered) joints abut on ceilings, use Trim-Tex "Buttboard" behind the joint in accordance with Trim-Tex recommendations.

G. Stagger vertical joints over different studs on opposite sides of partitions.

H. Attach gypsum panels to steel studs so that the leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Attach gypsum panels to framing provided at openings and cutouts.

J. Except where frames are solidly grouted, spot grout hollow metal door frames. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.

K. Provide perimeter relief where board abuts structural decks, ceilings, vertical structural elements, or glazed assembly.

L. Install horizontal boards first. Butt joints between boards loosely. Do not force boards into place. Place tapered or wrapped edges next to one another.

M. Attach boards to all studs and furring members with power-driven screws securely engaging supporting member, and with fastener heads uniformly depressed not over 1/32 below surface of board (except for first layer of multiple layer assembly) without breaking face paper.

N. After boards have been installed over screws and backing plates, tap boards with a rubber mallet to depress backside of board over heads to eliminate unacceptable bulges.

3.3 SINGLE LAYER APPLICATION

A. Horizontal surfaces:

1. Install board with long dimension at right angle to supports, with end joints located over supports.

2. Use maximum practical length boards to minimize end joints. Stagger end joints in alternate boards.

B. Vertical surfaces: Unless otherwise acceptable to the Architect, install board vertically. Use floor-to-ceiling length boards (unless height exceeds 12-foot) with vertical joints located over supports.

1. Offset joints at least one stud on opposite sides of partition/walls.

2. Extend gypsum board continuously from finish floor to underside of structure above, except where indicated otherwise on the Drawings.

3.4 MULTIPLE LAYER APPLICATION

A. Vertical surfaces:

1. Install board vertically using floor-to-ceiling length boards (unless height exceeds 12 feet) with vertical joints located over studs.

2. Offset joints at least one stud spacing on opposite sides of partitions and between subsequent layers of gypsum board.

3. Fasten all layers of gypsum board to metal framing with screws.

3.5 ALLOWABLE TOLERANCES

A. Do not exceed 3/16 inch in 8 feet, and 1/8 inch in 4 feet from plumb, level and flat (all directions) in gypsum board surfaces.

B. Do not exceed 1/16 inch offset at joints between boards.

C. Shim boards as necessary to comply with these tolerances.

3.6 FINISHING

A. Finish gypsum board surfaces with exposed joints, corners and edges reinforced or trimmed in compliance with GA-214 and the following:

1. Level 0: Use for first layer of multiple layer construction.

a. No taping, finishing or corner beads required.

2. Level 1: Use in plenum areas above ceilings, in attics, and in areas where the assembly will generally be concealed.

    a. Joints and interior angles shall have tape embedded in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

3. Level 2: Not used.

4. Level 3: Not used.

5. Level 4: Not used.

6. Level 5 – skim coat (spray and roller-applied finish is not acceptable): Use for all other areas to be painted. Finish as follows to match approved mockup. Treat joints and fasteners as follows.

    a. All joints and interior angles shall have tape embedded in joint compound and 2 separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles.

    b. Cover fastener heads and accessories with 3 separate coats of joint compound.

    c. Apply a thin skim coat of joint compound to the entire surface to result in a smooth surface free of tool marks and ridges.

B. General:

1. Fill joints, fastener heads, trim accessory flanges and surface defects with joint compound in compliance with the gypsum board manufacturer's recommendations to obtain a smooth, flush surface.

2. All joints, fastener heads and trim flanges in surfaces which will remain exposed to view in the building, shall be invisible after application of joint tape and compound.

C. Install trim in single unjointed length, unless length exceeds manufacturer's standard. Attach to gypsum board in compliance with manufacturer's instructions.

1. Install Type CB trim at external corners.

2. Install Type LC trim where gypsum board edges are exposed in the finish work.

3. Install Type CB or LC trim where gypsum board abuts a different material, and the edges are not covered by a finish material.

4. Install control joints as recommended in ASTM C 840, paragraph 20. Joint locations are subject to the Architect's approval.

D. Reinforce joints between gypsum boards, and interior corners and angles with tape set in joint compound.

1. Apply skim coat in one application over tape.

2. Where space greater than 1/16 inch occurs between abutting gypsum boards (except at control joints and for concealed layers of multiple layer assemblies), pre-fill joints with joint compound and allow to dry before applying joint tape.

E. Joint compound:

1. Lap each coat not less than 4 inches over the preceding coat (2 inches on each edge). Width of joint compound on tapered board edges shall be not less than 12 inches; width of joint compound on square board edges not less than 18 inches.

2. Allow at least 24 hours drying time between applications of joint compound.

3. Finish joint compound so that little or no sanding is required. When sanding, use sandpaper or mesh cloth with grit as fine as possible; do not scuff face paper. Remove all sanding dust before painting or applying other finishes.

F. Leave gypsum board surfaces smooth, undamaged and ready to receive scheduled finishes.

END OF SECTION

SECTION 09 3000
TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Ceramic wall tile, and trim shapes.

2. Surface preparation, setting materials, grouts and sealants.

B. Related work:

1. Division 7 for sealants other than specified herein.

1.2 REFERENCES

A. TCNA, Handbook for Ceramic Tile Installation.

B. ANSI A108.1, General Requirements: Subsurfaces and Preparations by Other Trades.

C. ANSI A108.1B, Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar.

D. ANSI A108.5, Installation of Ceramic Tile with Dry-Set Portland Cement or Latex-Portland Cement Mortar.

E. ANSI A108.10, Installation of Grout in Tilework.

F. ANSI A118.1, Dry-Set Cement Mortar.

G. ANSI A118.4, Latex-Portland Cement Mortar.

H. ANSI A118.6, Specifications for Standard Cement Grouts for Tile Installation.

I. ANSI A118.7, Polymer Modified Tile Grouts for Tile Installation.

J. ANSI A118.10, Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

K. ANSI A118.15, Specifications for Improved Modified Dry-Set Cement Mortar.

L. ANSI A137.1, Ceramic Tile.

1.3 SUBMITTALS

A. Samples: Submit the following.

1. 24-inch square samples, of each type and color of tile glued to hardboard backing; grout joints.

2. Type, color and shape of trim and base.

B. Data: Submit manufacturer's data for waterproofing membrane, pre-mixed mortars and grouts, with certification that they meet ANSI standards specified when applicable.

1.4 QUALITY ASSURANCE

A. Uniformity:

1. Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

2. Obtain materials of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

B. Installer's qualifications: Experienced firm who has successfully completed tile installations similar in material, design, and extent to that indicated for Project for at least 5 years.

C. Mockup: Before starting tile installation, erect mockups for each form of construction and finish required. Build mockups complying with the following, using materials indicated for final Work.

1. Make mockups a minimum of 6-foot square. Locate on site where directed by the Architect.

2. Make modifications requested by the Architect, or remove unsatisfactory mockups and construct new ones.

3. Obtain Architect's acceptance of mockups before starting final installation.

4. Retain and maintain mockups during construction in undisturbed condition as a standard for judging completed tile work.

5. When accepted by the Architect, accepted mockups in undisturbed condition at time of Substantial Completion may become part of the Work.

D. Preinstallation meeting: Contractor shall conduct a preinstallation meeting prior to the start of the Work of this Section to review requirements in ANSI A108.01 for substrates and for preparation by other trades. Attendees shall include tile installer, Architect, Owner's Representative, and setting materials local representative.

E. Master grade certificate: Submit, bearing the Certification Mark of the Tile Council of North America, Inc., signed by the tile manufacturer, stating the type and quality of each type of tile delivered to the job site.

1.5 HANDLING

A. Procedure: In accordance with Division One. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Delivery: Deliver tile cartons with grade seals unbroken.

1.6 JOB CONDITIONS

A. Set and grout this work when ambient temperature is at least 50 deg. F or higher. Do not install materials on surfaces (or when ambient temperature) is less than 40 deg. F.

B. For exterior tile work, shade the work areas from direct sunlight during installation, as needed to prevent rapid evaporation caused by excessive heat or wind.

1.7 MAINTENANCE

A. Furnish one full box of each type, color and size of tile properly packaged and identified, by room or area.

PART 2 - PRODUCTS

2.1 TILE

A. Make, size, colors, textures, and patterns: As scheduled at the end of this Section.

B. Factory-blending: For tile exhibiting color variations within the ranges selected during sample submittals, factory-blend tiles and package accordingly so that tiles taken from one package show the same color range as those taken from other packages, and match approved samples.

2.2 SETTING MATERIALS AND GROUT

A. Latex modified dry-set mortar for walls: Complying with ANSI A118.4, pre-sanded, latex-modified.

1. FlexBond Crack Prevention Mortar by Custom Building Products.

2. 254 Platinum by Laticrete International, Inc.

3. Kerabond/Keralastic by Mapei.

4. Pro Set Flex M300 by Siena (Omega Products International).

5. TEC Full Flex Mortar by TEC Specialty Construction Brands.

6. Merkrete 735 Premium Flex by Merkrete (Division of Parex USA).

B. Mortar bed materials:

1. Portland cement: ASTM C 150, Type 1.

2. Sand: ASTM C 144.

3. Water: Potable, fresh.

4. Setting bed reinforcing mesh: 2-inch by 2-inch by 16/16, 3-inch by 3-inch by 13/13 or 1-1/2-inch by 2-inch by 16/13 wire complying with ASTM A 82 or A 185.

C. Grout:

1. Latex modified Portland cement grout: Comply with ANSI A118.7, sanded or unsanded as applicable to the joint width and recommended by the grout manufacturer.

a. Poly Blend by Custom Building Products.

b. 1500/1600 Series by Laticrete International Inc.

c. Kera-Color by Mapei International.

d. NS200/GS300 by Siena (Omega Products International).

e. AccuColor by TEC.

f. Pro Grout by Merkrete (Division of Parex USA).

2.3 MISCELLANEOUS MATERIALS

A. Waterproofing membrane: ANSI A118.10

1. Redgard by Custom Building Products.

2. 9235 with reinforcing fabric by Laticrete International Inc.

3. Mapelastic 400 by Mapei.

4. Dragon Skin by Siena (Omega Products International).

5. HydraFlex by TEC Specialty Construction Brands.

6. Hydro Guard SP1 by Merkrete (Division of Parex USA).

B. Grout sealer: Penetrating sealer.

1. Aqua Mix Sealer's Choice Gold by Custom Building Products.

2. Laticrete 190 Sealer by Laticrete International Inc.

3. UltaCare by Mapei.

4. Grout Sealer by Merkrete (Parex).

5. DuPont Grout Sealer by StoneCare (Laticrete International Inc.).

C. Sealant and back-up for control joints in tiles: As specified in Section 07 9200.

D. Cleavage membrane: 10-mil thick polyethylene complying with ASTM D 2103, Type 13300.

2.4 MORTAR BED MATERIALS FOR WALLS

A. Vapor retarder: Complying with UBC Standard 14-1 and FS UU-B-790, Type I, Grade D (vapor permeable), Style 2, except with a water resistance of 60 minutes; Fortifiber Corp. "Super Jumbo Tex", Firstline Corp. "Kraftex Stucco Paper," or equal.

B. Lath: Expanded diamond mesh lath weighing 3.4-lbs./sq. yd. made from zinc-coated (galvanized) steel sheet to produce lath complying with ASTM C 847, by Clark/Western, Amico West or Cemco.

C. Scratch coat (by volume): One part Portland cement (ASTM C 150), maximum one part dry hydrated lime (ASTM C 206, Type S), maximum 4 parts loose sand aggregate (ASTM C 144) of the total volume of cement/lime.

PART 3 - EXECUTION

3.1 EXAMINATION/PREPARATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Remove glaze and contaminants, including remaining curing compounds, from floors by wire-brushing or sandblasting.

C. Verify that surfaces to be tiled are firm, dry, clean, and free from oil or waxy films and curing compounds, and within the following tolerances:

1. Mortar-set tiles: 1/4 inch in 8 feet for walls.

2. Walls shall have been engineered and installed for a maximum deflection of L/360 under loads prescribed by Code. Coordinate this requirement with other design criteria specified in Section 05 4100.

D. Examine that installation of grounds, anchors, recessed frames, electrical and mechanical work, and similar items located in or behind tile have been completed before installing tile.

E. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 WATERPROOFING MEMBRANE

A. General: Comply with the waterproofing membrane manufacturer's instructions, ANSI A 108.10, and the following.

B. Surface preparation:

1. Prepare surfaces to be waterproofed so that they are clean, smooth and free of contamination.

2. Repair defects such as cracks, penetrations and protrusions.

3. Apply waterproofing only when surface temperature is above 40-degrees F.

C. Installation: In accordance with the membrane manufacturer instructions, except reinforce the membrane at change of planes.

1. Embed the reinforcing fiberglass fabric in the wet membrane and install the final layer of paste to completely seal the fabric and cover all pinholes.

2. Completed membrane shall be uniform in thickness and texture, monolithic and waterproof.

3. Waterproofing manufacturer's technical representative shall observe the substrate and installation of the waterproofing membrane.

3.3 TILE INSTALLATION

A. General: Install proprietary materials in compliance with their manufacturer's instructions. Press or beat the tiles to obtain 100 percent coverage of mortar on back of tile; back butter tile if necessary.

1. Maintain minimum temperature limits and installation practices recommended by mortar and grout materials manufacturers in areas where this work is performed.

2. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignment. Saw-cut and drill tiles to obtain tight fitting, clean, sharp, undamaged cut edges.

a. Rub cuts smooth with fine abrasive stone.

b. Cut and drill so that electrical outlets, plumbing fixtures, pipes, fixtures and fittings standard plates, escutcheon and collars will overlap the tile.

c. Do not cut or split tile at penetrations.

3. Install tile in patterns indicated with uniform joints, continuing and perimeter units not less than 1/2 unit wide. Adjust to minimize cutting.

4. Accurately set tile with flush well-fitted joints, finished in true planes, plumb, square, sloped or level as required.

5. Form corners, returns, and exposed tile edges with approved trimmers.

6. Where tiles selected by the Architect are installed in the same plane, but are of a different thickness, it is the Contractor responsibility to adjust the setting bed or mortar thickness so that all tiles are flush.

7. Maximum deviation from true lines and levels shall not exceed 1/8-inch in 10-foot for floors, and 1/8-inch in 8-foot for walls.

8. Provide control joints where shown on Drawings and expansion joints at a maximum of 30 ft. oc.

9. Calk penetrations in tile with sealant and backing rod specified in Section 07 9200. Provide expansion joints where indicated or as recommended by TCNA Method EJ171.

B. Exterior tile installations:

1. Wall tile: Install over framing and plywood in compliance with ANSI A108.5 and TCNA installation method W221, modified to be used over cleavage and waterproofing membranes.

C. Sound tile after setting. Replace or reset hollow sounding units.

3.4 GROUTING/CLEANING/SEALING

A. Grouting: Comply with ANSI A108.10, ANSI A 118.7 for polymer modified grout.

1. Cementitious and polymer modified grout: Finish joints of square edge tiles flush with tile surfaces; finish joints of cushion edge tiles to depth of cushion. Grout shall be free of voids and pits.

B. Cleaning:

1. Clean tile and repair faulty grouting. Sponge and clean surfaces with clean water and soft brushes.

2. Polish glazed tile after cleaning with clean, dry cloths.

C. Grout sealer: Apply grout sealer to cementitious grout per manufacturer instructions.

3.5 PROTECTION

A. Protect completed installations until acceptance by the Owner.

B. Protect floor tiles with reinforced Kraft paper or other heavy covering securely taped in place during the construction period to prevent damage and stains. Remove protection when no longer needed.

C. When recommended by tile manufacturer, apply a coat of neutral protective cleaner to completed tilework.

D. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

E. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

F. Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tiles.

3.6 TILE SCHEDULE

A. Match existing.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Acoustical ceiling panels.

2. Metal suspension system.

3. Patching and repairing existing acoustical ceilings.

4. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings, and supplementary parts and components, such as inserts, clips, bracing, compression posts, splay wires and other miscellaneous supports required for a complete installation.

B. Related work:

1. Divisions 23 and 26 for mechanical and electrical work in acoustical ceilings.

1.2 REFERENCES

A. Association of the Wall and Ceiling Industries International.

B. ASTM A 641, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

C. ASTM C 635, Manufacturing of Metal Suspension Systems.

D. ASTM E 580, Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint.

E. CBC.

F. ASCE 7-05.

1.3 SYSTEM DESCRIPTION

A. Design requirements:

1. Design ceiling components to ensure that light fixtures and installed accessories will not induce concentrated loads.

2. Where components may induce rotation of ceiling system components, provide stabilizing reinforcement.

1.4 SUBMITTALS

A. Data:

1. Manufacturer product specifications and installation instructions for ceiling materials, and suspension system.

2. Include satisfactory test data certifying that the acoustical units comply with Code requirements.

B. Samples:

1. Full size acoustical units showing the full range of color and texture to be expected in the completed work.

2. Twelve-inch long samples of each linear components of the suspension system and samples of connectors.

C. Shop drawings:

1. Show ceiling layouts, seismic bracing, method of suspension where interference such as ducts and pipes exists, with light fixtures, grilles, sprinkler heads, speakers accurately located, and typical details of constructions and installation.

2. Where pipes, ducts and conduits prevent direct suspension, and trapezes have to be used, justify the suspension system with structural calculations.

3. Reproduction of the Contract Drawings as shop drawings is not acceptable; take necessary measurements at the job site.

D. Closeout: Manufacturer’s recommendations for cleaning and refinishing ceiling materials, including precautions against materials and methods that may be detrimental to finishes and acoustical performances.

1.5 QUALITY ASSURANCE

A. Design criteria: Suspension system shall have a “Heavy Duty” classification when tested in compliance with ASTM C 635.

B. Mockup:

1. Install a 10-foot square mockup of the acoustical ceiling for the Architect's approval before proceeding with this work.

2. Locate where directed by the Architect in the building.

3. The finished work shall match approved mockup and if properly identified for future reference may remain a part of the finished work, when approved by the Architect.

1.6 HANDLING

A. Delivery: Deliver UL labeled cartons of acoustical units bearing label classification of acoustical and flammability characteristics.

B. Storage:

1. Store acoustical panel cartons open at each end to stabilize moisture content and temperature, in fully enclosed space(s), in well-ventilated area protected from weather, moisture, soiling, extreme temperatures and humidity.

2. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handling: To avoid chipping edges or damaging units.

1.7 JOB CONDITIONS

A. Do not install acoustical ceilings until the space to receive them has been enclosed, and is weathertight, until work above ceilings has been completed, and until ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

B. Illuminate work areas during installation to provide the same or greater level of illumination required to properly perform the work and as will occur in the room or space after the building is in operation.

C. Do not use ceiling panels in extreme or continuous high humidity, or areas exposed directly to weather or water.

D. Allow time for dimensional changes in ceiling panels stored at temperature/humidity conditions well outside of those recommended for service. With increases in temperature/humidity, these products expand (up to 1/64-inch/foot at 85-degree F and 90 percent RH) and may not fit into a fixed grid.

1.8 MAINTENANCE

A. Full box of acoustical units matching those installed, packaged with protective covering for storage, and identified with appropriate labels.

1.9 WARRANTY

A. Manufacturer agrees to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:

1. Acoustical panels: Sagging and warping.

2. Grid system: Rusting and manufacturer's defects.

B. Warranty period:

1. Acoustical panels: 10 years from date of Substantial Completion.

2. Grid: 10 years from date of Substantial Completion.

C. The warranty shall not deprive the District of other rights the District may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 ACOUSTICAL UNITS

A. ACT-1: 24 in. x 24 in. x 9/16 in., Optima, 3251, white, square tegular edged units from a single production run or the same dye lot, by Armstrong World Industries. Panels shall have a Class A rating. Panels shall comply with ASTM D 1264, Type XII, Form 2, Pattern E; Class A; NRC of 0.95, and a light reflectance of 0.90.

B. ACT-2: 24 in. x 24 in. x 9/16 in., Optima, 3251, white, square tegular edged units from a single production run or the same dye lot, by Armstrong World Industries. Panels shall have a Class A rating. Panels shall comply with ASTM D 1264, Type XII, Form 2, Pattern E; Class A; NRC of 0.95, and a light reflectance of 0.90.

2.2 SUSPENSION SYSTEM

A. Grillage:

1. Components die-cut and interlocking.

2. Cope cross runners to lay flush with main runners, except at edge moldings.

3. The system shall have a Heavy Duty, classification complying with ASTM C 635.

4. Grillage:

a. ACT-1 Superafine 9/16 in. wide, exposed, white grilllage by Armstrong World Industries, USG Corp., or Chicago Metallic Corp. At existing ceilings, match grillage.

b. ACT-2 Superafine 9/16 in. wide, exposed, silver grilllage by Armstrong World Industries, USG Corp., or Chicago Metallic Corp.

B. Hanger wires: Galvanized carbon steel, ASTM A 641 soft-temper, prestretched, yield-stress load of at least 3 times design load, not less than 12-gage.

C. Accessories: Devices for attachment to overhead construction, secondary members, splines, splicers, connection slips, wall connectors and all other accessories required for a complete installation.

D. Trim:

1. As required by construction, and compatible with design and appearance of ceiling.

2. Perimeter trim and trim in ceiling penetrations shall permit lateral adjustment of at least 1/2-inch to accommodate irregularities in vertical surfaces interrupting ceiling.

E. Finish:

1. Concealed ferrous metal surfaces: Galvanized, cadmium-plated or coated with a factory-applied rust-inhibitive paint.

2. Exposed metal surfaces: Prime and apply a satin baked-on enamel finish matching the color of the acoustical units, as approved by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 INSTALLATION

A. General:

1. Install materials in compliance with the Drawings, the Specifications, and their manufacturer's instructions. In case of conflict, the most stringent provisions apply.

2. Comply with ASTM C 636 and E 580, governing regulations and industry standards applicable to this work.

3. Install materials so that the sound insulation of adjacent construction materials and assemblies is not compromised by locally reducing their surface mass, or creating unsealed penetrations.

4. Plan layout to balance border widths at opposite edges of each ceiling area.

5. Avoid use of less than half-width acoustical units wherever possible.

6. Comply with reflected ceiling plans shown on the Contract Drawings.

3.3 SUSPENDED GRILLAGE INSTALLATION

A. 12-gage (minimum) hanger wires may be used for up to and including 4-foot by 4-foot grid spacing along main runners.

B. Provide 12-gage hanger wires at the ends of all main and cross runners within 8 inches from the support or within 1/4 of the length of the end Tee, whichever is least, for the perimeter of the ceiling area. End connection for runners which are designed and detailed to resist the applied horizontal forces may be used in lieu of the 12-gage hanger wires subject to Building Department review and approval.

C. Provide trapeze/other supplementary support members at obstructions to main hanger spacing. Provide additional hangers, struts or braces as required at all ceiling breaks, soffits or discontinuous areas. Hanger wires that are more than 1 in 6 out of plumb shall have counter-sloping wires.

D. Ceiling grid members may be attached to no more than 2 adjacent walls. Ceiling grid members shall be at least 1/2-inch free of other walls. If walls run diagonally to ceiling grid system runners, one end of main and cross runner should be free and a minimum of 1/2-inch clear of wall.

E. At the perimeter of the ceiling area where main or cross runners are not connected to the adjacent wall, provide interconnection between the runners at the free end to prevent lateral spreading. A metal strut or a 16-gage wire with a positive mechanical connection to the runners may be used where the perpendicular distance from the wall interlock is not required.

F. Provide sets of four 12-gage splayed bracing wires oriented 90 deg. from each other at the following ceilings:

1. Place sets of bracing wires at a spacing not more than 12-foot by 12-foot o.c.

2. Provide bracing wires at locations not more than 1/2 the spacing given above from each perimeter wall and at the edge of vertical ceiling offsets.

3. The slope of these wires shall not exceed 45 deg. from the plane of the ceiling and shall be taut without causing the ceiling to lift. Splices in bracing wires are not permitted without Building Department approval. Fasten hanger wires with not less than 3 tight

turns. Fasten bracing wires with 4 tight turns. Make tight turns within a distance of 1-1/2-inch Hanger or bracing wires anchors to the structure shall be installed in such a manner that the direction of the wire aligns as closely as possible with the direction of the forces acting on the wire.

a. NOTE: Wire turns made by machine where both strands have been deformed or bent in wrapping are acceptable substitute for the 1-1/2-inch requirement, but the number of turns shall be maintained and be as tight as possible.

G. Separate all ceiling hanging and bracing wires at least 6-inch from all unbraced ducts, pipes, conduit, etc. Lightweight items, such as single electrical conduit, not exceeding 3/4-inch nominal diameter, may be attached to hanger wires using connectors acceptable to the Building Department.

H. Attach light fixtures to the ceiling grid runners to resist a horizontal force equal to the weight of the fixtures.

I. Flush or recessed light fixtures and air terminals or services weighing less than 56 lb. may be supported directly on the runners of a heavy duty grid system, but, in addition, they must have a minimum of two 12-gage slack safety wires attached to the fixture at diagonal corners and anchored to the structure above. All 4-foot by 4-foot light fixtures must have slack safety wires at each corner.

J. Flush and recessed light fixtures and air terminals or services weighing 56 lb. or more must be independently supported by not less than 4 taut 12-gage wires each attached to the fixture and to the structure above regardless of the type of ceiling grid system used.

K. The 4 taut 12-gage wires including their attachment to the structure above must be capable of supporting 4 times the weight of the unit.

L. Support surface-mounted light fixtures by at least 2 positive devices which surround the ceiling runners and which are each supported from the structure above by a 12-gage wire. Spring clips/clamps that connect only to the runners are not acceptable.

M. Provide additional supports when light fixtures are 8-foot or longer.

N. Classification of ceiling grid shall be Heavy Duty as a minimum.

O. For fire-rated ceilings provide UL design number, or state FM listing number. The components and installation details must conform in every particular with the UL or FM approval for the design number specified. Custom design which combine components from different approved design but have not been tested as a complete assembly will not be acceptable.

P. Pop rivets, screws, or other attachments are not acceptable unless specifically detailed on Drawings and approved by UL and FM.

Q. Complying with the requirements of Section 13.5.6 of ASCE 7-05 and Section 1614A.1.12 of the CBC.

3.4 ACOUSTICAL UNITS

A. Match tile for color and pattern by using tile from cartons in the same sequence as manufactured.

B. Scribe and cut acoustical units for accurate fit at borders and around work which penetrates ceilings. Install with flush, tight joints.

C. For reveal-edged units on suspension system runners, install units with bottom of reveal in firm contact with top surface of runner flanges.

D. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.5 CLEANING

A. Clean soiled acoustical units and their suspension systems in compliance with their manufacturer's instructions.

3.6 FIELD QUALITY CONTROL

A. Remove and replace units that are damaged or cannot be cleaned, to the Architect's satisfaction.

END OF SECTION

SECTION 09 6110
VAPOR CONTROL BARRIER

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes:

1. Vapor control barrier applied to interior concrete slabs on grade scheduled to receive floor finishes.

a. Surface treatments applied to fully cured concrete slabs, after slab preparation and cleaning. This option is applied after slab moisture testing as specified in related finish floor specification Sections and applied only as required to achieve the specified moisture criteria.

B. Related work:

1. Division 9 for floor finishes.

1.2 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM).

1. ASTM F-1869-04: "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride".

1.3 SUBMITTALS

A. Product data: Manufacturer's specifications, data, and installation instructions.

1.4 QUALITITY ASSURANCE

A. Performance criteria:

1. Vapor and moisture barrier shall reduce vapor transmissions from interior concrete slabs-on-grade and above-grade concrete and metal deck assemblies to 3 pounds or less per 1000-square feet in a 24-hour period when tested per ASTM F1869.

2. Alkalinity: Maximum pH of 10.

3. Vapor and moisture barrier shall be compatible with specified finish flooring systems, coatings and adhesives.

1.5 WARRANTY

A. Warrant against failure of materials and workmanship by the manufacturer against delamination and other deterioration of floor covering, due to vapor emission, installed over barrier for a period of 10 years. In the case of failure, remove defective materials and replace floor covering at no cost to District.

B. Manufacturer shall warrant the installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Tech MES100 by Floor Seal Technology, multi-part proprietary systems applied to fully cured and prepared slabs-on-grade.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction and conditions under which Work will be installed. Notify in writing deficiencies detrimental to proper or timely installation; do not proceed until corrected.

3.2 APPLICATION

A. Prepare, clean, and scarify concrete surfaces not more than 14 days prior to moisture testing and installation of resilient flooring and carpeting.

1. Preparation: Grind down high spots and protrusions; clean concrete of debris and dust; and fill cracks, cavities, and low spots with an epoxy or cement-based compound. Gypsum based underlayment and filler materials not permitted.

2. Concrete surface: Shot or bead-blast to scarify surface (machine sand with open grit sandpaper to scarify surface).

B. Apply vapor and moisture system per manufacturer's instructions.

1. Pre-Sealer: Provide in areas where moisture tests indicate vapor emissions greater than specified levels per 1,000 square feet per 24 hours.

2. Membrane: Apply, finish, and cure components as recommended by manufacturer. Remove roughness and irregularities in finish membrane surface by sanding.

3.3 TESTING

A. Floors may be tested by the District to verify vapor emission rates. Vapor emission shall not exceed specified criteria or remedial surface treatments shall be required until vapor emissions are within specified criteria.

END OF SECTION

SECTION 09 6513
RESILIENT WALL BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Rubber bases.

2. Adhesive.

1.2 SUBMITTALS

A. Samples: Submit 12-inch long samples of each type and color of base.

B. Data: Submit proof of compliance with specified requirements.

1.3 HANDLING

A. Store materials indoors at a temperature above 60-degree F for at least 24 hours before use.

1.4 JOB CONDITIONS

A. Illuminate work areas during installation to provide the same or greater level of illumination required to properly perform the work and as will occur in the room or space after the building is in operation.

B. Maintain temperature in spaces to receive resilient bases between 70-degree and 90-degree F for not less than 24 hours before and 48 hours after its installation.

C. Maintain minimum temperature of 60-degree F after bases have been installed, except as specified above.

1.5 MAINTENANCE

A. Furnish 100 feet of each type and color of base for future maintenance.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rubber bases:

1. 4 in. tall x 0.125-inch thick rubber base complying with ASTM F 1861, Type TP (thermoplastic rubber) by Burke Flooring Products (basis of design), Roppe Rubber Corp., Johnsonite, or Flexco Co.

2. Top set base where no flooring and resilient flooring occur; straight (carpet) base at all other locations; do not use preformed corners.

3. In rolls minimum 100-foot long. Do not use short pieces. All walls 20-foot or less in one piece.

B. Adhesive: Type and brand recommended by base manufacturer for the conditions of use.

PART 3 - EXECUTION

3.1 EXAMINATION/PREPARATION

A. Examine walls for excessive moisture content and unevenness which would prevent the proper execution of the work of this Section. Fill cracks and sand down bumps.

B. Remove dirt, oil, grease, or other foreign matter from surfaces to receive bases.

C. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 ADHESIVE

A. Mix and apply adhesive in compliance with its manufacturer's instructions.

B. Provide safety precautions during mixing and application as recommended by the adhesive manufacturer.

C. Apply adhesive uniformly over backing surfaces, but only on areas which can be covered by bases within the recommended working time of the adhesive.

D. Tape adjacent surfaces to prevent migration and misapplication of adhesive.

E. Remove adhesive which dries or films over. Do not soil walls, bases, and other adjacent surfaces with adhesive. Promptly remove spillage from adjacent surfaces without damaging those surfaces.

3.3 BASE

A. Match edges at seams or double cut adjoining lengths. Install with hairline, flush butt joints.

B. Locate end of runs not less than 36 inches from a corner, except where impossible due to length of wall.

C. Do not use pieces less than 6-foot long, except where impossible due to length of wall.

D. Do not use preformed corner pieces.

1. Form inside corners on job from straight pieces of maximum lengths possible by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce snug fit to substrate.

2. Form outside corners on job from straight pieces of maximum lengths possible by shaving back of base at point where bending will occur. Remove a strip perpendicular to length of base and only deep enough to produce a snug fit without bends whitening or removal of more than half the thickness of base.

E. Scribe base accurately to abutting materials.

3.4 FIELD QUALITY CONTROL

A. After adhesive has set, clean bases with a neutral cleaner recommended by the base manufacturer.

B. Verify that there are no open joints and that base is completely adhered for its full length. Re-install in fresh adhesive where applicable.

C. Protect completed installations from damage until final acceptance.

3.5 COLOR SCHEDULE

A. RB-1: 217 Charcoal by Burke Flooring.

END OF SECTION

SECTION 09 6543.13
LINOLEUM SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Linoleum flooring.

2. Accessories and installation materials.

B. Related work:

1. Division 9 for vapor control barrier.

1.2 SUBMITTALS

A. Samples: Submit 24-inch square sample of linoleum, and 12-inch long samples of termination bar.

B. Shop drawings: Submit shop drawings showing seam locations, where applicable. Seam locations are subject to Architect's approval and relocation at no cost to the District.

C. Recommendations: Furnish the District 2 copies of the sheet flooring manufacturer recommended maintenance products and recommended maintenance methods and procedures.

1.3 JOB CONDITIONS

A. Maintain temperature in spaces to receive resilient flooring and bases between 70-degree and 90-degree F for not less than 24 hours before and 48 hours after its installation.

B. Maintain minimum temperature of 60-degree F after resilient flooring has been installed, except as specified above.

C. Illuminate work areas during installation to provide the same or greater level of illumination required to properly perform the work and as will occur in the room or space after the building is in operation.

1.4 MAINTENANCE

A. Furnish maintenance materials consisting of 6-foot long roll of each type and color of sheet flooring installed on the Project.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sheet linoleum:

1. Resilient flooring shall be stable, firm and slip resistant, CBC Section 11B-302.1

2. 79 in. wide rolls, 2.0mm thick, ASTM F 2034, with a smoke developed of 450 or less per ASTM E 662. Flooring shall have a minimum coefficient of friction of 0.6 as determined by testing identical products per ASTM C 1028.

    a. LIN-01: Forest Ground, 3234, Marmeoleum MCS with Top Shield by Forbo Industries with matching welding rod.

B. Edging and reducer strip: Tapered hard rubber edging and reducer strip made specifically for termination of resilient flooring, by Johnsonite, Burke Flooring, Macklanburg-Duncan or equal of the color selected by the Architect.

C. Primer, adhesive and crack filler: Type and brand recommended by floor covering manufacturer for the conditions of use.

PART 3 - EXECUTION

3.1 EXAMINATION/PREPARATION

A. Examine conditions and measurements affecting the work of this Section at site. Examine substrates for excessive moisture content and unevenness that would prevent the proper execution of the work of this Section. Perform a calcium chloride test or relative humidity test.

B. Verify substrates for excessive moisture content and alkalinity and unevenness which would prevent the proper execution of the work of this Section.

1. Testing procedure for in situ relative humidity probe test:

    a. Conduct in situ relative humidity probe testing per ASTM F 2170.

    b. Concrete floor slabs shall be at the service temperature and the occupied air space above the slab shall be at the service temperature service relative humidity far at least 48 hours before taking relative humidity measurements.

    c. Perform 3 tests for the first 1,000 sq. ft. and a minimum of 1 test for every additional 1,000 sq. ft.

    d. For slabs on-grade and below-grade slabs choose a testing location within 3 feet of each exterior wall.

    e. Drill probe holes 40 percent into depth of slab for slabs drying from the top only and 20 percent into the slab for above grade slabs.

    f. Remove dust from hole using vacuum cleaner and allow 72 hours to achieve moisture equilibration within hole before taking relative humidity measurements.

    g. After inserting probe, allow necessary amount of time for probe to reach temperature equilibrium before measuring relative humidity.

    h. Use the relative humidity probe to measure the ambient air temperature and relative humidity above the slab in the vicinity of the hole.

2. Testing procedures for alkalinity:

    a. Conduct pH test per ASTM F 710.

b. Concrete floors shall be tested for alkalinity prior to the installation of any flooring materials. pH levels shall not exceed the written recommendations of the flooring and adhesive manufacturers.

c. Place several drops of water on a clean surface of concrete, to form a puddle approximately 1 in. diameter. Allow the puddle to set for 60 (+/-5) seconds, then dip the pH paper into the water. Remove immediately, and compare to chart to determine pH reading. Refer to flooring manufacturer's written instructions for guidelines on acceptable pH levels.

1) pH range of the concrete floor slab shall be between 5-9, and not to exceed 9 pH.

C. Fill cracks and grind down bumps that would telegraph through the resilient flooring to level the floor so that a 10 ft. straightedge applied anywhere in the room or space will contact the floor with no more than a 1/8 in. tolerance.

D. Do not start installation until subfloor temperature is 60-degree F or above.

E. Correct other conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 ADHESIVES

A. Mix and apply adhesives in compliance with their manufacturer's instructions.

B. Provide safety precautions during mixing and applications as recommended by the adhesive manufacturer.

C. Apply adhesive uniformly over backing surfaces, but only on areas that can be covered by flooring material within the recommended working time of the adhesive.

D. Remove adhesive that dries or films over. Do not soil walls, bases, or other adjacent surfaces with adhesive. Promptly remove spillage from adjacent surfaces without damaging those surfaces.

3.3 LINOLEUM FLOORING

A. Install in accordance with its manufacturer instructions, with the minimum number of seams as accepted on shop drawings. Lap and recut seams to a hairline, tight and flush.

B. Roll flooring into adhesive with heavy roller to eliminate air pockets and to thoroughly bond to the substrate.

3.4 EDGING STRIPS

A. Install at termination of linoleum flooring where the flooring material is not covered by another material.

1. Install in one piece between door jambs, and in longest possible length elsewhere.

2. Butt tightly to resilient flooring, where applicable, and scribe accurately to door frame and other abutting surfaces.

3. Glue securely to clean, dry subfloor.

3.5 FINISHING/CLEANING

A. General:

1. Protect flooring against mars, marks, indentations, and other damage immediately after installation and polishing.

2. Use protection methods recommended by flooring manufacturer.

3. Do not move heavy and sharp objects directly over resilient flooring. Place hardboard panels over flooring and under objects being moved.

4. Slide or roll objects over panels without moving panels.

5. Cover traffic lanes with undyed, untreated building paper taped securely in place. Remove at final cleaning.

B. Apply protective polish to floor surfaces that are free from soil, visible adhesive and surface blemishes.

1. Use commercially available product acceptable to flooring manufacturer.

2. Coordinate selection of floor polish with District's maintenance service.

C. Clean resilient floors not more than 4 days before dates scheduled for inspections intended to establish Substantial Completion in each area of Project.

1. Clean according to manufacturer’s recommendations.

2. If required to restore polish finish, and if recommended by flooring manufacturer, strip protective floor polish applied after completing installation before cleaning.

3. After cleaning, reapply polish to floor to restore floor finish according to flooring manufacturer recommendations. Coordinate with District's maintenance program.

D. Remove and replace materials that are damaged or cannot be cleaned as approved by the Architect.

END OF SECTION

SECTION 09 6813
CARPET TILE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Carpet tile.

2. Adhesive.

3. Accessories.

B. Related work:

1. Division 9 for vapor control barrier.

1.2 SYSTEM DESCRIPTION

A. Design criteria: Carpeting shall meet, and exceed where specified, minimum standards for the Carpet and Rug Institute's Indoor Air Quality testing program, and comply with the following environmental impact characteristics:

1. Less than 0.05 mg/square meter/per hour of formaldehyde.

2. Less than 0.3 mg/square meter/hour of total volatile organics compounds (TVOC).

3. Less than 0.4 mg/square meter/hour of styrene.

4. Less than 0.05 mg/square meter/hour of 4-PC.

5. Conduct test over 24-hour time period.

1.3 SUBMITTALS

A. Samples:

1. Five full size units of each type and color specified.

2. Twelve-inch long samples of each linear accessory.

B. Layout drawings:

1. Three eight inch minimum layout drawings showing grid, and pile direction.

2. Layout location shall comply with the requirements below; make adjustments and modifications requested by the Architect at no cost to the District.

3. Mark chalk lines on the slab, showing pattern alignment for placement of pattern layout. Spray lacquer on chalk lines, after Architect has approved the locations.

C. Tests: Results of test conducted on concrete (refer to Part 3 below) slabs prior to start of installation.

D. Data: Manufacturer=s recommended cleaning and maintenance instructions for carpet.

1. Manufacturer=s data on carpet tile, adhesive and accessories.

2. Evidence that the carpet tile, adhesives and accessories to be used comply with Code requirements for combustibility, flammability and toxicity.

1.4 QUALITY ASSURANCE

A. Installer's qualifications: FCIB or IFCI certified carpet installers, unless otherwise acceptable to the Architect.

B. Fire-test-response characteristics: Provide products with the critical radiant flux classification specified below, as determined by testing identical products in accordance with ASTM E 648 by a testing and inspecting agency acceptable to authorities having jurisdiction.

C. Static control:

1. Below level of human sensitivity when tested at 20 percent relative humidity at 70-degree F.

2. Carpet shall retain its static control for the useful life of the installation.

1.5 HANDLING

A. Procedure: In accordance with CRI's Carpet Installation Standard, Section 5. Store carpet indoors in a protected location.

B. Delivery: Deliver carpet boxes tagged by manufacturer with pattern match codes for installation sequence.

C. Conditioning:

1. Condition carpet tile and adhesive on site in a heated, dry space at a minimum temperature of 65-degree and a relative humidity between 10 percent and 65 percent for at least 48 hours before installation.

2. Maintain these conditions night and day during installation and for at least 72 hours after completion.

1.6 JOB CONDITIONS

A. Temperature: Maintain a uniform temperature, in the space being carpeted, in the range of 65 to 75-degree F during and after carpet installation.

B. Slab dryness: Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, without re-emulsification, and slabs have pH range recommended by carpet tile and adhesive manufacturers.

C. Lighting: Illuminate work areas during installation to provide the same or greater level of illumination required to properly perform the work and as will occur in the room or space after the building is in operation.

1.7 WARRANTIES

A. Carpet manufacturer shall warrant the carpet as follows:

1. The life of the carpet shall be 15 years under normal conditions.

2. The carpet shall not experience edge-ravel under normal use for the life of the carpet.

3. Primary and secondary backing shall not delaminate for the life of the carpet.

4. Twenty-pound tuft-bind, wet and dry, shall be warranted for the life of carpet.

5. Stain resistant properties shall be permanent and inherent in the fiber. Topically applied stain resistant treatments are not acceptable. Stain resistant properties shall not be removed by commercial cleanings and abrasive wear.

6. Carpet shall be warranted to be impervious to water damage.

7. There shall be no more than 10 percent face yarn loss for the life of the carpet.

1.8 MAINTENANCE

A. Furnish one box of each type, color and pattern of tiles installed.

PART 2 - PRODUCTS

2.1 CARPET

A. Carpet tile, Percheon 13511, Haphazard II 03366, ER3 Modular RS by Tandus Centiva, from one dye lot when used on the same floor or area. Glue down installed carpet tiles shall have piles no greater than 1/2 in. thick.

1. Construction:

a.	Fiber system:	TDX Nylon.
b.	Construction:	Statatec Patterned Loop.
c.	Dye method:	100 percent solution-dyed.
d.	Gage:	5/64 in.
e.	Thickness:	0.284 in.
f.	Stitch rate:	9.8 per in.
g.	Finished pile height:	0.187 in.
h.	Primary backing:	Non-woven synthetic fiber.
i.	Size:	24 in. x 24 in.
j.	Radiant panel (ASTM D 648):	Class 1.

k. Surface flammability (ASTM D 2859): Passes CPSC FF 1-70.

l. Smoke generation (ASTM E 662): <450.

m. Static propensity: 1.9 KV with AATCC-134.

2.2 ADHESIVE

A. Except where the carpet tile is provided with a “peel-and-stick” backing, provide the following:

1. Material complying with the combustibility, flammability, and toxicity limits allowed by authorities having jurisdiction.

2. USG Durabond Carpet Square Adhesive D2, WW Henry Peach Glue, or 3M Blue Glue.

2.3 MISCELLANEOUS ACCESSORIES AND MATERIALS

A. As recommended by the carpet tile manufacturer for the conditions of installation and use and the following:

1. Edge guard and transition strips: Rubber or vinyl extrusion by Mercer Plastics Co. or Johnson Rubber Co., designed specifically as carpet edge guard. The Architect will select Color(s).

2. Floor leveling material:

a. Provide a minimum of one 10 lbs. bag of Portland cement-based floor prep material for every 100 square yd. of carpet to be installed.

b. Do not use gypsum-based materials.

PART 3 - EXECUTION

3.1 EXAMINATION/PREPARATION

A. The applicable specifications and recommendations of the Carpet and Rug Institute (CRI), Standard for Installation of Textile Floor covering Materials CRI 104 govern the work of this Section, except as noted.

B. Measure space to be carpeted, as a basis for supplying, cutting and seaming the carpet. Do not scale the Drawings or calculate sizes from dimensions shown.

C. Vacuum substrate immediately prior to carpeting and remove deleterious substances, which would interfere with the installation or be harmful to this work.

D. Prepare concrete surfaces in accordance with CRI 104 Section 6.1.1 and 6.2. Verify that slabs are sealed in accordance with the carpet manufacturer’s instructions.

E. Verify substrates for excessive moisture content and alkalinity which would prevent the proper execution of the work of this Section.

1. Moisture testing:

a. Moisture testing shall be conducted in accordance with ASTM F 2170 "Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs using in

situ Probes" or ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

b. Results must not exceed 80 percent when testing to ASTM F 2170 or exceed 5 lbs. per 1,000 sq. ft. in 24 hours when testing to ASTM F 1869.

2. Alkalinity testing: A pH test for alkalinity shall be conducted with results between 7 and 9.

F. Remove dirt, oil, grease, or other foreign matter from surfaces to be carpeted and/or to receive floor filler.

G. Use floor filler, recommended by the carpet manufacturer, to fill-in cracks, holes and other indentation marks; grind down bumps to flat surface. Floor under carpet shall not exceed 1/8 inch in 10 feet when measured with a straightedge placed anywhere on the surface to be carpeted.

H. Correct other conditions which would prevent proper and timely completion of the carpeting.

3.2 INSTALLATION

A. General:

1. Comply with the carpet tile manufacturer's instructions and recommendations, except as modified herein.

2. Install carpet edge guard, where edge of carpet tile is exposed to traffic, in single length without joints except at changes in direction. Cut for a tight fit against abutting surfaces. Center under doors when applicable.

3. Install transition strips, where carpet tiles abut another material. Use single length without joints except at changes in direction. Cut for a tight fit against abutting surfaces. Center under doors when applicable.

4. Extend carpet tiles at the following locations:

a. Under open-bottomed and raised bottomed obstructions, and under removable flanges of obstructions.

b. Into closets and alcoves of spaces scheduled to be carpeted, unless another floor finish is indicated for such space.

c. Under movable furniture and equipment.

5. Carpet shall have full adhesion to subfloor without loose edges.

B. Install in accordance with CRI Carpet Installation Standard, Section 18 and the following:

1. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignment. Cut tiles to obtain clean, sharp edges.

2. Install tile by the stair step method in full bed of adhesive, with tight joints and perimeter units not less than 1/2 tile wide. Adjust to minimize cutting.

3. Architect will select installation pattern.

4. Accurately align joints parallel to walls unless otherwise indicated.

5. Install tiles so that the arrows on the back point in the same direction.

6. Fit tiles snugly to prevent gaps, but do not force into place, causing buckles. Align tiles to avoid trapping pile yarns in the joint.

7. Roll completed installation with a 35 to 75 lb. linoleum roller in both directions to ensure uniform bond everywhere.

3.3 CLEANING/PROTECTING

A. Remove debris from installation.

B. Vacuum carpet tile with a commercial machine, with a rotating agitator or beater in the nozzle. Remove soiled spots.

C. Close areas to traffic during installation. Cover carpet tile in traffic areas with protective non-staining building paper. Do not use plastic sheeting.

D. Prior to acceptance of the Work, replace damaged and stained carpet tiles with new carpet tiles.

END OF SECTION

SECTION 09 9100
PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Painting and finishing all interior and exterior exposed surfaces throughout the Project, except as excluded in Paragraphs B and C below.

2. Surface preparation, priming and coats of paint specified herein are in addition to shop priming and surface treatment specified in other Sections.

3. Paint all exposed surfaces whether or not colors are designated, except where the natural finish of the material is obviously intended or specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.

4. This Section also includes sealing joints between surfaces to be painted, except for joints designed to be expressed in the Work and joints between a natural finish and a painted surface.

5. Section also includes preparation of existing surface to be painted and painting these surfaces.

a. Where alternations occurs in a portion of a wall, the entire wall shall be painted.

B. Painting specified elsewhere:

1. Shop priming of ferrous metal items included under miscellaneous metal fabrications, hollow metal work, and similar work: Division 8.

2. Storefronts, entrances and other exterior glazed assemblies: Division 8.

3. Signs: Division 10.

4. Piping identification: Divisions 22 and 23.

5. Finished (not primed) mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets, except as specified in Article 3.4 below: Divisions 23 and 26.

C. Painting not included: Do not paint the following surfaces.

1. Insulation and its facing.

2. Roofing.

3. Steel decking.

4. Finish hardware, except those items noted USP.

5. Finished metal surfaces such as anodized aluminum, stainless steel, chromium-plating, copper, bronze, brass and similar finished materials will not require finish painting.

6. Painting is not required on walls or ceilings in concealed and inaccessible areas, such as furred areas, pipe spaces or duct shafts.

7. Operating parts, labels and nameplates:

   a. Do not paint moving parts of operating units, mechanical and electrical parts, such as valve and damper operator linkages, sinkages, sensing devices, motor and fan shafts.

   b. Do not paint over any nameplates, Code required labels, such as UL and FM, or any equipment identification, performance rating, name, or nomenclature plates.

1.2 DEFINITIONS

A. Paint: The term, as used in this Section, means all coating system components, including primers, emulsions, enamels, varnishes, stains, lacquers, sealers, fillers, and other applied materials whether used as prime, intermediate or finish coat.

B. Definitions of painting terms: ASTM D 16, unless otherwise specified.

C. Dry film thickness (DFT): Thickness of a coat of paint in fully cured state measured in mils (1/1000-inch).

D. Sheen: The terms used in these Specifications refer to the following approximate gloss ranges when tested in accordance with ASTM D 523 test method.

Name	ASTM D 523 Test Method	Gloss Range
Flat (matte)	60-degree meter	0 to 4
Velvet	60-degree meter	5 to 9
Eggshell	60-degree meter	10 to 15
Low sheen	60-degree meter	20 to 25
Satin	60-degree meter	20 to 35
Semi-gloss	60-degree meter	40 to 50
Gloss	60-degree meter	70 to 80
High Gloss	60-degree meter	>85

E. Coat: As used in this Section means a layer of paint, varnish, lacquer, or other material applied, then allowed to dry. To backroll or apply a wet-on-wet film still constitutes a single coat.

F. Finish: As used in this Section means the entire coating system including the texture, color, and sheen of a surface.

G. Refinish: As used in this Section implies a new finish will be applied to a surface that has been finished as defined above.

H. Touchup: As used in this Section means correction of deficiencies in the specified work to achieve a properly painted surface.

1.3 SUBMITTALS

A. Materials:

1. Copies of a complete materials list, identified by manufacturer name and product label or stock number.

2. Prepare list in the form of a repetition of the specified paint finishes, with the addition of the specific product intended for each coat.

B. Color samples:

1. Eight-and-one-half by 11-inch samples of each color for painted finishes.

2. Provide stepped samples, defining each separate coat.

3. Use representative colors when preparing samples for review.

4. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.

5. Resubmit until required sheen, color, and texture are achieved.

C. Certification: Submit duplicate copies of manufacturer affidavit with each shipment of materials delivered to the job site certifying that each material furnished complies with specified requirements.

1.4 QUALITY ASSURANCE

A. Painter's qualifications: Firm and individuals experienced in applying paints and coatings similar in material, design, and extent to those specified for the Project, whose work has resulted in applications with a record of successful in-service performance.

B. Mockups:

1. Apply sample paint finishes (approximately 10-foot square) of each color scheme to wall areas, as directed by the Architect. Refer to Section 09 2900 for painting gypsum board mockup.

2. Obtain Architect's approval of mockups before proceeding further. Approved mockups will be used as a standard for the Project, and if properly identified may remain a part of the Work.

3. Final acceptance of colors will be from job-applied samples.

1.5 JOB CONDITIONS

A. Environmental requirements:

1. Comply with paint manufacturer's recommendations for environmental conditions and the following.

2. Provide adequate heating and ventilating to maintain environmental conditions recommended by paint manufacturer.

3. Do not apply finish in areas where dust is being generated.

4. Apply paint under the following prevailing conditions.

a. Air and surface temperatures are not below 40 deg. F. or above 120 deg. F.

b. Surface temperature is at least 5 deg. F. above the dew point.

c. When there is not threat of impending rain.

B. Protection:

1. Protect adjacent whether being painted or not against damage from painting operation. Correct damage by cleaning, repairing, replacing, and repainting, as approved by Architect, and leave in an undamaged condition.

2. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

3. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work. Post signs immediately after painting.

4. Provide drop cloths, shields, barricades and other protection necessary to safeguard adjacent surfaces not to be painted.

5. Provide and maintain protection as required to protect finished work from damage until its acceptance.

C. Illuminate work area during painting to provide the same or greater level of illumination required to properly perform the work and will occur in the room or space after the building is in operation.

1.6 HANDLING

A. Store materials indoors and mix only in spaces suitable for such purpose. Protect adjacent surfaces when mixing.

B. Store paint containers so the manufacturer's labels are clearly visible.

1.7 WARRANTY

A. Color of exterior surfaces painted, as part of the work of this Section shall, at the end of one year, have remained free from serious fading when compared to a control sample of the original paint.

B. Paint shall have its original adherence at the end of one year and there shall be no evidence of blisters, running, peeling, scaling, chalking, streaks, or stains at the end of this period.

C. Washing painted surfaces with alkali-free soap and water shall remove surface dirt from painted surfaces without producing deteriorating effects.

1.8 MAINTENANCE MATERIAL

A. With closeout submittals deliver one identified unopened gallon of each type and color of paint material used on the Project to the District for future paint touchup.

B. In addition to manufacturer label, identify with room number, floor or area, type of paint, color and sheen, as applicable, for future identification.

PART 2 - PRODUCTS

2.1 PAINT

A. Quality and manufacture: Insofar as practicable each paint shall be factory-mixed to match approved samples and colors, and be of a consistency permitting immediate application. Use best quality grade regularly manufactured by one of the manufacturers listed in the schedule at the end of the Section.

1. Dunn-Edwards Corp.

2. Behr Process Corp.

3. Vista.

4. PPG.

5. Benjamin-Moore.

B. Paint uniformity and compatibility:

1. Paint shall be boxed at the job site or factory-batched to ensure color uniformity and consistency. This includes the required maintenance materials.

2. Provide finish coats compatible with the prime coats used.

a. Review other Sections of these Specifications, in which prime coats are specified, and manufacturer data for shop-primed surfaces to be painted.

b. Be responsible for the compatibility of the total coating system.

3. Provide barrier coats over incompatible primer or remove and reprime.

4. Products of more than one approved manufacturer may be used, except that all products applied on a surface shall be by the same manufacturer.

2.2 MISCELLANEOUS MATERIALS

A. Joint sealant: Paintable sealant as specified in Section 07 9200.

B. Galvanized etching product: One of the following:

1. Oakite CryCost 747.

2. Oakite 747 LTS.

3. Henkel Galvaprep 5.

2.3 COLOR SCHEDULE

A. The Architect will prepare a color schedule with samples for guidance in painting.]

B. Number of colors to be used will be determined by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be painted for conditions that would adversely affect the permanence and quality of this work.

B. Correct unsuitable conditions before proceeding with painting.

3.2 SURFACE PREPARATION

A. General: Prepare surfaces to receive the specified finishes in compliance with the paint manufacturer's instructions and the following.

B. Galvanized steel: Comply with American Galvanizers Association recommendations, ASTM D 6386, and the following.

1. Clean with commercial phosphoric acid solution or one of the products named above for pretreatment, or by brush off blast cleaning with a fine abrasive to achieve a uniform anchor profile of 1.5 to 2 mils.

2. Recoat within the time limit recommended by the primer manufacturer.

C. Shop-primed metal: Remove oil, grease, dirt and foreign matter. Spot prime abraded surfaces with compatible primer.

D. Shop-painted metal: Sand to provide a mechanical bond with field applied finishes, or use a commercial preparation specifically formulated to improve paint bond.

E. Unprimed ferrous metal: Remove rust, mill scale, oil and other foreign matter.

F. Factory-primed equipment: Repair damaged primer; remove rust and clean to bright metal where appropriate. Sand or etch primer to permit bonding of finish coats. Clean surfaces thoroughly before applying additional coats.

G. Gypsum board:

1. Remove dust, loose particles or other matter that would prevent proper paint adhesion.

2. Check to see that joints and screw heads are properly covered with joint compound and sanded smooth and flush with adjacent surfaces.

H. Wood:

1. Sandpaper smooth and dust clean. Remove handling marks and raised grain.

2. Fill nail holes, cracks and depressions with wood filler.

I. Other materials not covered above: Prepare to receive paint in compliance with the paint manufacturer instructions.

J. Existing painted surfaces:

1. Wash surfaces with biodegradable detergent to remove dirt, dust and contaminants. Rinse clean. Use bleach on mildew.

2. Patch dents, gouges and other imperfections in painted surfaces and sand smooth and flush with adjacent undamaged surfaces.

3. Remove dust, rust and other surface contaminates, loose and unsound paint coatings, etc. as required to provide clean and sound surfaces to receive new paint.

4. Remove gloss from enamel paints with steel wool or by treating them with a commercial de-glosser used in compliance with its manufacturer's instructions.

K. Hardware:

1. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures and similar items in place and not to be painted, or provide surface- applied protection prior to surface preparation and painting.

2. Following completion of painting each space or area, reinstall the removed item by workmen skilled in the trades involved.

L. Phasing: Program cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

3.3 PAINT PREPARATION

A. Open paint containers only as required for use. Mix paint in designated areas.

B. Thoroughly stir and agitate paint to uniformly smooth consistency suitable for proper application.

C. Do not reduce, change or use any materials except in compliance with manufacturer printed instructions.

D. In all cases, prepare and handle paint to prevent deterioration and inclusion of foreign matter.

3.4 APPLICATION

A. General:

1. Seal interior joints between wood or wood composite materials, trim, baseboard, molding, and casements and adjacent materials with paintable sealant specified in Section 07 9200.

2. Finish top, bottom and edges of doors the same as faces promptly upon delivery to the jobsite. This requirement applies also to top and bottom of plastic laminate faced doors.

a. Apply 2 coats of paint or sealer to top, bottom and cutouts of doors immediately after trimming.

3. Where the 2 faces of doors differ in color or finish, finish the edges to match the face visible when the door is open.

4. Apply paint only under conditions that will insure finishes free from blemishes and defects. Leave corners with no undue amount of paint buildup.

5. Use a slightly different shade for each coat of paint so that it may be readily identified.

6. Primer and intermediate coats shall be unscarred and completely integral when succeeding coats are applied. Sand and dust between each coat to remove defects visible from a distance of 5 feet.

7. Remove paint spillage and spatters on adjacent surfaces so as not to damage the surface being cleaned.

    a. Perform patching and repairs required because of painting operations.

    b. Refinish entire panel or assembly where portion of finish has been damaged or is not acceptable to the Architect.

8. Paint interior surfaces of ducts, where visible thru registers and grilles, with a flat nonspecular black paint.

9. Unless otherwise directed by the Architect, spray-paint exposed surfaces of ceiling diffusers, air return grilles, speakers and other electrical and mechanical items, except smoke detectors and sprinkler heads, in painted ceilings to match the ceilings, whether these items are primed or factory-finished.

10. Number of coats:

    a. The number of coats required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried.

    b. The number of coats specified is the minimum required for complete coverage and uniformity of color.

    c. Apply additional coats when undercoats, stains, or other conditions show through the final finish until the finish is of uniform color and appearance.

11. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.

12. Paint interior surfaces, which are a continuation of exterior surfaces, subject to exterior exposure (such as an out-swinging door), with the applicable exterior coating system.

13. Completely cover surfaces to be painted to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Painted surfaces with cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness and other imperfections will not be acceptable.

14. Completed work shall match approved samples, as determined by the Architect. Remove, refinish, or repaint work not complying with specified requirements.

B. Application method: Contractor's option provided applied coatings match approved samples. The Architect reserves the right to require that paint be sprayed for smoothness and uniformity.

C. Priming:

1. Prime bare metal scheduled to be painted, and not embedded in concrete and masonry, immediately upon delivery to the site.

2. Time lapse between priming and application of second coat shall be as short as possible.

D. Shop-primed metal:

1. Apply 2 finish coats of paint to match adjoining surfaces, as directed by the Architect, to shop primed mechanical and electrical equipment. This work includes but is not limited to interior of fire hose cabinets, air grilles, ceiling diffusers, electrical and telephone panels, and access panels.

2. Paint conduits, outlets and pull boxes, and mechanical equipment exposed to view, such as covered and uncovered piping and ductwork, pumps, compressors, air conditioning equipment and tanks as specified in this Section.

3. Paint the back side of access panels, removable or hinged covers to match the exposed surfaces.

E. Miscellaneous painting: Surfaces to be painted and not specifically described herein, shall be painted with a product specifically manufactured or prepared for the material and surface to be painted with a prime and 2 finish coats.

3.5 TOUCHUP/CLEANING

A. At completion of construction activities of other trades, touchup and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 PAINT FINISH SCHEDULE

A. Finish all surfaces in compliance with the following schedule. Catalog names and numbers refer to products by the Dunn Edwards, Behr Process Corp. Vista, PPG and Benjamin-Moore except as otherwise specified.

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SURFACE	NUMBER OF COATS	DUNN-EDWARDS	BEHR PROCESS CORP. PRODUCTS	VISTA	PPG	BENJAMIN-MOORE
EXTERIOR SURFACES						
Galvanized Steel: 100 percent Acrylic Semi-Gloss						
	Pretreat	SCME-01 Supreme Chemical Metal Etch		Jasco Prep N Prime	Prep120	V600 Oil and Grease Emulsifier
	1st Coat	UGPR00 Ultra Grip Primer	991 Behr Premium Concrete Masonry Cleaner & Etcher	4800 Metal Pro Primer	Pitt-Tech Plus 90-912	P04 Acrylic Primer
	2nd & 3rd Coat	EVSH 50 Evershield Semi-Gloss	5000 Series Premium Plus Exterior Semi-Gloss Enamel	8400 Carefree Semi-Gloss or 9800 Protec Semi-Gloss	Pitt-Tech Plus 90-1210	HP29 Ultra-Spec DTM
Galvanized Steel: 100 percent Acrylic Gloss						
	Pretreat	SCME-01 Supreme Chemical Metal Etch		Jasco Prep N Prime	Prep120	V600 Oil and Grease Emulsifier
	1st Coat	UGPR00 Ultra Grip Primer	991 Behr Premium Concrete Masonry Cleaner & Etcher	4800 Metal Pro Primer	Pitt-Tech Plus 90-912	P04 Acrylic Primer
	2nd & 3rd Coat	EVSH 60 Evershield Gloss	8000/2-8000 Series Premium Plus Interior/Exterior High Gloss Enamel	8500 Carefree Gloss or 9900 Protec Gloss	Pitt-Tech Plus 90-1310	HP28 Ultra-Spec DTM
INTERIOR SURFACES						
Gypsum Board: Acrylic Flat						
	1st Coat	VNPR00 Vinylastic	73 Drywall Primer Sealer	Not Required	Pure Performance 9-900	Fresh Start Primer 046
	2nd & 3rd Coat	SPMA 10 Suprema Flat	1450 Marquee Interior Stain Blocking Paint & Primer, Matte or 1000 Series Premium Plus Zero VOC Interior Flat	8100 Carefree Flat	Pure Performance 9-100	Aura Matte 522

Gypsum Board: Acylic Satin						
	1st Coat	VNPR00 Vinylastic Primer	73 Drywall Primer Sealer	1100 Hi Build PVA Sealer	Pure Performance 9-900	Fresh Start Primer 046
	2nd & 3rd Coat	SPMA 30 Suprema Eggshell	7000 Series Premium Plus Zero VOC Interior Satin	NA	Pure Performance 9-300	Aura Satin 631
Gypsum Board: Acrylic Eggshell						
	1st Coat	VNPR00 Vinylastic Primer	73 Drywall Primer Sealer	1100 Hi Build PVA Sealer	Pure Performance 9-900	Fresh Start Primer 046
	2nd & 3rd Coat	SPMA 40 Suprema Low Sheen	2450 Marquee Interior Stain Blocking Paint & Primer, Eggshell or 2000 Series Premium Plus Zero VOC Interior Eggshell	8300 Carefree Eggshell	Pure Performance 9-300	Aura Low Luster 634
Gypsum Board: Acrylic Semi-Gloss						
	1st Coat	VNPR00 Vinylastic Primer	73 Drywall Primer Sealer	1100 Hi Build PVA Sealer	Pure Performance 9-900	Fresh Start Primer 046
	2nd & 3rd Coat	SPMA 50 Suprema Semi-Gloss	3450 Marquee Interior Stain Blocking Paint & Primer, Eggshell or 3000 Series Premium Plus Zero VOC Interior Semi-Gloss	8400 Carefree Semi-Gloss	Pure Performance 9-500	Aura Semi Gloss 632
Ferrous Metal: Acrylic Semi-Gloss						
	1st Coat	BRPR00 Bloc-Rust Primer	436 Multi-Surface Primer & Sealer	9600 Protec	Pitt-Tech Plus 90-912	P04 Acrlic Primer
	2nd & 3rd Coat	SPMA 50 Suprema Semi-Gloss	3200 Direct-To-Metal Semi-Gloss Paint	8400 Carefree Semi-Gloss or 9800 Protec Semi-Gloss	Pitt-Tech Plus 90-1210	HP29 Ultraspec DTM
Ferrous Metal: Acrylic Gloss						
	1st Coat	BRPR00 Bloc-Rust Primer	436 Multi-Surface Primer & Sealer	9600 Protec	Pitt-Tech Plus 90-912	P04 Acrylic Primer
	2nd & 3rd Coat	W10 Syn-Lustro Gloss or EVSH 60 Evershield Gloss	8200 Direct-To-Metal Gloss Paint	8500 Carefree Gloss or 9900 Protec Gloss	Pitt-Tech Plus 90-1310	HP28 Ultraspec DTM

END OF SECTION

SECTION 10 1116
MARKER BOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Framed porcelain enameled marker boards.

2. Anchoring devices and miscellaneous accessories required for complete installation.

B. Related work:

1. Division 10 for tack boards.

1.2 SYSTEM DESCRIPTION

A. Systems shall comprise factory assembled markerboards, in configurations and sizes indicated on the Drawings or as specified herein.

B. Laminations of panel components shall be by face sheet manufacturer.

1.3 SUBMITTALS

A. Data: Manufacturer's data for boards, including cleaning recommendations for the porcelain enamel surface.

B. Shop drawings: Include sections of trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

C. Samples:

1. Porcelain enamel samples, not less than 6-inch square, laminated to the actual core and backing assembly.

2. Twelve-inch length of each linear item.

3. Full-size sample of each accessory.

4. Copy of manufacturer’s warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer shall have been regularly engaged in the business of manufacturing markerboards for at least 5 years.

B. Comply with requirements and recommendations of applicable portions of Porcelain Enamel Institute - PEI 2.

1.5 HANDLING

A. Deliver materials to the Project site with manufacturer's labels intact and legible.

B. Store pre-framed units vertically, with packing material between each layer.

C. Cover units from damage and dust accumulation.

1.6 PROJECT CONDITIONS

A. Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting.

B. Show recorded measurements on final shop drawings.

1.7 WARRANTY

A. Furnish the District the manufacturer's warranty, agreeing to replace marker boards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed.

1. Warranty period: 50 years.

PART 2 - PRODUCTS

2.1 MARKER BOARD

A. Basis of design is for DTS series, fixed aluminum-framed markerboards by Platinum Visual Systems.

1. Other acceptable manufacturers:

a. 110 Series by Steelcase.

b. Architectural School Products.

c. Best-Rite Manufacturing.

d. Egan Visual.

e. Claridge Products and Equipment, Inc.

f. K Prosteel.

g. Marsh Industries.

B. Construction: Balanced, high-pressure laminated porcelain enamel boards of 3-ply construction consisting of face sheet with cover coat, core material, and backing sheet.

C. Materials

1. Face sheet: ASTM A 424, 28-gage enameling grade steel specially processed for temperatures used in coating porcelain on steel. Coat the exposed face and exposed edges with a 3-coat process consisting of primer, ground coat, and color cover coat, and the concealed face with a 2-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at the manufacturer's standard firing temperatures, but not less than 1450 degrees F.

2. Cover coat: Manufacturer's standard light-colored special writing surface with gloss finish intended for use with liquid felt-tipped markers.

3. Core, one of the following:

   a. Manufacturer's standard 1/2 in. thick particle-board core material complying with the requirements of ANSI A208.1, Grade 1-M-1, and with aluminum trim designed to engage hanger clips.

   b. Not less than 1/2 in. thick, kraft-paper honeycomb core; designed to be rigid and to resist warpage, and with aluminum trim designed to engage hanger clips.

4. Backing sheet: Manufacturer's standard 0.005 in. aluminum backing sheet.

5. Laminating adhesive: Manufacturer's standard moisture-resistant thermoplastic-type adhesive.

6. Extruded aluminum: ASTM B 221, Alloy 6063-T5.

D. Accessories:

1. Trim: 1 in. wide, clear anodized extruded aluminum alloy fitted to hairline, flush joints.

2. Tray: Clear anodized extruded aluminum with 3/4 in. radius corners.

3. Map rail: 1 in. wide map rail with cork insert, including the following:

   a. Roller brackets (one pair per markerboard).

   b. End stops (one pair per display rail).

   c. Map hooks (one per each 2 feet).

4. Flag holders (one per classroom).

E. Attachment devices:

1. Zinc-plated adjustable slotted wall brackets and attachment screws.

2. Wall adhesive, type recommended by the markerboard manufacturer.

2.2 FABRICATION

A. Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to neat, hairline closure.

C. Finish aluminum with a Class II, Clear Anodic Finish, AA-M12C22A31.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 INSTALLATION

A. Deliver factory-built boards completely assembled in one piece without joints, wherever possible.

1. Where dimensions exceed available panel size, provide 2 or more pieces of equal length as acceptable to the Architect.

2. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install marker boards in compliance with their manufacturer's instructions, and the Drawings.

C. Set securely, plumb, level and square with flush, hairline joints.

D. Locate accessories on each board as required and indicated.

E. Touchup minor damage, when the results are acceptable to the Architect, or replace damaged parts.

END OF SECTION

SECTION 10 1123
TACK BOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Framed, cork tack boards.

2. Anchoring devices and miscellaneous accessories required for complete installation.

B. Related work:

1. Division 10 for marker boards.

1.2 SYSTEM DESCRIPTION

A. Systems shall comprise factory assembled tack boards, in configurations and sizes indicated on the Drawings or as specified herein.

1.3 SUBMITTALS

A. Data: Manufacturer's data for tack boards, including cleaning recommendations.

B. Shop drawings: Include sections of trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout and installation details.

C. Samples: 12 in. x 12 in. sample, framed on 2 adjacent sides to show materials, finish, color, and configuration.

1.4 QUALITY ASSURANCE

A. Manufacturer shall have been regularly engaged in the business of manufacturing tack boards for at least 5 years.

1.5 HANDLING

A. Deliver materials to the Project site with manufacturer's labels intact and legible.

B. Store pre-framed units vertically, with packing material between each layer.

C. Cover units from damage and dust accumulation.

1.6 PROJECT CONDITIONS

A. Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting.

B. Show recorded measurements on final shop drawings.

PART 2 - PRODUCTS

2.1 MARKER BOARD

A. Basis of design is for DTS series, fixed aluminum-framed tack boards by Platinum Visual Systems.

1. Other acceptable manufacturers:

a. 110 Series by Steelcase.

b. Architectural School Products.

c. Best-Rite Manufacturing.

d. Egan Visual.

e. Claridge Products and Equipment, Inc.

f. K Prosteel.

g. Marsh Industries.

B. Materials:

1. Face Sheet: 1/4 in. thick, resilient, homogenous tackable linoleum surface consisting of linseed oil, granulated cork, rosin binders and dry pigments calendared onto natural burlap backing. Color shall extend through thickness of material and be self-healing.

a. Color: To be selected by Architect.

2. Core: 1/4 in. thick medium density fiberboard.

3. Laminating adhesive: Manufacturer's standard moisture-resistant thermoplastic-type adhesive.

4. Extruded aluminum: ASTM B 221, Alloy 6063-T5.

C. Accessories:

1. Frame: Clear anodized extruded aluminum alloy fitted to hairline, flush joints.

D. Attachment devices:

1. Zinc-plated adjustable slotted wall brackets and attachment screws.

2. Wall adhesive, type recommended by the markerboard manufacturer.

2.2 FABRICATION

A. Laminate cork face sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to neat, hairline closure.

C. Finish aluminum with a Class II, Clear Anodic Finish, AA-M12C22A31.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 INSTALLATION

A. Deliver factory-built boards completely assembled in one piece without joints, wherever possible.

1. Where dimensions exceed available panel size, provide 2 or more pieces of equal length as acceptable to the Architect.

2. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install tack boards in compliance with their manufacturer's instructions, and the Drawings.

C. Set securely, plumb, level and square with flush, hairline joints.

D. Touchup minor damage, when the results are acceptable to the Architect, or replace damaged parts.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Acrylic signs.

2. Post-mounted parking and roadway signs.

B. Related work:

1. Division 1 for temporary construction signs.

2. Division 3 for footings for signs specified herein.

1.2 SUBMITTALS

A. Data: Manufacturer's technical data and installation instructions for each type of sign required.

B. Samples: Each sign form and material showing finishes, colors and surface texture.

1. Full-size sample units, when requested by Architect.

2. Acceptable units may be installed as part of the work.

C. Shop drawings: Of all signs. Include elevations, sections, and large-scale details of copy and lettering layout. Show anchorages and accessory items. Furnish location template drawings for signs supported or anchored to other construction.

1. Furnish full-size spacing templates for individual building mounted letters.

1.3 QUALITY ASSURANCE

A. Uniformity: For each sign form and graphic image process indicated furnish products of a single manufacturer.

B. Accessibility: Comply with 2016 California Building Code (CBC), Title 24, Part 2, Chapter 11B. All signage shall conform to CBC Section 1104B.2.4.

C. Coordination: Before starting shop drawings, notify the Architect and arrange a meeting with the District's designated personnel to review in detail the work of this Section. Review and coordinate layouts for each sign, and obtain Architect's approval prior to manufacture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Interior signage: One of the following.

1. ASI-Modulex.

2. Vomar Products, Inc.

3. Architectural Graphics, Inc.

4. Architectural Signs and Directories.

B. Exterior signage: One of the following.

1. Best Manufacturing Sign Systems.

2. Safeway Sign Co.

3. Zumar Industries.

4. Western Highway.

5. Seton Name Plate Co.

2.2 MATERIALS

A. Cast acrylic sheet: Cast (not extruded or continuous cast) methacrylate plastic sheet with a minimum flexural strength of 16,000 psi, ASTM D 790, as follows.

1. Transparent sheet: Colorless sheet with light transmittance of 92 percent, ASTM D 1003, in matte finish, unless otherwise indicated.

2. White translucent sheet: White translucent sheet of density required to produce uniform brightness and minimum halation effects.

3. Opaque sheet: Colored opaque acrylic sheet in colors and finishes indicated.

B. Aluminum sheet: ASTM B 209, 0.08-inch alloy 3000 Series. Provide with mill finish for work to be painted.

C. Steel:

1. Sheet steel: Minimum 18 gage. One of the following zinc-coated sheet steel treated for paint adhesion.

a. Paintbond by US Steel Corp.

b. Zincgrip Paintgrip by Armco Steel Corp.

c. Bethzin Gripcote by Bethlehem Steel.

d. Paint-tite by Inland Steel Corp.

D. Steel shapes: ASTM A 36 hot-rolled, or cold-rolled shapes, plates and tubes in sizes indicated on Drawings, hot-dip galvanized.

E. Stainless steel plate, sheet and strip: ASTM A 167, AISI Type 316.

F. Fasteners: Use concealed fasteners unless otherwise indicated. Fabricate from metals which are non-corrosive to sign materials and mounting surface.

G. Anchors and inserts: Toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete work.

H. Colored coating:

1. Acrylic sheet: Non-fading coatings, including inks and paints for copy and background colors, recommended by acrylic manufacturers for optimum adherence to acrylic surface.

2. Metal sheet: Non-fading coating, including inks and paints for copy and background colors, recommended by background manufacturers for optimum adherence to substrate.

2.3 FABRICATION OF SIGNS

A. General:

1. Produce smooth, even, level sign panel surfaces, constructed to remain flat when installed within a tolerance of plus or minus 1/16 inches measured diagonally from corner to corner.

2. Letter and number spacing shall conform to standards shown.

3. Edges of letters, numbers or symbols shall be smooth with corners sharp and true.

4. Forms shall be free of ticks, line waver, discontinuous curves and other imperfections.

5. Text shall be centered on plaque unless otherwise noted.

6. Construct work to eliminate burrs, cutting edges, and sharp corners.

7. Surfaces which are intended to be flat shall be without bulges, oil-canning, or other physical deformities.

B. Graphic Content and Style: Comply with requirements indicated and with CBC, Title 24, Part 2, Sect. 1117B.5.

C. Permanent Signs: Raised and brailled characters and pictorial symbol signs in accordance with CBC, Title 24, Part 2, Sect. 1117B.5.

D. Directional and Informational Signs: Character proportion and height in accordance with ADA Accessibility Guidelines and CBC, Title 24, Part 2, Sect. 1115B.5 and Sect. 1117B.5.

E. Braille Symbols: Provide Contracted Grade 2 Braille with dots 1/10 inch (2.54 mm) on centers in each cell with 2/10 inch (5.08 mm) space between cells and with dots raised a minimum of 1/40 inch (0.635 mm) above background.

2.4 FABRICATION OF EXTERIOR SIGNS

A. General:

1. Produce smooth, even, level sign panel surfaces, constructed to remain flat when installed within a tolerance of plus 1/16-inch measured diagonally from corner to corner.

2. Letter style: "Radiant Bold". Size of letters shall be as indicated on Drawings.

3. Edges of letters, numbers or symbols shall be smooth with corners sharp and true.

4. Forms shall be free of ticks, line waver, discontinuous curves and other imperfections.

5. Construct work to eliminate burrs, cutting edges, and sharp corners.

6. Finish welds on exposed surfaces to be invisible in the finished work.

7. Surfaces shall be without bulges, oil-canning, or other physical deformities.

B. Posts, brackets and fittings:

1. Fabricate from same material as sign.

2. Factory-paint brackets in color matching background color of sign panel, unless otherwise indicated.

2.5 FINISHES

A. General: Colors and surface textures: For exposed sign materials which require selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not otherwise indicated, as selected by Architect from manufacturer's standards.

B. Apply paint uniformly, over compatible primer for finishes applied on metal surfaces, without runs, pinholes, ripples, holidays and other defects. Match approved samples.

C. Surface and subsurface silkscreened signs: Silkscreen copy shall be photo-produced rather than hand cut seams using fine mesh screens and screening inks.

D. Signs shall be consistent in color, value and coverage

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 INSTALLATION

A. General: Locate sign units and accessories where shown, scheduled, or directed by Architect, using mounting methods shown or selected by Architect and in compliance with the manufacturer's instructions and CBC, Title 24, Part 2, Chapter 11B, for buildings and facilities.

B. Locate signs where indicated.

C. Install level, plumb and at height indicated, with sign surfaces free from distortion and other defects.

D. Install post-mounted signs in concrete footings.

E. Wall mounted signs: Use adhesive or ship plate mounting, except where tape mounting is indicated.

1. Vinyl-tape mounting: Use double-sided foam tape to mount signs to smooth non-porous surfaces. Do not use for vinyl-covered or rough surfaces.

2. Silicone adhesive mounting: Use standard liquid silicone adhesive recommended by sign manufacturer to attach signs to irregular, porous or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by sign manufacturer to hold sign in place until adhesive has fully cured.

3. Shim plate mounting:

a. Provide 1/8-inch thick concealed aluminum shim plate with pre-drilled and countersunk holes where other mounting methods are not practicable.

b. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach sign to plate by method specified above for application to smooth surfaces.

END OF SECTION

SECTION 11 5213
PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Permanently affixed audiovisual projection screens.

B. Related Sections include the following:

1. Division 32 Sections for electrical wiring, connections, and installation of remote control switches and interfaces for electrically operated projection screens.

1.2 SUBMITTALS

A. Product data: For each type of screen submitted.

B. Shop drawings:

1. Location of screen centerline relative to ends of screen case.

2. Connections to suspension systems for screens mounted in recessed surfaces (e.g., ceilings).

3. Anchorage details.

4. Details of juncture of exposed surfaces with adjacent finishes.

5. Frame details.

6. Accessories.

1.3 QUALITY ASSURANCE

A. Coordination of Work: Coordinate layout and installation of projection screens with other construction supported by, or penetrated through, ceilings, including light fixtures, HVAC equipment, fire suppression system and partitions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver projection screens until building is enclosed.

B. Protect screen surfaces from damage during installation from abrasion, dust and other conditions.

C. Waste Management and Disposal:

1. Separate waste materials for recycling in accordance with Construction Waste Management and Disposal procedures.

2. Remove crates and packaging materials from site and dispose of at appropriate recycling facilities.

D. Collect and separate for disposal packing materials (wood crates, paper, plastic, polystyrene, corrugated cardboard) in appropriate onsite bins or designated location(s) for recycling.

PART 2 - PRODUCTS

2.1 GENERAL

A. All projection screens shall be Owner Furnished – Contractor Installed (OFCI).

B. Projection screens shall be installed within individual areas of the project as specified within the Audiovisual Drawings. Specifications include the following information:

1. Location.

2. Type of Screen (e.g., front projection).

3. Operation (e.g., electrical, manual).

4. Projected Image Area.

5. Borders/Masking (top, bottom and sides).

6. Projection Surface Material.

2.2 FRONT PROJECTION SCREENS

A. Screen Material (Viewing Surface):

1. Mildew Resistance: Provide mildew resistant screen fabrics as determined by FS 191A/5760.

2. Fire Test Response Characteristics: Provide projection screen fabrics identical to materials that have been tested for flame resistance according to both small and large scale tests for NFPA 701.

3. Seams: Projection screens shall be constructed such that there are no visible seams within the viewable image area.

4. Edge Treatment: Provide black masking borders as indicated for each screen. Side tensioning cables shall be provided where indicated to maintain a flat image viewing surface.

5. Top Treatment: Provide 6” black drop at top as indicated for each screen unless otherwise noted.

6. Bottom Treatment: Provide a black border at the bottom as indicated for each screen. A continuous rigid batten shall be integrated at the bottom of the screen.

7. Screen material to be GREENGUARD certified for school use. See sections below for specific types.

8. Screen case shall be white to match painted walls and ceilings.

9. Screen material to have solid black backing to prevent light to pass through (e.g. installed in front of window walls, etc.).

2.3 ELECTRICALLY OPERATED ROLLER SCREENS

A. Motor: Install instant-reversing motor size and capacity recommended by the screen manufacturer. Screen shall have permanently lubricated ball bearings, automatic thermal overload protection, preset limit switches to automatically stop screen in up and down positions, and positive stop-action to prevent coasting. Allowable motor configurations shall be as follows:

B. Motor in Roller: Screens specified with motors in the screen roller shall be configured with the motor mounted with vibration isolators to reduce noise transmission and screen vibration.

C. Motor: Screens specified with end-mounted motors shall be configured such that the motor is mounted on the left-hand end of the roller as viewed from the audience side of the screen.

D. Control: Install low voltage interface and three-button, momentary contact wall switch unless otherwise noted. Wall switch shall match finish and style of room lighting switches. Where two screens are required, include both low voltage wall control switches (Decora style) in the same two-switch wall box or housing (and 1 or 2-gang Decora wall plate).

E. Audiovisual System Control: Provide RS232 or contact closure (cabling) and install OFCI low voltage interface for connection to audiovisual system equipment. Include low voltage interface cabling from interface back to audiovisual system final equipment location (AV cabinet or AV floor box for instructor desk) and provide 10’ of coiled cable for AV system electronics routing and connection. Origin of control cabling to low voltage interface can be either LV wall switch or at the LV screen interface.

F. Manufacturer to be Da Lite and shall be tensioned style 16:10 aspect and have top black masking per individual room requirements. Model to be Tensioned Contour Electrol. Typical sizes to be (sized by location per table on Drawing AV800):

1. 54” tall x 96” wide.

2. 78” tall x 139” wide.

G. Matte White viewing surface with GREENGUARD Certification.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install projection screens at locations indicated to comply with the manufacturers written instructions.

B. Install front projection screens with screen cases in position and in relationship to adjoining construction as indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when the screen is in the lowered position.

3.2 PROTECTING AND CLEANING

A. Protect projection screens after installation from damage during ongoing construction activity. If damage occurs despite such protection, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

B. Perform cleanup in accordance with section for Cleaning and Waste Management.

C. Upon completion, remove surplus materials, rubbish, tools and equipment.

END OF SECTION

SECTION 12 2113
HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Horizontal blinds at indicated exterior windows and doors unless indicated otherwise.

2. Supplementary parts and components such as inserts, clips, fasteners, anchors, bracing, and other miscellaneous supports and accessories required for a complete installation.

1.2 SUBMITTALS

A. Data and shop drawings: Shop drawings, manufacturer data sheets, complete parts list, and installation requirements for the blinds.

B. Samples:

1. Typical full size blind, complete with anchorage devices and accessories.

2. Color samples, approximately 12 inches long, on base metal.

C. Schedule: Of blinds using same room designations indicated on Drawings.

D. Maintenance data: Bind in the operation and maintenance manual. Include the following.

1. Methods for maintaining blinds and finishes.

2. Precautions for cleaning materials and methods that could be detrimental to finishes and performance.

1.3 MAINTENANCE

A. Provide the District with maintenance stock equal to one percent of the blinds installed but not less than 2 blinds.

B. Carefully pack the maintenance stock in heavy cardboard cartons with the contents clearly identified.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Model CD88 by Hunter Douglas Contract (basis of design), Levelor Contract or equal.

2.2 MATERIALS/CONSTRUCTION

A. One-inch wide solid (unperforated) slat, 0.008-inch thick minimum. Other materials standard with the manufacturer.

1. Color: Brushed aluminum 00034.

B. Headrail: Channel-shaped section, complete with tilting mechanism, top and end braces, top cradles, cord lock, and accessory items required for type of blind and installation indicated.

C. Bottom rail:

1. Tubular steel bottom rail, designed to withstand twisting or sagging.

2. Contour top surface to match slat curvature, with flat or slightly curved bottom.

3. Close ends with manufacturer standard metal or plastic end caps, of same color as slats, unless otherwise indicated.

D. Slats:

1. 1-inch nominal width, with other components sized to suit.

2. Spring-tempered, unperforated, aluminum slats, nominal 0.008-inch thick, (louver blades), rounded corners with forming burrs removed.

E. Ladders:

1. Manufacturer standard ladder, construction designed to support and maintain slats at proper spacing and alignment in open and closed positions, as follows:

2. Braided polyester cord design consisting of vertical components of not less than 0.043-inch, nor more than 0.068-inch in diameter, and integrally braided ladder rungs of not less than 4 threads; space ladders at 23-inch o.c. maximum, and 7-inch from ends of slats.

3. Distance between end ladder and end of slats shall not exceed 7 inches. Distance between braided ladders shall not exceed 23 inches.

F. Tilting mechanism:

1. Manufacturer standard assembly, including disengaging worm and gear mechanism to eliminate overdrive, low friction gear tilter, drum, and cradle at each ladder, tilt rod, tape clips, and grommet guides to prevent wear on ladder and cords; designed to hold slats in any angle, and prevent movement of slats due to vibration, operated as follows:

2. Wand operation: Detachable, clear plastic wand, of proper length to suit blind installation, to provide convenient operation, and detachable, without tools, by raising locking sleeve.

G. Lifting mechanism:

1. Manufacturer standard, including crash-proof cord locks with cord separations and braided polyester or nylon lift cords with tassels at ends.

2. Size cord to suit blind type.

3. Include cord equalizers of self-aligning type designed to maintain horizontal blind position.

H. Installation brackets:

1. Metal brackets designed to facilitate removal of head channels.

2. Provide intermediate brackets at spacing recommended by blind manufacturer.

3. Include hardware necessary for secure attachment of brackets to adjoining construction and to head rails. Provide attachment clips to anchor bottom rails to doors.

4. Design brackets to support safely the weight of blind assemblies, plus forces applied to operate blinds, with a maximum deflection, under load, of L/360.

I. Finish: Finish exposed accessories and hardware to match rail color. Provide manufacturer standard baked-on synthetic resin enamel finish of the color selected by the Architect from the manufacturer palette.

1. Steel components: Galvanize and either phosphate coat or prime exposed steel surfaces, followed by manufacturer standard baked-on synthetic resin enamel finish.

2. Aluminum slats: Factory-applied chemical conversion coating followed by baked-on synthetic resin enamel finish coat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction and supports.

B. Verify that openings are within allowable tolerances, plumb, level, clean, will provide a solid anchoring surface and conditions detrimental to the proper or timely completion of this work are corrected before proceeding with installation.

3.2 INSTALLATION

A. Install blinds with uniform minimum jamb and sill clearances, in compliance with their manufacturer instructions and the Drawings. Blinds shall be installed separately for each window.

B. Attach blind tracks securely to concealed metal framing with self-drilling self-tapping steel screws spaced in compliance with the blind manufacturer recommendations.

C. Installation tolerances:

1. Maximum variation of gap at perimeter: 1/4 inch.

2. Maximum offset from level: 1/8 inch.

D. Adjust blinds to operate freely through their full extension and rotation.

E. Remove finger marks, smears and other visual soiling from exposed blind surfaces after their installation.

F. Replace blind components damaged beyond satisfactory field repair, as determined by the Architect, with acceptable components.

END OF SECTION

SECTION 21 0518
ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Escutcheons.

2. Floor plates.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.

c. Insulated Piping: One-piece, stamped-steel type.

d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.

f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.

h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.

j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.

k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 21 1313
WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Pipes, fittings, and specialties.

2. Sprinklers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.

C. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which items of other systems and equipment are shown and coordinated with each other, using input from installers of the items involved.

B. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

C. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13.

B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.

1. Sprinkler system design shall be approved by authorities having jurisdiction.

a. Sprinkler Occupancy Hazard Classifications:

1) Office and Classroom Areas: Light Hazard

2. Minimum Density for Automatic-Sprinkler Piping Design:

a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.

3. Maximum Protection Area per Sprinkler: According to UL listing.

4. Maximum Protection Area per Sprinkler:

a. Classroom Areas: 225 sq. ft.

b. Office Spaces: 225 sq. ft.

c. Storage Areas: 130 sq. ft.

d. Mechanical Equipment Rooms: 130 sq. ft.

e. Electrical Equipment Rooms: 130 sq. ft.

f. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.2 STEEL PIPE AND FITTINGS

A. Schedule 40, Black-Steel Pipe: ASTM A 135/A 135M; ASTM A 795/A 795M, or ASME B36.10M wrought steel, with wall thickness not less than Schedule 40. Pipe ends may be factory or field formed to match joining method.

B. Schedule 10, Black-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M, Schedule 10 in NPS 2-1/2 and larger.

C. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

D. Steel Couplings: ASTM A 865/A 865M, threaded.

E. Malleable- or Ductile-Iron Unions: UL 860.

F. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Anvil International, Tyco Fire products, Victaulic Company or Approved equal.

2. Pressure Rating: 175-psig minimum.

3. Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.

4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Manufacturers: Anvil International, Tyco Fire Products and Victaulic Company or approved equal.

2. Standard: UL 213.

3. Pressure Rating: 175-psig minimum.

4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.

5. Type: Mechanical-tee and -cross fittings.

6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.

7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.

8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Adjustable Drop Nipples:

1. Manufacturers: Corcoran Piping System, Merit Manufacturing or approved equal.

2. Standard: UL 1474.

3. Pressure Rating: 250-psig minimum.

4. Body Material: Steel pipe with EPDM-rubber O-ring seals.

5. Size: Same as connected piping.

6. Length: Adjustable.

7. Inlet and Outlet: Threaded.

2.4 SPRINKLERS

A. Manufacturers: Reliable Automatic Sprinklers, Tyco Fire Products, Viking Corporation or approved equal.

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

D. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.

2. Nonresidential Applications: UL 199.

3. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

E. Sprinkler Finishes: Chrome plated.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat.

G. Sprinkler Guards:

1. Manufacturers: Reliable Automatic Sprinklers, Tyco Fire Products, Viking Corporation or approved equal.

2. Standard: UL 199.

3. Type: Wire cage with fastening device for attaching to sprinkler.

PART 3 - EXECUTION

3.1 WATER-SUPPLY CONNECTIONS

A. Connect sprinkler piping to building's interior Automatic Fire Sprinkler system distribution piping.

B. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

M. Fill sprinkler system piping with water.

N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

J. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

K. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

L. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING

A. Install cover system, brackets, and cover components for sprinkler piping according to manufacturer's "Installation Manual" and NFPA 13 or NFPA 13R for supports.

3.5 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

C. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.6 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.

4. Energize circuits to electrical equipment and devices.

5. Coordinate with fire-alarm tests. Operate as required.

6. Coordinate with fire-pump tests. Operate as required.

7. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.9 PIPING SCHEDULE

A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints.

B. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller shall be one of the following:

1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

2. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.

C. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 4 shall be the following:

1. Schedule 10, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.10 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.

2. Rooms with Suspended Ceilings: Pendent, recessed, flush, and concealed sprinklers as indicated.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.

2. Flush Sprinklers: Bright chrome, with painted white escutcheon.

3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.

END OF SECTION

SECTION 22 0500
COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for Plumbing Piping and Equipment.

2. Sleeves.

3. Mechanical sleeve seals.

4. Formed steel channel.

5. Firestopping relating to plumbing work.

6. Firestopping accessories.

1.2 REFERENCES

A. General: Comply with Appropriate Standards.

1. American National Standards Institute: ANSI.

2. American Society of Mechanical Engineers: ASME.

3. American Society of Sanitary Engineering: ASSE.

4. ASTM International: American Society of Testing and Mechanicals: ASTM.

5. American Welding Society: AWS.

6. American Water Works Association: AWWS.

7. Manufacturers Standardization Society of the Valve and Fittings Industry: MSS.

8. National Electrical Manufacturers Association: NEMA.

9. Plumbing and Drainage Institute: PDI.

10. Underwriters Laboratories Inc.: U.L.

11. California Energy Commission: C.E.C.

12. National Fire Protection Association: NFPA.

13. Canadian Standards Association: CSA.

14. Factory Mutual Standards: FM.

15. American Gas Association: AGA.

16. California State Fire Marshal Regulations: CSFM.

17. National Sanitation Foundation: NSF.

18. International Association of Plumbing & Mechanical Officials: IAPMO.

19. Cast Iron Soil Pipe Institute: CISPI.

20. California Plumbing Code: CPC.

21. California Building Code: CBC.

1.3 SYSTEM DESCRIPTION

A. Firestopping: Conform to UL for fire resistance ratings and surface burning characteristics.

B. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.4 SUBMITTALS

A. Shop Drawings: Submit for piping and equipment identification list of wording, symbols, letter size, and color coding for pipe identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

B. Product Data for Pipe and Equipment Identification: Submit for mechanical identification manufacturers catalog literature for each product required.

C. Samples for Pipe and Equipment Identification: Submit two tags, 1-1/2 inches in size. Submit two labels, 1.9 x 0.75 inches in size.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of California standard.

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

A. Manufacturers:

1. Seton.

2. Brady.

3. Kolby.

B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light background color.

C. Plastic Tags: Laminated three-layer plastic with engraved black letters on light background color, minimum 1-1/2 inches diameter.

D. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener. Color and Lettering: Conform to ASME A13.1.

E. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Color and Lettering: Conform to ASME A13.1.

F. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.2 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sealant: Acrylic.

2.3 MECHANICAL SLEEVE SEALS

A. Manufacturers:

1. Thunderline Link-Seal, Inc.

2. NMP Corporation.

B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.4 FORMED STEEL CHANNEL

A. Manufacturers:

1. B-Line.

2. Tolco.

3. Unistrut.

B. Product Description: Galvanized 12 gage) thick steel. With holes 1-1/2 inches on center.

2.5 FIRESTOPPING

A. Manufacturers:

1. Dow Corning.

2. Hilti.

3. 3M.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.

2. Foam Firestopping Compounds: Single component foam compound.

3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.

4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.

5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.

6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.

7. Firestop Pillows: Formed mineral fiber pillows.

C. Color: Dark gray.

2.6 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive sleeves.

3.2 INSTALLATION - PIPING AND EQUIPMENT IDENTIFICATION

A. Install plastic nameplates with adhesive.

B. Install plastic tags with corrosion resistant metal chain.

3.3 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with mechanical sleeve seals.

B. Set sleeves in position in forms. Provide reinforcing around sleeves.

C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

F. Install chrome plated steel escutcheons at finished surfaces.

3.4 INSTALLATION - FIRESTOPPING

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

END OF SECTION

SECTION 22 0523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ball valves.

2. Plug valves.

3. Butterfly valves.

4. Check valves.

B. Related Sections:

1. Section 22 0503 - Pipes and Tubes for Plumbing Piping and Equipment: Product and installation requirements for piping materials applying to various system types.

2. Section 22 0529 - Hangers and Supports for Plumbing Piping and Equipment: Product and installation requirements for pipe hangers and supports.

3. Section 22 0700 - Plumbing Insulation: Product and installation requirements for insulation for valves.

4. Section 22 1100 - Facility Water Distribution: Product and installation requirements for piping, and equipment used in domestic water systems.

5. Section 22 1300 - Facility Sanitary Sewerage: Product and installation requirements for piping, and equipment used in sanitary waste and vent systems.

6. Section 22 1400 - Facility Storm Drainage: Product and installation requirements for piping, and equipment used in storm drainage systems.

1.2 REFERENCES

A. General: Comply with Appropriate Standards.

1. American National Standards Institute: ANSI.

2. American Society of Mechanical Engineers: ASME.

3. American Society of Sanitary Engineering: ASSE.

4. ASTM International: American Society of Testing and Mechanicals: ASTM.

5. American Welding Society: AWS.

6. American Water Works Association: AWWS.

7. Manufacturers Standardization Society of the Valve and Fittings Industry: MSS.

   a. MSS SP67 - Butterfly Valves.

   b. MSS SP71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.

   c. MSS SP78 - Cast Iron Plug Valves, Flanged and Threaded Ends.

   d. MSS SP110 - Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved Ends.

8. National Electrical Manufacturers Association: NEMA.

9. Plumbing and Drainage Institute: PDI.

10. Underwriters Laboratories Inc.: U.L.

11. California Energy Commission: C.E.C.

12. National Fire Protection Association: NFPA.

13. Canadian Standards Association: CSA.

14. Factory Mutual Standards: FM.

15. American Gas Association: AGA.

16. California State Fire Marshal Regulations: CSFM.

17. National Sanitation Foundation: NSF.

18. Cast Iron Soil Pipe Institute: CISPI.

1.3 SUBMITTALS

A. Division 01 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.

C. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of valves.

C. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views.

1.5 QUALITY ASSURANCE

A. For drinking water service, provide valves complying with NSF 61.

B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

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

B. Installer: Company specializing in performing work of this section with minimum 3 years experience.

1.7 PRE-INSTALLATION MEETINGS

A. Division 01 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Division 01 - Product Requirements: Environmental conditions affecting products on site.

B. Do not install valves underground when bedding is wet or frozen.

1.10 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Requirements for warranties.

B. Furnish five year manufacturer warranty for valves excluding packing.

1.11 EXTRA MATERIALS

A. Division 01 - Execution and Closeout Requirements: Requirements for extra materials.

B. Furnish two packing kits for each size valve.

PART 2 - PRODUCTS

2.1 BALL VALVES

A. Manufacturers:

1. Nibco.

2. Milwaukee.

3. Crane.

B. 2 inches and Smaller: MSS SP 110, 400 psi WOG, two piece bronze body, chrome plated brass ball, full port, teflon seats, blow-out proof stem, threaded ends with union, lever handle.

C. 2 inches and Smaller: MSS SP 110, Class 150, bronze, two piece body, type 316 stainless steel ball, full port, teflon seats, blow-out proof stem, threaded ends with union, lever handle.

D. 2 inches and Smaller: MSS SP 110, Class 150, bronze, three piece body, type 316 stainless steel ball, full port, teflon seats, blow-out proof stem, threaded ends, lever handle.

2.2 PLUG VALVES

A. Manufacturers:

1. Nordstrom.

2. Dezurik.

3. Crane.

B. 2 inches and Smaller: MSS SP 78, Class 150, cast iron construction, round port, full pipe area, pressure lubricated, teflon packing, threaded ends. Furnish one plug valve wrench for every ten plug-valves with minimum of one wrench.

C. 2-1/2 inches and Larger: MSS SP 78, Class 150, cast iron construction, round port, full pipe area, pressure lubricated, teflon packing, flanged ends. Furnish wrench-operated.

2.3 BUTTERFLY VALVES

A. Manufacturers:

1. Nibco.

2. Milwaukee.

3. Crane.

B. 2-1/2 inches and Larger: MSS SP 67, Class 150.

1. Body: Cast or ductile iron, wafer or lug ends, stainless steel stem, extended neck.

2. Disc: Bronze, aluminum bronze or stainless steel.

3. Seat: Resilient replaceable EPDM.

4. Handle and Operator: 10 position lever handle. Infinite position lever handle with memory stop.

2.4 CHECK VALVES

A. Horizontal Swing Check Valves:

1. Manufacturers:

a. Nibco.

b. Milwaukee.

c. Crane.

2. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N teflon disc, threaded ends.

3. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.

4. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bronze swing disc, renewable disc seal and seat, flanged ends, outside lever and weight.

B. Spring Loaded Check Valves:

1. Manufacturers:

a. Nibco.

b. Milwaukee.

c. Crane.

2. 2 inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, Buna-N teflon disc, integral seat, threaded ends.

3. 2-1/2 inches and Larger: MSS SP 71, Class 125, wafer style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify piping system is ready for valve installation.

3.2 INSTALLATION

A. Install valves with stems upright or horizontal, not inverted.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

D. Install valves with clearance for installation of insulation and allowing access.

E. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Division 08.

F. Refer to Section 22 0529 for pipe hangers.

G. Refer to Section 22 0700 for insulation requirements for valves.

3.3 VALVE APPLICATIONS

A. Install shutoff and drain valves at locations indicated on Drawings in accordance with this Section.

B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball valves for throttling, bypass, or manual flow control services.

D. Install spring loaded check valves on discharge of water pumps.

E. Install check valves on discharge of pumps in pumped sanitary piping.

F. Install lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

G. Install ball valves in domestic water systems for shut-off service.

H. Install ball valves in domestic water systems for throttling service.

I. Install ball valves in sanitary systems for shut-off service.

J. Install ball valves in storm water systems for shut-off service.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball valves.

2. Throttling Service: Ball valves.

3. Pump-Discharge Check Valves:

a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.

b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring or iron, center-guided, resilient-seat check valves.

c. NPS 2-1/2 and Larger for Sanitary Waste: Iron swing check valves with lever and weight or spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.

3. For Copper Tubing, NPS 4 and Larger: Flanged ends.

4. For Steel Piping, NPS 2 and Smaller: Threaded ends.

5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.

6. For Steel Piping, NPS 5 and Larger: Flanged ends.

3.5 DOMESTIC, HOT AND COLD WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.

2. Bronze Angle Valves: Class 150, nonmetallic disc.

3. Ball Valves: Two or three piece, full port, bronze with stainless-steel trim.

4. Bronze Lift Check Valves: Class 125, nonmetallic TFE disc.

5. Bronze Swing Check Valves: Class 150, nonmetallic TFE disc.

B. Pipe NPS 2-1/2 and Larger:

1. Steel Ball Valves: Class 150, full-port.

2. Iron Swing Check Valves: Class 125, metal seats.

3. Iron Swing Check Valves with Closure Control: Class 125, lever and weight.

4. Iron, Center-Guided Check Valves: Class 125, globe, resilient seat.

3.6 SANITARY-WASTE VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.

2. Ball Valves: Three piece, full port, bronze with stainless-steel trim.

3. Bronze Swing Check Valves: Class 125, nonmetallic disc.

4. Bronze Ball Valves: Class 150, RS.

B. Pipe NPS 2-1/2 and Larger:

1. Steel Ball Valves: Class 150, full port.

2. Iron Swing Check Valves: Class 125, metal seats.

3. Iron Swing Check Valves with Closure Control: Class 125, lever and weight.

END OF SECTION

SECTION 22 0529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports.

2. Hanger rods.

3. Inserts.

4. Flashing.

5. Sleeves.

6. Firestopping relating to plumbing work.

7. Firestopping accessories.

8. Equipment bases and supports.

B. Related Sections:

1. Division 03 - Concrete Forming and Accessories: Execution requirements for placement of inserts sleeves in concrete forms specified by this section.

2. Division 03 - Cast-In-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this section.

3. Section 22 1100 - Facility Water Distribution: Execution requirements for placement of hangers and supports specified by this section.

4. Section 22 1300 - Facility Sanitary Sewerage: Execution requirements for placement of hangers and supports specified by this section.

1.2 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME B31.9 - Building Services Piping.

B. ASTM International:

1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

3. ASTM E814 - Standard Test Method for Fire Tests of Through Penetration Fire Stops.

4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

C. American Welding Society:

1. AWS D1.1 - Structural Welding Code - Steel.

D. FM Global:

1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.

E. Underwriters Laboratories Inc.:

1. UL 1479 - Fire Tests of Through-Penetration Firestops.

2. UL 2079 - Tests for Fire Resistance of Building Joint Systems.

3. UL - Fire Resistance Directory.

F. Intertek Testing Services (Warnock Hersey Listed):

1. WH - Certification Listings.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 SYSTEM DESCRIPTION

A. Firestopping Materials: UL 1479 to achieve fire ratings as noted on Drawings for adjacent construction, but not less than 1 hour fire rating.

B. Firestop interruptions to fire rated assemblies, materials, and components.

1.5 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to UL for fire resistance ratings and surface burning characteristics.

B. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.6 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.

C. Product Data:

1. Hangers and Supports: Submit manufacturers catalog data including load capacity.

2. Firestopping: Submit data on product characteristics, performance and limitation criteria.

D. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.

E. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

F. Manufacturer's Installation Instructions:

1. Hangers and Supports: Submit special procedures and assembly of components.

2. Firestopping: Submit preparation and installation instructions.

G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

H. Firestopping Engineering Judgments: For conditions not covered by UL or WH listed designs, submit judgments by licensed professional engineer suitable for presentation to authority having jurisdiction for acceptance as meeting code fire protection requirements.

1.7 QUALITY ASSURANCE

A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.

1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.

2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.

a. Floor Penetrations Within Wall Cavities: T-Rating is not required.

B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.

1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.

2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.

C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.

D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.

E. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

F. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

G. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

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

B. Installer: Company specializing in performing Work of this section with minimum 3 years experience.

1.9 PRE-INSTALLATION MEETINGS

A. Division 01 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Division 01 - Product Requirements: Environmental conditions affecting products on site.

B. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.

C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.

D. Provide ventilation in areas to receive solvent cured materials.

1.12 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.13 WARRANTY

A. bonds.

B. Furnish five year manufacturer warranty for pipe hangers and supports.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. B-Line.

2. Tolco.

3. Anvil International.

4. Unistrut.

5. Superstrut.

B. Plumbing Piping - DWV:

1. Conform to ASME B31.9.

2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

3. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.

4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

5. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.

6. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.

7. Vertical Support: Steel riser clamp.

8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

9. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.

C. Plumbing Piping - Water:

1. Conform to ASME B31.9.

2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.

4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.

5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

6. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.

7. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.

8. Vertical Support: Steel riser clamp.

9. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

10. Floor Support for Hot Pipe Sizes 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

11. Copper Pipe Support: Copper-plated, Carbon-steel ring.

2.2 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.3 INSERTS

A. Manufacturers:

1. B-Line.

2. Tolco.

3. Hilti.

B. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

A. Metal Flashing: 26 gage thick galvanized steel.

B. Lead Flashing:

1. Waterproofing: 5 lb./sq. ft sheet lead.

2. Soundproofing: 1 lb./sq. ft sheet lead.

C. Flexible Flashing: 47 mil thick sheet compatible with roofing.

D. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.5 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sealant: Acrylic.

2.6 FIRESTOPPING

A. Manufacturers:

1. Dow-Corning.

2. Hilti.

3. 3M.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.

2. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.

3. Firestop Pillows: Formed mineral fiber pillows.

C. Color: Dark gray.

2.7 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:

1. Mineral fiberboard.

2. Mineral fiber matting.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

D. General:

1. Furnish UL listed products.

2. Select products with rating not less than rating of wall or floor being penetrated.

E. Non-Rated Surfaces:

1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.

2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify openings are ready to receive sleeves.

C. Verify openings are ready to receive firestopping.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install backing materials to arrest liquid material leakage.

D. Obtain permission from Architect/Engineer before using powder-actuated anchors.

E. Do not drill or cut structural members.

F. Obtain permission from Architect/Engineer before drilling or cutting structural members.

3.3 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Install in accordance with ASME 31.9.

B. Support horizontal piping as scheduled.

C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

D. Place hangers within 12 inches of each horizontal elbow.

E. Use hangers with 1-1/2 inch minimum vertical adjustment.

F. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

G. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

H. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

I. Support riser piping independently of connected horizontal piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 22 0700.

3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.6 INSTALLATION - FLASHING

A. Provide flexible flashing and metal counterflashing where piping penetrates weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash, and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor drains watertight to adjacent materials.

E. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.7 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with mechanical sleeve seals.

B. Set sleeves in position in forms. Provide reinforcing around sleeves.

C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

E. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

F. Install chrome plated steel escutcheons at finished surfaces.

3.8 INSTALLATION - FIRESTOPPING

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping and other items, requiring firestopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.

D. Fire Rated Surface:

1. Seal opening at floor, wall, partition, ceiling, and roof as follows:

a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.

b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.

c. Pack void with backing material.

d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.

E. Non-Rated Surfaces:

1. Seal opening through non-fire rated wall, partition floor, ceiling, and roof opening as follows:

a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.

b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.

c. Install type of firestopping material recommended by manufacturer.

2. Install escutcheons, floor plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.

3. Exterior wall openings below grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place, in accordance with manufacturer's instructions.

4. Interior partitions: Seal pipe penetrations at clean rooms, computer rooms, telecommunication rooms data rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.9 FIELD QUALITY CONTROL

A. Division 01 - Quality Requirements: Requirements for inspecting, testing.

B. Division 01 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.10 CLEANING

A. Division 01 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean adjacent surfaces of firestopping materials.

3.11 PROTECTION OF FINISHED WORK

A. Division 01 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect adjacent surfaces from damage by material installation.

3.12 SCHEDULES

A. Pipe Hanger Spacing:

PIPE HANGER SPACING		
PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
Cast Iron (4” and smaller)	5	3/8
Cast Iron (5” and larger) with 10 foot length of pipe	10	1/2
Copper Tube, 4 inches and smaller	6	3/8
Copper Tube, 5 inches and larger	10	1/2
Steel, 4 inches and smaller	12	3/8
Steel, 4 inches and larger	12	1/2

END OF SECTION

SECTION 22 0553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nameplates.

2. Tags.

3. Pipe markers.

4. Ceiling tacks.

5. Labels.

1.2 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit manufacturers catalog literature for each product required.

C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Samples: Submit two tags, labels, pipe markers, and size used on project.

E. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.5 QUALITY ASSURANCE

A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 PRE-INSTALLATION MEETINGS

A. Division 01 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 EXTRA MATERIALS

A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Manufacturers:

1. Seton.
2. Brady.
3. Kolbi.

B. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.2 TAGS

A. Plastic Tags:

1. Manufacturers:

a. Seton.

b. Brady.

c. Kolbi.

2. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches diameter.

B. Metal Tags:

1. Manufacturers:

a. Seton.

b. Brady.

c. Kolbi.

2. Brass with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges.

C. Information Tags:

1. Manufacturers:

a. Seton.

b. Brady.

c. Kolbi.

2. Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.

D. Tag Chart: Typewritten letter size list of applied tags and location in anodized aluminum frame.

2.3 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Plastic Pipe Markers

1. Manufacturers:

a. Seton.

b. Brady.

c. Kolbi.

2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers

1. Manufacturers:

   a. Seton.

   b. Brady.

   c. Kolbi.

2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Plastic Underground Pipe Markers

1. Manufacturers:

   a. Seton.

   b. Brady.

   c. Kolbi.

2. Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.4 CEILING TACKS

A. Manufacturers:

1. Seton.

2. Brady.

3. Kolbi.

B. Description: Steel with 3/4 inch diameter color-coded head.

C. Color code as follows:

1. Plumbing valves: Green.

2.5 LABELS

A. Manufacturers:

1. Seton.

2. Brady.

3. Kolbi.

B. Description: Aluminum, size 1.9 x 0.75 inches, adhesive backed with printed identification.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install identifying devices after completion of coverings and painting.

B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

C. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

D. Install tags using corrosion resistant chain. Number tags consecutively by location.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Identify water heaters, pumps, tanks, and water treatment devices with plastic nameplates. Identify in-line pumps and other small devices with tags.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify valves in main and branch piping with tags.

I. Identify piping, concealed or exposed, with plastic pipe markers plastic tape pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

J. Provide ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 22 0700
PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plumbing piping insulation, jackets and accessories.

2. Plumbing equipment insulation, jackets and accessories.

B. Related Sections:

1. Division 07 - Firestopping: Product requirements for firestopping for placement by this section.

2. Division 09 - Painting and Coating: Execution requirements for painting insulation jackets and covering specified by this section.

1.2 REFERENCES

A. ASTM International:

1. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.

2. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

3. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

4. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

5. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

6. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

7. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and 120.

8. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

9. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

1.3 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

C. Samples: Submit two samples of representative size illustrating each insulation type.

D. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 450 in accordance with ASTM E84.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

D. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Applicator: Company specializing in performing Work of this section with minimum three years experience.

1.6 PRE-INSTALLATION MEETINGS

A. Division 01 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Division 01 - Product Requirements: Environmental conditions affecting products on site.

B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

C. Maintain temperature before, during, and after installation for minimum period of 24 hours.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for man made fiber.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Glass Fiber and Mineral Fiber Insulation

1. Manufacturers:

a. John Manville.

b. Owens-Corning.

c. Knauf.

2.2 PIPE INSULATION

A. ASTM C547, molded glass fiber pipe insulation.

1. Thermal Conductivity: 0.23 at 75 degrees F.

2. Operating Temperature Range: 0 to 850 degrees F.

3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.

4. Jacket Temperature Limit: minus 20 to 150 degrees F.

2.3 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:

1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.

2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

B. PVC Plastic Pipe Jacket:

1. Product Description: ASTM D1785, One piece molded type fitting covers and sheet material, off-white color.

2. Thickness: 30 mil.

3. Connections: Brush on welding adhesive.

2.4 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

2.5 EQUIPMENT INSULATION

A. ASTM C553; glass fiber, flexible or semi-rigid, noncombustible.

1. Thermal Conductivity: 0.023 at 75 degrees F.

2. Operating Temperature Range: 0 to 450 degrees F.

3. Density: 2.3 pound per cubic foot.

2.6 EQUIPMENT INSULATION JACKETS

A. PVC Plastic Equipment Jacket:

1. Product Description: ASTM D1785, sheet material, off-white color.

2. Minimum Service Temperature: -40degrees F.

3. Maximum Service Temperature: 150degrees F.

4. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

5. Thickness: 30 mil.

6. Connections: Brush on welding adhesive.

B. Aluminum Equipment Jacket:

1. ASTM B209.

2. Thickness: 0.020 inch thick sheet.

3. Finish: Embossed.

4. Joining: Longitudinal slip joints and 2 inch laps.

5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

C. Stainless Steel Equipment Jacket:

1. ASTM A240 OR ASTM 666 Type 304 stainless steel.

2. Thickness: 0.016inch thick.

3. Finish: Corrugated.

4. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

D. Canvas Equipment Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric with fire retardant lagging adhesive compatible with insulation.

E. Vapor Retarder Jacket:

1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.

2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

F. Field Applied Glass Fiber Fabric Jacket System:

1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2. Glass Fiber Fabric:

a. Cloth: Untreated; 9 oz/sq yd weight.

b. Blanket: 1.0 lb/cu ft density.

3. Indoor Vapor Retarder Finish:

a. Cloth: Untreated; 9 oz/sq yd weight.

b. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.7 EQUIPMENT INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449.

E. Adhesives: Compatible with insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify piping and equipment has been tested before applying insulation materials.

C. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.

C. Glass Fiber Board Insulation:

1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.

D. Hot Piping Systems less than 140 degrees F:

1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.

E. Hot Piping Systems greater than 140 degrees F:

1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

3. Insulate flanges and unions at equipment.

F. Inserts and Shields:

1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.

2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.

a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.

b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.

3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.

G. Insulation Terminating Points:

1. Condensate Piping: Insulate entire piping system and components to prevent condensation.

3.3 SCHEDULES

A. Water Supply Services Piping Insulation Schedule:

1. Domestic Hot Water Supply and Recirculation:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS Inches
Domestic Hot Water Supply Return & Condensate Piping	Molded Glass Fiber	1 inches and smaller 1-1/4 inches and larger	1.0 1.5

END OF SECTION

SECTION 22 1100
FACILITY WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Domestic water piping, within 5 feet of building.
2. Domestic water piping, above grade.
3. Unions and flanges.
4. Valves.
5. Pressure gages.
6. Pressure gage taps.
7. Thermometers.
8. Flow control valves.
9. Water pressure reducing valves.
10. Relief valves.
11. Strainers.
12. Hose bibs.
13. Water hammer arrestors.
14. Thermostatic mixing valves.
15. Diaphragm-type compression tanks.
16. In-line circulator pumps.
17. Access panels.
18. Bedding and cover materials.

B. Related Sections:

1. Division 03 - Cast-In-Place Concrete: Execution requirements for placement of concrete house keeping pads specified by this section.
2. Division 08 - Access Doors and Frames: Product requirements for access doors for placement by this section.

3. Section 22 0523 - General-Duty Valves for Plumbing Piping: Product requirements for valves for placement by this section.

4. Section 22 0529 - Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports and firestopping for placement by this section.

5. Section 22 0553 - Identification for Plumbing Piping and Equipment: Product requirements for pipe identification and valve tags for placement by this section.

6. Section 22 0700 - Plumbing Insulation: Product and execution requirements for pipe insulation.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI Z21.22 - Relief Valves for Hot Water Supply Systems.

B. American Society of Mechanical Engineers:

1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

3. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.

4. ASME B31.9 - Building Services Piping.

5. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.

C. American Society of Sanitary Engineering:

1. ASSE 1010 - Performance Requirements for Water Hammer Arresters.

2. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers.

3. ASSE 1019 - Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type.

D. ASTM International:

1. ASTM B32 - Standard Specification for Solder Metal.

2. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.

3. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

4. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

5. ASTM E1 - Standard Specification for ASTM Thermometers.

6. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

E. American Welding Society:

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

F. American Water Works Association:

1. AWWA C651 - Disinfecting Water Mains.

G. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

H. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

I. Plumbing and Drainage Institute:

1. PDI WH201 - Water Hammer Arrester Standard.

1.3 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.

2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.

3. Domestic Water Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.

4. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of valves and equipment.

C. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

1.5 QUALITY ASSURANCE

A. For drinking water service, provide valves complying with NSF 61.

B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 PRE-INSTALLATION MEETINGS

A. Division 01 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Product storage and handling requirements.

B. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Division 01 - Product Requirements.

B. Do not install underground piping when bedding is wet or frozen.

1.10 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.11 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for domestic water piping.

1.12 EXTRA MATERIALS

A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish two packing kits for each size valve, two loose keys for hose end vacuum breakers for hose bibs.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Tubing: ASTM B88, Type L, annealed.

1. Manufacturers:

a. Muller.

b. ABS Pipe.

2. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.

3. Joints: Compression connection or Brazed, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

2.2 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type K, drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder

2.3 FLUE AND COMBUSTION AIR PIPING

A. PVC Pipe: ASTM D1785, Schedule 40, polyvinyl chloride (PVC) material.

1. Fittings: ASTM D2466, Schedule 40, PVC.

2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement. Prime joints with a contrasting color.

2.4 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:

1. Ferrous Piping: Class 150, malleable iron, threaded.

2. Copper Piping: Class 150, bronze unions with soldered joints.

3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flanges for Pipe 2-1/2 inches and Larger:

1. Ferrous Piping: Class 150, forged steel, slip-on flanges.

2. Copper Piping: Class 150, slip-on bronze flanges.

3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.5 VALVES

A. Refer to Section 22 0523 - General Duty Valves for Plumbing Piping.

2.6 PIPE HANGERS AND SUPPORTS

A. Refer to Section 22 0529 - Hangers and Supports for Plumbing Piping and Equipment.

2.7 PRESSURE GAGES

A. Manufacturers:

1. Ameter Inc.

2. Trerice.

3. Weiss.

B. Gage: ASME B40.1, UL 393 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.

1. Case: Steel.

2. Bourdon Tube: Brass.

3. Dial Size: 3-1/2 inch diameter.

4. Mid-Scale Accuracy: two percent.

5. Scale: Both psi and kPa.

2.8 PRESSURE GAGE TAPS

A. Manufacturers:

1. Ameter, Inc.

2. Trerice.

3. Weiss.

B. Needle Valve: Brass, 1/4 inch NPT for minimum 300 psi.

C. Ball Valve: Brass, 1/8 inch NPT for 250 psi.

2.9 STEM TYPE THERMOMETERS

A. Manufacturers:

1. Ashcroft.

2. Trerice.

3. Weiss.

B. Thermometer: ASTM E1, red appearing mercury, lens front tube, cast aluminum case with enamel finish.

1. Size: 7-inch scale.

2. Window: Clear glass.

3. Stem: Brass, 3/4 inch NPT, 3-1/2 inch long.

4. Accuracy: ASTM E77 2 percent.

5. Calibration: Degrees F.

2.10 FLOW CONTROL VALVES

A. Manufacturers:

1. Bell & Gossett.

2. Griswold.

3. Flocon.

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet.

C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 5 psi.

2.11 WATER PRESSURE REDUCING VALVES

A. Manufacturers:

1. Zurn-Wilkins.

2. Conbraco.

3. Watts.

4. Cla-Val.

B. 2 inches and Smaller: MSS SP 80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded ends.

C. 2 inches and Larger: MSS SP 85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.12 RELIEF VALVES

A. Manufacturers:

1. Zurn-Wilkins.

2. Watts.

3. Conbraco.

4. Cla-Val.

B. Pressure Relief: ANSI Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

C. Temperature and Pressure Relief: ANSI Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME certified and labeled.

2.13 STRAINERS

A. Manufacturers:

1. Watts.

2. Zurn-Wilkins.

3. Conbraco.

B. 2 inch and Smaller: Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

C. 1-1/2 inch to 4 inch: Class 125, flanged iron body, Y pattern with 1/16-inch stainless steel perforated screen.

D. 5 inch and Larger: Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

2.14 HOSE BIBS

A. Manufacturers:

1. Acorn.

2. J.R. Smith.

3. Mifab.

B. Interior: Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with lock shield and removable key, integral vacuum breaker in conformance with ASSE 1011.

2.15 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Mifab.

2. Precision Plumbing Products, PPP.

3. J.R. Smith.

B. ASSE 1010; stainless steel construction, bellows type sized in accordance with PDI WH-201.

C. Pre-charged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

2.16 THERMOSTATIC MIXING VALVES

A. Main Mixing Valve:

1. Manufacturers:

a. Powers.

b. Bradley.

c. Simmons.

B. Point of Use:

1. Manufacturers:

a. Chicago.

b. Watts.

c. Zurn.

C. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment. Conform to ASSE 1070 to temper water to maximum 110 degrees F.

D. Capacity: As scheduled.

E. Accessories:

1. Check valve on inlets.

2. Volume control shut-off valve on outlet.

3. Stem thermometer on outlet.

4. Strainer stop checks on inlets.

F. Cabinet: 16 gage prime coated steel, for recessed surface mounting with keyed lock.

2.17 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Manufacturers:

1. Amtrol.

2. Bell & Gossett.

3. Taco.

B. Construction: Welded steel, tested and stamped in accordance with ASME Section VIII; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

C. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 50 psig.

D. Size: As scheduled.

2.18 IN-LINE CIRCULATOR PUMPS

A. Manufacturers:

1. Bell & Gossett.

2. Grundfos.

3. Taco.

B. Casing: Bronze rated for 125 psig working pressure.

C. Impeller: Bronze.

D. Shaft: Alloy steel with integral thrust collar and two, oil lubricated bronze sleeve bearings.

E. Seal: Carbon rotating against stationary ceramic seat.

F. Drive: Flexible coupling.

G. Performance:

1. Flow: As scheduled.

H. Electrical Characteristics and Components:

1. Electrical Characteristics: As scheduled.

2.19 ACCESS PANELS

A. Manufacturers:

1. J.R. Smith.

2. Karp.

3. Milcor.

B. Panel 8x8 minimum size, but larger if required. Concealed hinge, allen head lock.

C. Styles:

1. Gypsum Board or Masonry: Prime coated steel.

2. Tile: Stainless steel.

3. Plaster: Prime coated steel.

4. Acoustical Plaster: Karp DSC-210PL.

5. Fire Rated Construction:

2.20 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type as specified in Division 31.

B. Cover: Fill Type, as specified in Division 31.

C. Soil Backfill from Above Pipe to Finish Grade: Soil Type, as specified in Division 31.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

3.3 INSTALLATION - THERMOMETERS AND GAGES

A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.

B. Install gage taps in piping.

C. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.

E. Provide instruments with scale ranges selected according to service with largest appropriate scale.

F. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

G. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.4 INSTALLATION - HANGERS AND SUPPORTS

A. Install hangers and supports in accordance with Section 22 0529.

3.5 INSTALLATION - BURIED PIPING SYSTEMS

A. Verify connection to existing piping system size, location, and invert are as indicated on Drawings.

B. Establish elevations of buried piping with not less than 1 ft of cover.

C. Establish minimum separation of 12 inches from other services piping in accordance with code.

D. Remove scale and dirt on inside of piping before assembly.

E. Excavate pipe trench in accordance with Division 31.

F. Install pipe to elevation as indicated on Drawings.

G. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted depth; compact to 95 percent maximum density.

H. Install pipe on prepared bedding.

I. Route pipe in straight line.

J. Install pipe to allow for expansion and contraction without stressing pipe or joints.

K. Install shutoff and drain valves at locations indicated on Drawings in accordance with Section 22 0523.

L. Install plastic ribbon tape continuous over top of pipe. buried 6 inches below finish grade, above pipe line; coordinate with Division 31. Refer to Section 22 0553.

M. Pipe Cover and Backfilling:

1. Backfill trench in accordance with Division 31.

2. Maintain optimum moisture content of fill material to attain required compaction density.

3. After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 4 inches compacted layers to 6 inches minimum cover over top of jacket. Compact to 95 percent maximum density.

4. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.

5. Do not use wheeled or tracked vehicles for tamping.

3.6 INSTALLATION - ABOVE GROUND PIPING

A. Install non-conducting dielectric connections wherever jointing dissimilar metals.

B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

D. Group piping whenever practical at common elevations.

E. Slope piping and arrange systems to drain at low points.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 0700.

H. Provide access where valves and fittings are not accessible.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Provide support for utility meters in accordance with requirements of utility companies.

K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Division 09.

L. Install domestic water piping in accordance with ASME B31.9.

M. Sleeve pipes passing through partitions, walls and floors. Refer to Section 22 0529.

N. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Section 22 0529.

O. Install unions downstream of valves and at equipment or apparatus connections.

P. Install valves with stems upright or horizontal, not inverted.

Q. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

R. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

S. Install ball valves for throttling, bypass, or manual flow control services.

T. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

U. Provide spring loaded check valves on discharge of water pumps.

V. Provide flow controls in water circulating systems as indicated on Drawings.

W. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.

X. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.

Y. Test backflow preventers in accordance with ASSE 5015.

Z. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories.

3.7 INSTALLATION - PUMPS

A. Lubricate pumps before start-up.

3.8 INSTALLATION - TANKS

A. Install Work in accordance with State of California standards.

B. Provide support, independent of building structural framing members.

C. Clean and flush after installation. Seal until pipe connections are made.

D. Install the following piping accessories on domestic water piping connections:

1. On inlet: Thermometer check valve and shut-off valve.

2. On outlet: Thermometer and shut-off valve.

3. Install relief valve piping to nearest approved receptor.

3.9 FIELD QUALITY CONTROL

A. Division 01 - Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Test domestic water piping system in accordance with applicable code.

3.10 CLEANING

A. Division 01 - Execution and Closeout Requirements: Requirements for cleaning.

B. Disinfect water distribution system in accordance with applicable code.

C. Prior to starting work, verify system is complete, flushed and clean.

D. Verify pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

E. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain residual from 50 to 80 mg/L.

F. Bleed water from outlets to obtain distribution and test for disinfectant residual at minimum 15 percent of outlets.

G. Maintain disinfectant in system for 24 hours.

H. When final disinfectant residual tests less than 25 mg/L, repeat treatment.

I. Flush disinfectant from system until residual concentration is equal to incoming water or 1.0 mg/L.

J. Take samples no sooner than 24 hours after flushing, from 2 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

END OF SECTION

SECTION 22 1300
FACILITY SANITARY SEWERAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sanitary sewer piping buried within 5 feet of building.

2. Sanitary sewer piping above grade.

3. Floor drains.

4. Floor sinks.

5. Cleanouts.

6. Bedding and cover materials.

B. Related Sections:

1. Division 03 - Cast-In-Place Concrete: Execution requirements for placement of concrete specified by this section.

2. Section 22 0523 - General-Duty Valves for Plumbing Piping: Product requirements for valves for placement by this section.

3. Section 22 0529 - Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports and firestopping for placement by this section.

4. Section 22 0548 - Vibration and Seismic Controls for Plumbing Piping and Equipment: Product requirements for vibration isolators for placement by this section.

5. Section 22 0553 - Identification for Plumbing Piping and Equipment: Product requirements for pipe identification for placement by this section.

6. Section 22 0700 - Plumbing Insulation: Product and execution requirements for pipe insulation.

1.2 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME A112.14.1 - Backwater Valves.

2. ASME A112.21.1 - Floor Drains.

3. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

4. ASME B16.3 - Malleable Iron Threaded Fittings.

5. ASME B16.4 - Gray Iron Threaded Fittings.

6. ASME B31.9 - Building Services Piping.

B. ASTM International:

1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

2. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.

3. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

4. ASTM A536 - Standard Specification for Ductile Iron Castings.

5. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

C. Cast Iron Soil Pipe Institute:

1. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

2. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

D. Plumbing and Drainage Institute:

1. PDI G101 - Standard - Testing and Rating Procedure for Grease Interceptors.

1.3 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes for sewage-ejectors, and manholes.

C. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.

2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.

3. Hangers and Supports: Submit manufacturers catalog information including load capacity.

4. Sanitary Drainage Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.

5. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of equipment and clean-outs.

C. Operation and Maintenance Data: Submit frequency of treatment required for interceptors. Include, spare parts lists, exploded assembly views for pumps and equipment.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of California standards.

B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 PRE-INSTALLATION MEETINGS

A. Division 01 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Product Requirements: Product storage and handling requirements.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Division 01 - Product Requirements.

B. Do not install underground piping when bedding is wet or frozen.

1.10 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.11 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

1.12 EXTRA MATERIALS

A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: CISPI 301, ASTM 888 service weight hub-less.

1. Manufacturers:

a. Charlotte.

b. Tyler.

c. AB&I.

2. Fittings: Cast iron, CISPI 301, ASTM 888 hubless.

3. Joints: CISPI 310, ASTM C1540, C564 neoprene gasket and heavy duty 304 stainless steel clamp and shield assemblies.

a. Manufacturers:

1) Husky SD4000.

2) Clamp All.

3) MG Couplings.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, ASTM 888 hub-less, service weight.

1. Manufacturers:

a. Charlotte.

b. Tyler.

c. AB&I.

2. Fittings: Cast iron, CISPI 301, ASTM 888.

3. Joints: CISPI 310, ASTM 1540 with ASTM C564 neoprene gaskets and stainless steel clamp-and-shield assemblies.

a. Manufacturers:

1) Husky SD4000.

2) Clamp All.

3) MG Couplings.

2.3 PIPE HANGERS AND SUPPORTS

A. Refer to Section 22 0529.

2.4 FLOOR DRAINS (REFER TO PLANS FOR MODEL AND TYPE)

A. Manufacturers:

1. J.R. Smith.

2. Zurn.

3. Mifab.

B. Floor Drain: ASME A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer, provide 1/2" trap primer connection.

2.5 FLOOR SINKS (REFER TO PLANS FOR MODEL AND TYPE)

A. Manufacturers:

1. J.R Smith.

2. Zurn.

3. Mifab.

B. Floor Sink: Square lacquered cast iron body with integral seepage pan, epoxy coated interior, aluminum dome strainer, clamp collar, sediment bucket, nickel bronze frame and secured grate.

2.6 CLEANOUTS

A. Manufacturers:

1. J.R. Smith.

2. Zurn.

3. Mifab.

B. Exterior Surfaced Areas: Round cast nickel bronze access frame and non-skid cover.

C. Exterior Unsurfaced Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket.

D. Interior Finished Floor Areas: Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round scored cover with gasket in service areas and round depressed cover with gasket to accept floor finish in finished floor areas.

E. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket, and round stainless steel access cover secured with machine screw.

F. Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.7 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type as specified in Division 31.

B. Cover: Fill Type, as specified in Division 31.

C. Soil Backfill from Above Pipe to Finish Grade: Soil Type, as specified in Division 31.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.3 INSTALLATION - HANGERS AND SUPPORTS

A. Refer to Section 22 0529.

3.4 INSTALLATION - BURIED PIPING SYSTEMS

A. Verify connection to existing piping system size, location, and invert are as indicated on Drawings.

B. Establish elevations of buried piping with not less than 3 ft of cover.

C. Establish minimum separation of 12 inches from other services piping in accordance with code.

D. Remove scale and dirt on inside of piping before assembly.

E. Excavate pipe trench in accordance with Division 31.

F. Install pipe to elevation as indicated on Drawings.

G. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted depth; compact to 95 percent maximum density.

H. Install pipe on prepared bedding.

I. Route pipe in straight line.

J. Install plastic ribbon tape continuous over top of pipe. buried 6 inches below finish grade, above pipe line; coordinate with Division 31. Refer to Section 22 0553.

K. Pipe Cover and Backfilling:

1. Backfill trench in accordance with Division 31.

2. Maintain optimum moisture content of fill material to attain required compaction density.

3. After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 6 inches compacted layers to 12 inches minimum cover over top of jacket. Compact to 95 percent maximum density.

4. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.

5. Do not use wheeled or tracked vehicles for tamping.

3.5 INSTALLATION - ABOVE GROUND PIPING

A. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearances at cleanout for snaking drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

G. Install piping to maintain headroom. Do not spread piping, conserve space.

H. Group piping whenever practical at common elevations.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 22 0700.

K. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Division 08.

L. Install piping penetrating roofed areas to maintain integrity of roof assembly.

M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

N. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Division 09.

O. Install bell and spigot pipe with bell end upstream.

P. Sleeve pipes passing through partitions, walls and floors.

Q. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Section 22 0529.

R. Support cast iron drainage piping at every joint.

3.6 FIELD QUALITY CONTROL

A. Division 01 - Quality Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Test sanitary waste and vent piping system in accordance with applicable code.

END OF SECTION

SECTION 23 0500
COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Motors.
2. Sleeves.
3. Mechanical sleeve seals.
4. Formed steel channel.
5. Firestopping relating to HVAC work.
6. Firestopping accessories.

1.2 SYSTEM DESCRIPTION

A. Firestopping Materials: Comply with requirements of Section 07 8400.

B. Firestopping: Conform to UL for fire resistance ratings and surface burning characteristics.

C. Firestopping: Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.3 SUBMITTALS

A. Shop Drawings: Submit for piping and equipment identification list of wording, symbols, letter size, and color coding for pipe identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with State of California standard.

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 MOTORS

A. Provide U.S. standard motor 3ph and 1ph as applicable for UFD, energy use BECM motors shall be U.S. standard type, built in variable speed capable, REE magnet electric, commutating.

2.2 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sleeves for Round Ductwork: Galvanized steel.

D. Sleeves for Rectangular Ductwork: Galvanized steel or wood.

E. Sealant: Refer to Section 07 9000.

2.3 MECHANICAL SLEEVE SEALS

A. Manufacturers:

1. PIPE SEAL.

2. Substitutions: Not Permitted.

B. Furnish materials in accordance with State of California standards.

C. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.4 FORMED STEEL CHANNEL

A. Manufacturers:

1. U.S. Steel.

2. Substitutions: Permitted.

B. Furnish materials in accordance with State of California standards.

C. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.5 FIRESTOPPING

A. Firestopping Materials: Comply with requirements of Section 07 8400.

B. Manufacturers:

1. Hilti.

2. Substitutions: Not Permitted.

C. Furnish materials in accordance with State of California standards.

D. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

1. Silicone Firestopping Elastomeric Firestopping: [Single] [Multiple] component silicone elastomeric compound and compatible silicone sealant.

2. Foam Firestopping Compounds: [Single] [Multiple] component foam compound.

3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.

4. Fiber Stuffing and Sealant Firestopping: Composite of [mineral] [ceramic] fiber stuffing insulation with silicone elastomer for smoke stopping.

5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.

6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.

7. Firestop Pillows: Formed mineral fiber pillows.

E. Color: As selected from manufacturer's full range of colors.

2.6 FIRESTOPPING ACCESSORIES

A. Installation Accessories: Comply with requirements of Section 07 8400.

B. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive sleeves.

3.2 INSTALLATION - PIPING AND EQUIPMENT IDENTIFICATION

A. Install plastic nameplates with adhesive.

B. Install plastic tags with corrosion resistant metal chain.

3.3 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with mechanical sleeve seals.

B. Set sleeves in position in forms. Provide reinforcing around sleeves.

C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with [stuffing] [firestopping] insulation and caulk [airtight]. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

F. Install chrome plated steel, plastic, stainless steel escutcheons at finished surfaces.

3.4 INSTALLATION - FIRESTOPPING

A. Firestopping Materials: Comply with requirements of Section 07 8400.

B. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

END OF SECTION

SECTION 23 0529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports.

2. Hanger rods.

3. Inserts.

4. Flashing.

5. Equipment curbs.

6. Formed steel channel.

7. Equipment bases and supports.

B. Related Requirements:

1. Section 03 1000 - Concrete Forming and Accessories: Placement of [inserts] [sleeves] in concrete forms as required by this Section.

2. Section 03 3000 - Cast-in-Place Concrete: Placement of concrete housekeeping pads as required by this Section.

3. Section 07 9000 - Joint Protection: Sealant materials for placement by this Section.

4. Section 09 9000 - Painting and Coating: Painting as required by this Section.

5. Section 09 9635 - Chemical-Resistant Coatings: Painting as required by this Section in designated areas subject to chemical corrosion.

6. Section 21 0548 - Vibration and Seismic Controls for Fire-Suppression Piping and Equipment: Coordination with installation of rigid pipe anchors.

7. Section 23 0700 - Insulation.

1.2 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): The material used to seal or stuff or an assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire-rated construction.

1.3 REFERENCE STANDARDS

A. American Welding Society:

1. AWS D1.1/D1.1M - Structural Welding Code - Steel.

B. ASME International:

1. ASME B31.1 - Power Piping.

2. ASME B31.5 - Refrigeration Piping and Heat Transfer Components.

3. ASME B31.9 - Building Services Piping.

C. ASTM International:

1. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

2. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

3. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

4. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

D. FM Global:

1. FM - Approval Guide.

E. Intertek Testing Services (Warnock Hersey Mark):

1. WH-ETL - Product Directory.

F. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

1.4 PREINSTALLATION MEETINGS

A. Section 01 3000 - Administrative Requirements: Requirements for preinstallation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.5 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Hangers and Supports: Submit manufacturer's catalog information, including load capacity.

C. Shop Drawings:

1. Indicate system layout with location, including critical dimensions and sizes.

2. Indicate pipe hanger and support locations, and detail of trapeze hangers.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Delegated Design Submittals:

1. Submit signed and sealed Shop Drawings with design calculations and assumptions for load-carrying capacity of trapeze, multiple-pipe, and riser support hangers.

2. Submit sizing methods and calculations sealed by a registered professional engineer (P.E.).

3. Firestopping Engineering Judgments: For conditions not covered by UL or WH-ETL listed designs, submit judgments by licensed P.E. suitable for presentation to authority having jurisdiction for acceptance as meeting fire protection code requirements.

F. Manufacturer Instructions:

1. Hangers and Supports: Submit special procedures and assembly of components.

2. Firestopping: Submit preparation and installation instructions.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statements:

1. Submit qualifications for manufacturer, installer, and licensed professional.

2. Submit manufacturer's approval of applicator fabricator installer.

3. Welders: Qualify procedures and personnel according to AWS D1.1/D1.1M.

1.6 QUALITY ASSURANCE

A. Through-Penetration Firestopping of Fire-Rated Assemblies:

1. Comply with UL 1479.

2. Positive Pressure Differential:

a. As required to achieve fire F-ratings and temperature T-ratings as indicated on Drawings, but not less than one hour.

b. Minimum 0.10 inch wg.

3. Wall Penetrations: Fire F-ratings as indicated on Drawings, but not less than one hour.

4. Floor and Roof Penetrations:

a. Fire F-ratings and temperature T-ratings as indicated on Drawings, but not less than one hour.

b. Floor Penetrations within Wall Cavities: T-rating not required.

B. Through-Penetration Firestopping of Non-fire-rated Floor and Roof Assemblies:

1. Materials: Resist free passage of flame and products of combustion.

2. Noncombustible Penetrating Items: Connecting maximum three stories.

3. Penetrating Items: Materials approved by authorities having jurisdiction for connecting maximum two stories.

C. Fire-Resistive Joints in Fire-Rated Floor, Roof, and Wall Assemblies:

1. Comply with UL 2079.

2. As required to achieve fire-resistance rating as indicated on Drawings for assembly in which joint is installed.

D. Fire-Resistive Joints between Floor Slabs and Exterior Walls:

1. Comply with ASTM E119.

2. Positive Pressure Differential:

a. As required to achieve fire F-ratings and temperature T-ratings as indicated on Drawings for floor assembly.

b. Minimum 0.10 inch wg.

E. Surface-Burning Characteristics:

1. Maximum 25/450 flame-spread/smoke-developed index.

2. Testing: Comply with ASTM E84.

F. Welding of Hanger and Support Attachments to Building Structure: Comply with [applicable authority] [AWS D1.1/D1.1M].

G. Perform Work according to U.S. standards.

H. Maintain 1 copy of each standard affecting Work of this Section on Site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience and approved by manufacturer.

C. Welders: AWS qualified within previous 12 months for employed weld types.

D. Licensed Professional: P.E. experienced in design of specified Work and licensed in State of California.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

2. Provide additional protection according to manufacturer instructions.

1.9 AMBIENT CONDITIONS

A. Section 01 5000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Minimum Conditions:

1. Do not apply firestopping materials if temperature of substrate material and ambient air is below 60 degrees F.

2. Maintain this minimum temperature before, during, and for minimum three days after installation of firestopping materials.

C. Provide ventilation in areas to receive solvent cured materials.

1.10 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.

2. Indicate field measurements on Shop Drawings.

1.11 WARRANTY

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for warranties.

B. Furnish five-year manufacturer's warranty for pipe hangers and supports.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. Firestopping Materials: As specified in Section 07 8400 - Firestopping by HILTI.

B. Firestopping Materials:

1. Comply with UL 263 and UL 1479.

2. Adjacent Construction:

a. Achieve fire ratings as indicated on Drawings for adjacent construction.

b. Minimum Fire Rating: One hour.

c. Fire ratings may be three hours for firestopping in through-penetrations of four-hour fire-rated assemblies, unless otherwise required by applicable codes.

C. Firestopping Materials:

1. Comply with UL 263 and UL 1479.

2. Adjacent Construction:

a. Achieve fire ratings according to indicated UL Design Numbers.

D. Firestop interruptions to fire-rated assemblies, materials, and components.

2.2 PERFORMANCE AND DESIGN CRITERIA

A. Firestopping Materials: As specified in Section 07 8400 - Firestopping.

B. Firestopping:

1. Comply with UL for fire-resistance ratings and surface-burning characteristics.

2. Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

2.3 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. Itt Grinnell.

2. Mason.

3. Vibrex.

4. Substitutions: Not permitted.

5. Furnish materials according to ISAT Hangers standards.

6. On roof use PHP design Stanchion System Bruce Kolb 714-465-7606.

B. Hydronic Piping:

1. Comply with [ASME B31.9] [ASTM F708] [MSS SP-58].

2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches:

a. Material: [Malleable iron] [Carbon steel].

b. Type: Adjustable swivel and split ring.

3. Hangers for Cold Pipe, Sizes 2 Inches and Larger:

    a. Material: Carbon steel.

    b. Type: Adjustable; clevis.

4. Hangers for Hot Pipe, Sizes 2 to 4 Inches:

    a. Material: Carbon steel.

    b. Type: Adjustable; clevis.

5. Hangers for Hot Pipe, Sizes 6 Inches and Larger:

    a. Type: Double hanger.

    b. Yoke: Adjustable; steel.

    c. Roll: Cast iron.

6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

7. Multiple or Trapeze Hangers for Hot Pipe, Sizes 6 Inches and Larger:

    a. Steel channels with welded spacers and hanger rods.

    b. Roll: Cast iron.

8. Wall Support for Pipe Sizes 3 Inches and Smaller: Cast-iron hooks.

9. Wall Support for Pipe Sizes 4 Inches and Larger: Welded steel bracket and wrought steel clamp.

10. Wall Support for Hot Pipe Sizes 6 Inches and Larger:

    a. Welded steel bracket and wrought steel clamp.

    b. Yoke: Adjustable; steel.

    c. Roll: Cast iron.

11. Vertical Support: Steel riser clamp.

12. Floor Support for Cold Pipe:

    a. Pipe Saddle: Cast iron; adjustable.

    b. Support: Concrete pier or steel column.

    c. Furnish lock nut, nipple, and floor flange.

13. Floor Support for Hot Pipe, Sizes 4 Inches and Smaller:

    a. Pipe Saddle: Cast iron; adjustable.

b. Support: Concrete pier or steel column.

c. Furnish lock nut, nipple, and floor flange.

14. Floor Support for Hot Pipe, Sizes 6 Inches and Larger:

a. Roll and Stand: Cast iron; adjustable.

b. Screws: Steel.

c. Support: Concrete pier or steel column.

15. Copper Pipe Support: Copper-plated carbon-steel ring.

C. Refrigerant Piping:

1. Conform to [ASME B31.5] [ASTM F708] [MSS SP-58].

2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: [Malleable iron] [Carbon steel,] adjustable swivel, split ring.

3. Hangers for Pipe Sizes 2 Inches and Larger: Carbon steel, adjustable, clevis.

4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

5. Wall Support for Pipe Sizes 3 Inches and Smaller: Cast iron hook.

6. Wall Support for Pipe Sizes 4 Inches and Larger: Welded steel bracket and wrought steel clamp.

7. Vertical Support: Steel riser clamp.

8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

9. Copper Pipe Support: Copper-plated carbon-steel ring.

D. Accessories:

1. Hanger Rods: Mild steel [threaded both ends] [, threaded on one end] [, or] [continuously threaded].

2.4 INSERTS

A. Description:

1. Malleable iron case with [galvanized] steel shell and expander plug for threaded connection.

2. Lateral adjustment, top slot for reinforcing rods, and lugs for attaching to forms.

3. Size: To suit threaded hanger rods.

2.5 FLASHING

A. Metal Flashing:

1. Material: Galvanized steel.

2. Thickness: 26 gage.

B. Metal Counterflashing:

1. Material: Galvanized steel.

2. Thickness: 22 gage.

C. Flexible Flashing:

1. Material:

a. Sheet butyl.

b. Compatible with roofing.

2. Thickness: 47 mils.

D. Caps:

1. Material: Steel.

2. Minimum Thickness:

a. 22 gage.

b. 16 gage at fire-resistive elements.

2.6 EQUIPMENT CURBS

A. Manufacturers:

1. Pate.

2. Substitutions: Not permitted.

B. Description:

1. Shell and Base: Welded 18-gage galvanized steel.

2. Cant: Mitered; 3 inches.

3. [Variable Step: To match root insulation.]

4. Insulation Thickness: 1-1/2 inches.

5. Wood Nailer: Factory installed.

2.7 SLEEVES

A. Pipes through Non-fire-rated Floors:

1. Material: Galvanized steel.

2. Thickness: 18 gage.

B. Pipes through Non-fire-rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18-gage galvanized steel.

C. Round Ductwork: Galvanized steel.

D. Rectangular Ductwork: Galvanized steel or wood.

E. Sealant:

1. As specified in Section 07 9000 - Joint Protection.

2. Material: Acrylic.

2.8 MECHANICAL SLEEVE SEALS

A. Manufacturers:

1. Pipe Seal.

2. Substitutions: Not permitted.

3. Furnish materials according to U.S. standards.

B. Description:

1. Type: Modular mechanical.

2. Configuration: Interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve.

3. Connection: Bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and insulation.

2.9 FORMED STEEL CHANNEL

A. Manufacturers:

1. U.S. Steel.

2. Substitutions: Not permitted.

3. Furnish materials according to U.S. standards.

B. Description:

1. Material: Galvanized 12-gage steel.

2. Thickness: 12 gage.

3. Hole Spacing: 1-1/2 inches o.c.

2.10 FIRESTOPPING

A. Firestopping Materials: As specified in Section 07 8400 - Firestopping.

B. Manufacturers:

1. Hilti.

2. Substitutions: Not permitted.

3. Furnish materials according to U.S. standards.

C. Description:

1. Various types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements.

2. Provide only one type for each similar application.

3. Silicone Elastomeric Firestopping: [Single] [Multiple]-component silicone elastomeric compound and compatible silicone sealant.

4. Foam Firestopping Compounds: [Single] [Multiple]-component foam compound.

5. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.

6. Fiber Stuffing and Sealant Firestopping: Composite of [mineral] [ceramic]-fiber stuffing insulation with silicone elastomer for smoke stopping.

7. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless-steel jacket, joined with collars, and penetration sealed with flanged stops.

8. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.

9. Firestop Pillows: Formed mineral-fiber pillows.

D. Color: As selected from manufacturer's full range of colors.

2.11 FIRESTOPPING ACCESSORIES

A. Installation Accessories: As specified in Section 07 8400 - Firestopping.

B. Primer: Type as recommended by firestopping manufacturer for specific substrate surfaces and as suitable for required fire ratings.

C. Permanent Dam Material:

1. Mineral fiberboard.

2. Mineral fiber matting.

3. Sheet metal.

4. Plywood or particle board.

5. Alumina silicate board.

D. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

E. General:

1. Furnish UL-listed products [or products tested by independent testing laboratory].

2. Select products with rating not less than rating of wall or floor being penetrated.

F. Nonrated Surfaces:

1. Covering for Openings in Occupied Areas Where Piping is Exposed: Stamped-steel, chrome-plated, hinged, split-ring escutcheons, or floor or ceiling plates.

2. Exterior Wall Openings below Grade: Furnish mechanical sealing device to continuously fill annular space between piping and cored opening or waterstop-type wall sleeve.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that openings are ready to receive sleeves.

C. Verify that openings are ready to receive firestopping.

3.2 PREPARATION

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that may affect bond of firestopping material.

C. Remove incompatible materials that may affect bond.

D. Install backing damming materials to arrest liquid material leakage.

E. Obtain permission from Architect/Engineer before using powder-actuated anchors.

F. Do not drill or cut structural members.

G. Obtain permission from Architect/Engineer before drilling or cutting structural members.

3.3 INSTALLATION

A. Inserts:

1. Install inserts for placement in concrete forms.

2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.

4. If concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. If inserts are omitted, drill through concrete slab from below and provide through bolt with recessed square steel plate and nut above flush with top of recessed into and grouted flush with slab.

B. Pipe Hangers and Supports:

1. Comply with ASME [B31.1] [B31.5] [B31.9].

2. Support horizontal piping as scheduled on Drawings.

3. Minimum Hanger Spacing: 1/2 inch between finished covering and adjacent Work.

4. Place hangers within 12 inches of each horizontal elbow.

5. Minimum Vertical Hanger Adjustment: 1-1/2 inches.

6. Support vertical piping at every [other] floor.

7. If piping is installed in parallel and at same elevation, provide multiple-pipe or trapeze hangers.

8. Support riser piping independently of connected horizontal piping.

9. Provide [copper-plated hangers and supports for copper piping] [sheet-lead packing between hanger or support and piping].

10. Design hangers for pipe movement without disengagement of supported pipe.

11. Painting and Coating:

a. Prime coat exposed steel hangers and supports as specified in Section 09 9000 - Painting and Coating.

b. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

12. Insulation:

a. Provide clearance in hangers and from structure and other equipment for installation of insulation.

b. As specified in Section 22 0700 - Plumbing Insulation.

C. Equipment Bases and Supports:

1. Provide housekeeping pads of concrete as specified in Section 03 3000 - Cast-in-Place Concrete.

2. Minimum Size: 3-1/2 inches thick and extending 6 inches beyond supported equipment.

3. Use templates furnished with equipment to install equipment anchor bolts and accessories.

4. Supports:

   a. Material: Steel members Formed steel channel Steel pipe and fittings.

   b. Brace and fasten with flanges bolted to structure.

5. Provide rigid anchors for pipes after vibration isolation components are installed as specified in 210548 - Vibration and Seismic Controls for Fire-Suppression Piping and Equipment.

D. Flashing:

1. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weatherproofed or waterproofed walls, floors, and roofs.

2. For sound control, provide acoustical-lead flashing around ducts and pipes penetrating equipment rooms.

3. Curbs:

   a. Provide curbs for roof installations with minimum height of 14 inches above roofing surface.

   b. Flash and counterflash with sheet metal and seal watertight.

   c. Attach counterflashing to equipment and lap base flashing on roof curbs.

   d. Flatten and solder joints.

4. Storm Collars:

   a. Adjust storm collars tight to pipe with bolts and calk around top edge.

   b. Install storm collars above roof jacks.

   c. Screw vertical flange section to face of curb.

E. Sleeves:

1. Exterior Watertight Entries: Seal with mechanical sleeve seals.

2. Set sleeves in position in forms and provide reinforcing around sleeves.

3. Sizing:

   a. Size sleeves large enough to allow for movement due to expansion and contraction.

b. Provide for continuous insulation wrapping.

4. Extend sleeves through floors [1 inch] [<_____> inches] above finished floor level, and calk sleeves.

5. Spaces:

a. If piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent Work with [stuffing] [firestopping] insulation and calk [airtight].

b. Provide close-fitting metal collar or escutcheon covers at both sides of penetration.

c. Install [chrome-plated steel] [plastic] [stainless-steel] escutcheons at finished surfaces.

F. Firestopping:

1. Firestopping Materials: As specified in Section 07 8400 - Firestopping.

2. Install material at fire-rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, and other items requiring firestopping.

3. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

4. Apply firestopping material [to uniform density and texture and] in sufficient thickness to achieve required fire and smoke rating.

5. Placement: Compress fibered material to maximum 40 percent of its uncompressed size.

6. Placement:

a. Place foamed material in layers to ensure homogenous density, filling cavities and spaces.

b. Place sealant to completely seal junctions with adjacent dissimilar materials.

7. Placement: Place intumescent coating in sufficient coats to achieve required rating.

8. Dam Material: Remove after firestopping material has cured.

9. Fire-Rated Surfaces:

a. Seal opening at [floor,] [wall,] [partition,] [ceiling,] [and] [roof].

b. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.

c. Size sleeve allowing minimum of 1 inch void between sleeve and building element.

d. Pack void with backing material.

e. Seal ends of sleeve with UL-listed fire-resistive silicone compound to meet fire rating of structure being penetrated.

10. If cable tray, bus, cable bus, conduit, wireway, and trough penetrate fire-rated surface, install firestopping product according to manufacturer instructions.

11. Nonrated Surfaces:

    a. Seal opening through non-fire-rated wall, partition, floor, ceiling, and roof opening.

    b. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.

    c. Size sleeve allowing minimum of 1 inch void between sleeve and building element.

    d. Install type of firestopping material as recommended by manufacturer.

12. Occupied Spaces:

    a. Install [escutcheons] [, floor plates] [, or] [ceiling plates] where conduit penetrates non-fire-rated surfaces in occupied spaces.

    b. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.

13. Exterior Wall Openings below Grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place according to manufacturer instructions.

14. Interior Partitions:

    a. Seal pipe penetrations at clean rooms, laboratories, computer rooms, telecommunication rooms, and data rooms.

    b. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.4 FIELD QUALITY CONTROL

A. Section 01 4000 - Quality Requirements: Requirements for inspecting and testing.

B. Section 01 7000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.5 CLEANING

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean adjacent surfaces of firestopping materials.

3.6 PROTECTION

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect adjacent surfaces from damage by material installation.

3.7 ATTACHMENTS

A. Pipe Hanger Spacing:

1. Pipe Material: Copper tube.

a. Size: 1-1/4 inches and smaller.

b. Maximum Hanger Spacing: 6 feet.

c. Hanger Rod Diameter: 1/2 inch.

2. Pipe Material: Copper tube.

a. Size: 1-1/2 inches and larger.

b. Maximum Hanger Spacing: 10 feet.

c. Hanger Rod Diameter: 1/2 inch.

3. Pipe Material: Steel.

a. Size: 3 inches and smaller.

b. Maximum Hanger Spacing: 12 feet.

c. Hanger Rod Diameter: 1/2 inch.

4. Pipe Material: Steel.

a. Size: 4 inches and larger.

b. Maximum Hanger Spacing: 12 feet.

c. Hanger Rod Diameter: 5/8 inch.

END OF SECTION

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nameplates.

2. Tags.

3. Stencils.

4. Pipe markers.

5. Ceiling tacks.

6. Labels.

7. Lockout devices.

B. Related Sections:

1. Section 09 9000 - Painting and Coating: Execution requirements for painting specified by this section.

1.2 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit manufacturers catalog literature for each product required.

C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Samples: Submit two tags, labels, and pipe markers size used on project.

E. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 7000 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.5 QUALITY ASSURANCE

A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.

B. Installer: Company specializing in performing Work of this section with minimum three years [documented] experience [approved by manufacturer].

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 3000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 EXTRA MATERIALS

A. Section 01 7000 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish two containers of spray-on adhesive.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Nameplates

1. Manufacturers:

a. Seton.

b. Substitutions: Section 01 6000 - Product Requirements.

B. Furnish materials in accordance with State of California standards.

C. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.2 TAGS

A. Plastic Tags

1. Manufacturers:

a. Seton.

b. Substitutions: See Section 01 6000.

c. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches diameter, square.

B. Metal Tags

1. Manufacturers:

a. Seton.

b. Substitutions: See Section 01 6000.

c. Brass, Aluminum, Stainless Steel with stamped letters; tag size minimum 1-1/2 inches diameter, square with finished edges.

C. Information Tags

1. Manufacturers:

a. Seton.

b. Substitutions: Section 01 6000 - Product Requirements.

c. Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.

D. Tag Chart: Typewritten letter size list of applied tags and location in anodized aluminum frame plastic laminated.

2.3 STENCILS

A. Stencils

1. Manufacturers:

a. Seton.

b. Substitutions: Section 01 6000 - Product Requirements.

B. Furnish materials in accordance with State of California standards.

C. Stencils: With clean cut symbols and letters of following size:

1. Up to 2 inches Outside Diameter of Insulation or Pipe: 1/2 inch high letters.

2. 2-1/2 to 6 inches Outside Diameter of Insulation or Pipe: 1-inch high letters.

3. Over 6 inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.

4. Ductwork and Equipment: 1-3/4 inches high letters.

D. Stencil Paint: As specified in Section 09 9000, semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

2.4 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Plastic Pipe Markers

1. Manufacturers:

a. Seton.

b. Substitutions: Section 01 6000 - Product Requirements.

2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers

1. Manufacturers:

a. Seton.

b. Substitutions: Section 01 6000 - Product Requirements.

2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.5 CEILING TACKS

A. Ceiling Tacks

1. Manufacturers:

a. Seton.

b. Substitutions: Section 01 6000 - Product Requirements.

B. Furnish materials in accordance with State of California standards.

C. Description: Steel with 3/4 inch diameter color-coded head.

D. Color code as follows:

1. HVAC equipment: Yellow.

2. Fire dampers/smoke dampers: Red.

3. Plumbing valves: Green.

4. Heating/cooling valves: Blue.

2.6 LABELS

A. Labels:

1. Manufacturers:

a. Seton.

b. Substitutions: Section 01 6000 - Product Requirements.

B. Furnish materials in accordance with State of California standards.

C. Description: Aluminum, size 1.9 x 0.75 inches, adhesive backed with printed identification [and bar code].

2.7 UNDERGROUND WARNING TAPE

A. Underground Warning Tape

1. Manufacturers:

a. Chilled Water.

b. Natural Gas.

c. Substitutions: Section 01 6000 - Product Requirements.

B. Furnish materials in accordance with State of California standards.

C. Description: Polyethylene tape with metallic core for detection and location of piping with metal detector resistant to acids, alkalis and other soil components.

1. Size: 0.004 inch6 inches

2. Printed text as selected by Architect/Engineer in [black] [contrasting] color and repeated at maximum 40 inchesintervals.

2.8 LOCKOUT DEVICES

A. Lockout Hasps

1. Manufacturers:

a. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

b. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

2. [Anodized aluminum] [Reinforced nylon] hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

B. Valve Lockout Devices

1. Manufacturers:

a. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

b. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

2. [Nylon] [Steel] [Plastic] device preventing access to valve operator, accepting lock shackle.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 9000 for stencil painting.

3.2 INSTALLATION

A. Apply stencil painting in accordance with Section 09 9000.

B. Install identifying devices after completion of coverings and painting.

C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

D. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

E. Install tags using corrosion resistant chain. Number tags consecutively by location.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Identify in-line pumps and other small devices with tags.

H. Identify control panels and major control components outside panels with plastic nameplates.

I. Identify valves in main and branch piping with tags.

J. Identify air terminal units and radiator valves with numbered tags.

K. Tag automatic controls, instruments, and relays. Key to control schematic.

L. Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

M. For exposed natural gas lines other than steel pipe, attach yellow pipe labels with "GAS" in black lettering, at maximum 5 foot spacing.

N. Identify ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

O. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

3.3 SCHEDULES

A. Identification:

1. Chilled Water

a. Identification Type:

b. Background Size:

c. Background Color:

d. Lettering Size:

e. Lettering Color:

2. Hot water Heating.

a. Identification Type:

b. Background Color:

c. Lettering Size:

d. Lettering Color:

3. Ductwork.

a. Identification Type:

b. Lettering Color:

c. Natural Gas

1) Identification Type:

2) Background Size:

d. Background Color:

e. Lettering Size:

f. Lettering Color:

B. Valve Tags:

1. SETON.

a. Tag Material:

b. Tag Size:

c. Tag Shape:

d. Tag Color:

2. Chilled Water.

a. Tag Material:

b. Tag Shape:

END OF SECTION

SECTION 23 0593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Testing adjusting, and balancing of air systems.

2. Testing adjusting, and balancing of hydronic refrigerating systems.

3. Measurement of final operating condition of HVAC systems.

4. Sound measurement of equipment operating conditions.

5. Vibration measurement of equipment operating conditions.

B. Related Sections:

1. Section 23 0548 - Vibration.

2. Section 23 0923 - Direct-Digital Control System for HVAC: Requirements for coordination between DDC system and testing, adjusting, and balancing work.

3. Section 23 0993 - Sequence of Operations for HVAC Controls: Sequences of operation for HVAC equipment.

1.2 REFERENCES

A. Associated Air Balance Council:

1. AABC MN-1 - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.

1.3 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Submittal procedures.

B. Prior to commencing Work, submit proof of latest calibration date of each instrument.

C. Test Reports: Indicate data on AABC MN-1 National Standards for Total System Balance forms.

D. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

E. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty.

F. Submit draft copies of report for review prior to final acceptance of Project.

G. Furnish reports in soft cover, letter size, 3-ring binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 7000 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of flow measuring stations balancing valves and rough setting.

C. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of California standard.

B. Perform Work in accordance with AABC MN-1 National Standards for Field Measurement and Instrumentation, Total System Balance.

C. Maintain one copy of each document on site.

D. Prior to commencing Work, calibrate each instrument to be used. [Upon completing Work, recalibrate each instrument to assure reliability.]

1.6 QUALIFICATIONS

A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this section with minimum three years documented experience certified by AABC.

B. Perform Work under supervision of AABC Certified Test and Balance Engineer registered professional engineer experienced in performance of this Work and licensed in State of California.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 3000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 SEQUENCING

A. Section 01 1000 - Summary: Work sequence.

B. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.9 SCHEDULING

A. Section 01 3000 - Administrative Requirements: Coordination and project conditions.

B. Schedule and provide assistance in final adjustment and test of life safety system with Fire Authority.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 3000 - Administrative Requirements: Coordination and project conditions.

B. Verify systems are complete and operable before commencing work. Verify the following:

1. Systems are started and operating in safe and normal condition.

2. HVAC control systems are installed complete and operable.

3. Proper thermal overload protection is in place for electrical equipment.

4. Final filters are clean and in place. If required, install temporary media in addition to final filters.

5. Duct systems are clean of debris.

6. Fans are rotating correctly.

7. Fire and volume dampers are in place and open.

8. Air coil fins are cleaned and combed.

9. Access doors are closed and duct end caps are in place.

10. Air outlets are installed and connected.

11. Duct system leakage is minimized less than 1%.

12. Hydronic systems are flushed, filled, and vented.

13. Pumps are rotating correctly.

14. Proper strainer baskets are clean and in place or in normal position.

15. Service and balancing valves are open.

3.2 PREPARATION

A. Furnish instruments required for testing, adjusting, and balancing operations.

B. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. Section 01 7000 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Verify recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.

E. Report defects and deficiencies noted during performance of services, preventing system balance.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner.

H. Check and adjust systems approximately six months after final acceptance and submit report.

3.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to obtain required or design supply, return, and exhaust air quantities [at site altitude].

B. Make air flow rate measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain:

1. Space temperatures within 2 degrees F.

2. Minimal objectionable drafts.

E. Use volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.

F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. At modulating damper locations, take measurements and balance at extreme conditions. Balance variable volume systems at maximum airflow rate, full cooling, and at minimum airflow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to obtain required relationship between each to maintain approximately 0.05 inches differential static pressure between spaces near building entries.

M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

N. For variable air volume system powered units set volume controller to airflow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable-air-volume temperature control.

O. On fan powered VAV boxes, adjust airflow switches for proper operation.

3.6 WATER SYSTEM PROCEDURE

A. Adjust water systems, after air balancing, to obtain design quantities.

B. Use calibrated [Venturi tubes, orifices, or other metered] fittings and pressure gauges to determine flow rates for system balance. Where flow-metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in system.

C. Confirm air bleeds indicate system is full of water.

D. Adjust systems to obtain specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

E. Perform system balance with automatic control valves fully open triple duty valves fully open, and pump VFDs at 100 percent speed.

F. Confirm pump rotation and differential pressure at full flow.

G. Perform adjustment of water distribution systems by the following measures:

1. Reduce total system flow rate first by reducing speed of VFD.

2. Use balancing cocks, valves, and fittings.

H. Do not use service or shut-off valves for balancing unless designed for balancing and shut-off functions. Where available pump capacity is less than total flow requirements or individual system parts, simulate full flow in one part by temporary restriction of flow to other parts.

3.7 SCHEDULES

A. [Partial list of] [Complete list of]Equipment Requiring Testing, Adjusting, and Balancing:

1. HVAC Pumps.

2. Packaged Steel Water Tube Boilers.

3. Air Cooled Refrigerant Condensers.

4. Computer Room Air Conditioning Units.

5. Air Coils.

6. Evaporative Humidifier.

7. Terminal Heat Transfer Units.

8. Air Handling Units.

9. Fans.

10. Air Filters.

11. Air Terminal Units.

12. Air Inlets and Outlets.

B. Report Forms

1. Title Page:

a. Name of Testing, Adjusting, and Balancing Agency

b. Address of Testing, Adjusting, and Balancing Agency

c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency

d. Project name

e. Project location

f. Project Architect

g. Project Engineer

h. Project Contractor

i. Project altitude

j. Report date

2. Summary Comments:

a. Design versus final performance

b. Notable characteristics of system

c. Description of systems operation sequence

d. Summary of outdoor and exhaust flows to indicate building pressurization

e. Nomenclature used throughout report

f. Test conditions

3. Instrument List:

a. Instrument

b. Manufacturer

c. Model number

d. Serial number

e. Range

f. Calibration date

4. Electric Motors:

a. Manufacturer

b. Model/Frame

c. HP/BHP and kW

d. Phase, voltage, amperage; nameplate, actual, no load

e. RPM

f. Service factor

g. Starter size, rating, heater elements

h. Sheave Make/Size/Bore

5. Pump Data:

a. Identification/number

b. Manufacturer

c. Size/model

d. Impeller

e. Service

f. Design flow rate, pressure drop, BHP and kW

g. Actual flow rate, pressure drop, BHP and kW

h. Discharge pressure

i. Suction pressure

j. Total operating head pressure

k. Shut off, discharge and suction pressures

l. Shut off, total head pressure

6. Combustion Test:

a. Manufacturer

b. Model number

c. Serial number

d. Firing rate

e. Overfire draft

f. Gas meter timing dial size

g. Gas meter time per revolution

h. Gas pressure at meter outlet

i. Gas flow rate

j. Heat input

k. Burner manifold gas pressure

l. Percent carbon monoxide (CO)

m. Percent carbon dioxide (CO2)

n. Percent oxygen (O2)

o. Percent excess air

p. Flue gas temperature at outlet

q. Ambient temperature

r. Net stack temperature

s. Percent stack loss

t. Percent combustion efficiency

u. Heat output

7. Air Cooled Condenser:

a. Identification/number

b. Location

c. Manufacturer

d. Model number

e. Serial number

f. Entering DB air temperature, design and actual

g. Leaving DB air temperature, design and actual

h. Number of compressors

8. Cooling Coil Data:

a. Identification/number

b. Location

c. Service

d. Manufacturer

e. Air flow, design and actual

f. Entering air DB temperature, design and actual

g. Entering air WB temperature, design and actual

h. Leaving air DB temperature, design and actual

i. Leaving air WB temperature, design and actual

j. Water flow, design and actual

k. Water pressure drop, design and actual

l. Entering water temperature, design and actual

m. Leaving water temperature, design and actual

n. Saturated suction temperature, design and actual

o. Air pressure drop, design and actual

9. Heating Coil Data:

a. Identification/number

b. Location

c. Service

d. Manufacturer

e. Air flow, design and actual

f. Water flow, design and actual

g. Water pressure drop, design and actual

h. Entering water temperature, design and actual

i. Leaving water temperature, design and actual

j. Entering air temperature, design and actual

k. Leaving air temperature, design and actual

l. Air pressure drop, design and actual

10. Air Moving Equipment:

a. Location

b. Manufacturer

c. Model number

d. Serial number

e. Arrangement/Class/Discharge

f. Air flow, specified and actual

g. Return air flow, specified and actual

h. Outside air flow, specified and actual

i. Total static pressure (total external), specified and actual

j. Inlet pressure

k. Discharge pressure

l. Sheave Make/Size/Bore

m. Number of Belts/Make/Size

n. Fan RPM

11. Return Air/Outside Air Data:

    a. Identification/location

    b. Design air flow

    c. Actual air flow

    d. Design return air flow

    e. Actual return air flow

    f. Design outside air flow

    g. Actual outside air flow

    h. Return air temperature

    i. Outside air temperature

    j. Required mixed air temperature

    k. Actual mixed air temperature

    l. Design outside/return air ratio

    m. Actual outside/return air ratio

12. Exhaust Fan Data:

    a. Location

    b. Manufacturer

    c. Model number

    d. Serial number

    e. Air flow, specified and actual

    f. Total static pressure (total external), specified and actual

    g. Inlet pressure

    h. Discharge pressure

    i. Sheave Make/Size/Bore

    j. Number of Belts/Make/Size

    k. Fan RPM

13. Duct Traverse:

a. System zone/branch

b. Duct size

c. Area

d. Design velocity

e. Design air flow

f. Test velocity

g. Test air flow

h. Duct static pressure

i. Air temperature

j. Air correction factor

14. Duct Leak Test:

a. Description of ductwork under test

b. Duct design operating pressure

c. Duct design test static pressure

d. Duct capacity, air flow

e. Maximum allowable leakage duct capacity times leak factor

f. Test apparatus

1) Blower

2) Orifice, tube size

3) Orifice size

4) Calibrated

g. Test static pressure

h. Test orifice differential pressure

i. Leakage less <1% accutrol.

15. Air Monitoring Station Data:

a. Identification/location

b. System

c. Size

d. Area

e. Design velocity

f. Design air flow

g. Test velocity

h. Test air flow

16. Flow Measuring Station:

a. Identification/number

b. Location

c. Size

d. Manufacturer

e. Model number

f. Serial number

g. Design Flow rate

h. Design pressure drop

i. Actual/final pressure drop

j. Actual/final flow rate

k. Station calibrated setting

17. Terminal Unit Data:

a. Manufacturer

b. Type, constant, variable, single, dual duct

c. Identification/number

d. Location

e. Model number

f. Size

g. Minimum static pressure

h. Minimum design air flow

i. Maximum design air flow

j. Maximum actual air flow

k. Inlet static pressure

18. Air Distribution Test Sheet:

a. Air terminal number

b. Room number/location

c. Terminal type

d. Terminal size

e. Area factor

f. Design velocity

g. Design air flow

h. Test (final) velocity

i. Test (final) air flow

j. Percent of design air flow

19. Sound Level Report:

a. Location

b. Octave bands - equipment off

c. Octave bands - equipment on

d. RC level - equipment on

20. Vibration Test:

a. Location of points:

1) Fan bearing, drive end

2) Fan bearing, opposite end

3) Motor bearing, center (when applicable)

4) Motor bearing, drive end

5) Motor bearing, opposite end

6) Casing (bottom or top)

7) Casing (side)

8) Duct after flexible connection (discharge)

9) Duct after flexible connection (suction)

b. Test readings:

1) Horizontal, velocity and displacement

2) Vertical, velocity and displacement

3) Axial, velocity and displacement

c. Normally acceptable readings, velocity and acceleration

d. Unusual conditions at time of test

e. Vibration source (when non-complying)

21. Boiler: Test boiler and all components and flow switch and flow meter (Badger M-2000).

END OF SECTION

SECTION 23 0700
HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. HVAC piping insulation, jackets and accessories.

2. HVAC equipment insulation, jackets and accessories.

3. HVAC ductwork insulation, jackets, and accessories.

B. Related Sections:

1. Section 07 8400 - Firestopping: Product requirements for firestopping for placement by this section.

2. Section 09 9000 - Painting and Coating: Execution requirements for painting insulation jackets and covering specified by this section.

1.2 REFERENCES

A. ASTM International:

1. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

2. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

4. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

5. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

6. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

7. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.

8. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

9. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

10. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

11. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

12. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

13. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

14. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.

15. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

16. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

17. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

18. ASTM C1071 - Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).

19. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

20. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.

21. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

22. ASTM D4637 - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.

23. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

24. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

B. Sheet Metal and Air Conditioning Contractors?:

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

C. Underwriters Laboratories Inc.:

1. UL 1978 - Standard for Safety for Grease Ducts.

1.3 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

C. Samples: Submit two samples of representative size illustrating each insulation type.

D. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

D. Duct insulation, Coverings, and Linings: Maximum 25/50 flame spread/smoke developed index, when tested in accordance with ASTM E84, using specimen procedures and mounting procedures of ASTM E 2231.

E. Perform Work in accordance with State of California standard.

F. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

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

B. Applicator: Company specializing in performing Work of this section with minimum three years experience approved by manufacturer.

1.6 PRE-INSTALLATION MEETINGS

A. Section 01 3000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01 6000 - Product Requirements: Environmental conditions affecting products on site.

B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

C. Maintain temperature before, during, and after installation for minimum period of 24 hours.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Section 01 7000 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for man made fiber.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Glass Fiber and Mineral Fiber Insulation

1. Manufacturers:

a. Certainteed.

b. Johns Manville.

c. Substitutions: Not Permitted.

B. Closed Cell Elastomeric Insulation

1. Manufacturers:

a. EPDM.

b. Substitutions: Not Permitted.

C. Polyisocyanurate Foam Insulation

1. Manufacturers:

a. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

b. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

D. Extruded Polystyrene Insulation

1. Manufacturers:

a. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

b. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

E. Furnish materials in accordance with [[State] [Municipality] of <_____> [Highways] [Public Work's] standards.]

2.2 PIPE INSULATION

A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation. [Conform to ASTM C795 for application on Austenitic stainless steel.]

1. Thermal Conductivity: 0.23 at 75 degrees F.

2. Operating Temperature Range: 0 to 850 degrees F.

3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.

4. Jacket Temperature Limit: minus 20 to 150 degrees F.

B. TYPE P-2: ASTM C547, molded glass fiber pipe insulation. [Conform to ASTM C795 for application on Austenitic stainless steel.]

1. Thermal Conductivity: 0.23 at 75 degrees F.

2. Operating Temperature Range: 0 to 850 degrees F.

C. TYPE P-3: ASTM C612; semi-rigid, fibrous glass board noncombustible, end grain adhered to jacket. [Conform to ASTM C795 for application on Austenitic stainless steel.]

1. Thermal Conductivity: 0.27 at 75 degrees F.

2. Operating Temperature Range: 0 to 650 degrees F.

3. Vapor Barrier Jacket: ASTM C1136, Type II, factory applied reinforced foil kraft with self-sealing adhesive joints.

4. Jacket Temperature Limit: minus 20 to 150 degrees F.

D. TYPE P-4: ASTM C612; semi-rigid, fibrous glass board noncombustible. [Conform to ASTM C795 for application on Austenitic stainless steel.]

1. Thermal Conductivity: 0.27 at 75 degrees F.

2. Operating Temperature Range: 0 to 650 degrees F.

E. TYPE P-5: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.

1. Thermal Conductivity: 0.27 at 75 degrees F.

2. Operating Temperature Range: Range: Minus 70 to 180 degrees F.

F. TYPE P-6: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.

1. Thermal Conductivity: 0.30 at 75 degrees F.

2. Maximum Service Temperature: 300 degrees F.

3. Operating Temperature Range: Range: Minus 58 to 300 degrees F.

G. TYPE P-7: ASTM C534, Type I, flexible, nonhalogen, closed cell elastomeric insulation, tubular.

1. Thermal Conductivity: 0.27 at 75 degrees F.

2. Maximum Service Temperature: 250 degrees F.

3. Operating Temperature Range: Range: Minus 58 to 250 degrees F.

H. TYPE P-8: ASTM C547, Type I or II, mineral fiber preformed pipe insulation, noncombustible.

1. Thermal Conductivity: 0.23 at 75 degrees F.

2. Maximum Service Temperature: 1200 degrees F.

3. Canvas Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric treated with fire retardant lagging adhesive.

I. TYPE P-9: ASTM C591, Type IV, polyisocyanurate foam insulation, formed into shapes for use as pipe insulation.

1. Density: [2.0] [4.0] [6.0] <_____> pounds per cubic foot.

2. Thermal Conductivity: 180 day aged value of [0.19] [0.19] [0.20] at 75 degrees F.

3. Operating Temperature Range: Range: Minus 297 to 300 degrees F.

4. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied film of [4] [6] mils thickness and water vapor permeance of [0.02] [0.01] perms.

J. TYPE P-10: ASTM C578, Type XIII, extruded polystyrene insulation, formed into shapes for use as pipe insulation.

1. Thermal Conductivity: 180 day aged value of 0.259 at 75 degrees F.

2. Operating Temperature Range: Range: Minus 297 to 165 degrees F.

3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied film of [4] [6] mils thickness and water vapor permeance of [0.02] [0.01] perms.

K. TYPE P-11: ASTM C533; Type I, hydrous calcium silicate pipe insulation, rigid molded white; asbestos free.

1. Thermal Conductivity: 0.45 at 200 degrees F.

2. Operating Temperature Range: 140 to 1200 degrees F.

2.3 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:

1. [ASTM C921,] white Kraft paper with glass fiber yarn, bonded to aluminized film.

2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

B. PVC Plastic Pipe Jacket:

1. Product Description: [ASTM D1785,] One piece molded type fitting covers and sheet material, off-white color.

2. Thickness: [10] [15] [30] mil.

3. Connections: [Brush on welding adhesive] [Tacks] [Pressure sensitive color matching vinyl tape].

C. ABS Plastic Pipe Jacket:

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.

2. Minimum service temperature: [-40] <_____>degrees F.

3. Maximum service temperature of [180] <_____> degrees F.

4. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

5. Thickness: [30] <_____> mil.

6. Connections: Brush on welding adhesive.

D. Aluminum Pipe Jacket:

1. [ASTM B209].

2. Thickness: [0.016] [0.020] [0.025] [0.032] [0.040] <_____> inch thick sheet.

3. Finish: [Smooth] [Embossed] <_____>.

4. Joining: Longitudinal slip joints and 2 inch laps.

5. Fittings: [0.016] <_____> inch thick die shaped fitting covers with factory attached protective liner.

6. Metal Jacket Bands: [3/8 inch] [1/2 inch] wide; [[0.015] <_____> inch thick aluminum.] [[0.010] [0.020] <_____> inch thick stainless steel.]

E. Stainless Steel Pipe Jacket:

1. ASTM ASTM A240/A240M OR ASTM 666 Type [302] [304] [316] stainless steel.

2. Thickness: [0.010] [0.016] [0.018] <_____>inch thick.

3. Finish: [Smooth.] [Corrugated.]

4. Metal Jacket Bands: [3/8 inch] [1/2 inch] wide; [0.010] [0.020] <_____> inch thick stainless steel.

F. Field Applied Glass Fiber Fabric Jacket System:

1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2. Glass Fiber Fabric:

a. Cloth: Untreated; 9 oz/sq yd weight.

b. Blanket: 1.0 lb/cu ft density.

c. Weave: [5 x 5] [10 x 10] [10 x 20].

3. Indoor Vapor Retarder Finish:

a. Cloth: Untreated; 9 oz/sq yd weight.

b. Vinyl emulsion type acrylic, compatible with insulation, [black] [white] <_____> color.

2.4 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.

D. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.

E. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with [aluminum] [stainless steel jacket] single piece construction with self-adhesive closure. Thickness to match pipe insulation.

F. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

G. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

H. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.

I. Adhesives: Compatible with insulation.

2.5 EQUIPMENT INSULATION

A. TYPE E-1: ASTM C553; glass fiber, flexible or semi-rigid, noncombustible.

1. Thermal Conductivity: [0.24] [0.023] at 75 degrees F.

2. Operating Temperature Range: 0 to 450 degrees F.

3. Density: [1.5] [1.65] [2.3] pound per cubic foot.

B. TYPE E-2: ASTM C612; glass fiber, rigid board, noncombustible [with factory applied [kraft] [reinforced] aluminum foil jacket].

1. Thermal Conductivity: [0.24] [0.023] at 75 degrees F.

2. Operating Temperature Range: 0 to 450 degrees F.

3. Density: [3.0] [4.2] pound per cubic foot.

4. Jacket Temperature Limit: minus 20 to 150 degrees F.

C. TYPE E-3: ASTM C612; semi-rigid, fibrous glass board noncombustible, end grain adhered to jacket.

1. Thermal Conductivity: 0.27 at 75 degrees F.

2. Operating Temperature Range: 0 to 650 degrees F.

3. Vapor Barrier Jacket: ASTM C1136, Type II, factory applied reinforced foil kraft with self-sealing adhesive joints.

4. Jacket Temperature Limit: minus 20 to 150 degrees F.

D. TYPE E-4: ASTM C612; semi-rigid, fibrous glass board noncombustible.

1. Thermal Conductivity: 0.27 at 75 degrees F.

2. Operating Temperature Range: 0 to 650 degrees F.

E. TYPE E-5: ASTM C612; glass fiber, semi-rigid board, noncombustible.

1. Thermal Conductivity: 0.23 at 75 degrees F.

2. Maximum Operating Temperature: 850 degrees F.

3. Density: 3.0 pound per cubic foot.

F. TYPE E-6: ASTM C553; mineral fiber blanket, Type I.

1. Thermal Conductivity: 0.27 at 75 degrees F.

2. Maximum Operating Temperature: 1000 degrees F.

3. Density: 1.0 pound per cubic foot.

G. TYPE E-7: ASTM C533; Type II, hydrous calcium silicate block insulation, asbestos free.

1. Thermal Conductivity: 0.45 at 200 degrees F.

2. Operating Temperature Range: 140 to 1200 degrees F.

H. TYPE E-8: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.

1. Thermal Conductivity: 0.27 at 75 degrees F.

2. Operating Temperature Range: Range: Minus 70 to 220 degrees F.

I. TYPE E-9: ASTM C612, man made mineral fiber, noncombustible, Classes 1-4.

1. Thermal Conductivity: 0.25 at 100 degrees F.

2. Maximum Service Temperature: 1200 degrees F.

3. Density: [4] [6] [8] [10] [12] pound per cubic foot.

2.6 EQUIPMENT INSULATION JACKETS

A. PVC Plastic Equipment Jacket:

1. Product Description: ASTM D1785, sheet material, off-white color.

2. Minimum Service Temperature: [-40] <_____>degrees F.

3. Maximum Service Temperature: [150] <_____>degrees F.

4. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

5. Thickness: [10] [15] [20] [30] mil.

6. Connections: [Brush on welding adhesive] [Tacks] [Pressure sensitive color matching vinyl tape].

B. Aluminum Equipment Jacket:

1. [ASTM B209]Thickness: [0.016] [0.020] [0.025] [0.032] [0.040] <_____> inch thick sheet.

2. Finish: [Smooth] [Embossed] <_____>.

3. Joining: Longitudinal slip joints and 2 inch laps.

4. Fittings: [0.016] <_____> inch thick die shaped fitting covers with factory attached protective liner.

5. Metal Jacket Bands: 3/8 inch wide; [[0.015] <_____> inch thick aluminum.] [[0.010] <_____> inch thick stainless steel.]

C. Stainless Steel Equipment Jacket:

1. ASTM A240/A240M OR ASTM 666 Type [302] [304] [316] stainless steel.

2. Thickness: [0.010] [0.016] [0.018] <_____>inch thick.

3. Finish: [Smooth.] [Corrugated.]

4. Metal Jacket Bands: 3/8 inch wide; [0.010] <_____>inch thick stainless steel.

D. Canvas Equipment Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric with fire retardant lagging adhesive compatible with insulation.

E. Vapor Retarder Jacket:

1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.

2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

F. Field Applied Glass Fiber Fabric Jacket System:

1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2. Glass Fiber Fabric:

a. Cloth: Untreated; 9 oz/sq yd weight.

b. Blanket: 1.0 lb/cu ft density.

c. Weave: [5 x 5] [10 x 10] [10 x 20].

3. Indoor Vapor Retarder Finish:

a. Cloth: Untreated; 9 oz/sq yd weight.

b. Vinyl emulsion type acrylic, compatible with insulation, [black] [white] <_____> color.

2.7 EQUIPMENT INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

E. Adhesives: Compatible with insulation.

2.8 DUCTWORK INSULATION

A. TYPE D-1: ASTM C1290, Type III, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.

1. Thermal Conductivity: [0.30] [0.27] [0.25] at 75 degrees F.

2. Maximum Operating Temperature: 250 degrees F.

3. Density: [0.75] [1.0] [1.5] pound per cubic foot.

B. TYPE D-2: ASTM C612, Type IA or IB, rigid glass fiber, with factory applied [all service facing] [reinforced aluminum foil facing] [metalized polypropylene scrim kraft facing] meeting ASTM C1136, Type II.

1. Thermal Conductivity: [0.24] [0.23] [0.22] at 75 degrees F.

2. Density: [1.6] [2.25] [3.0] [4.25] [6.0] pound per cubic foot.

C. TYPE D-3: ASTM C612, Type IA or IB, rigid glass fiber, no facing.

1. Thermal Conductivity: [0.24] [0.23] [0.22] at 75 degrees F.

2. Density: [1.6] [2.25] [3.0] [4.25] [6.0] pound per cubic foot.

D. TYPE D-4: ASTM C1071, Type I, flexible, glass fiber duct liner with coated air side.

1. Thermal Conductivity: [0.28] [0.26] [0.25] [0.24] at 75 degrees F.

2. Density: [1.5] [2.0] [2.75] [3.0] pound per cubic foot.

3. Maximum Operating Temperature: 250 degrees F.

4. Maximum Air Velocity: 6,000 feet per minute.

E. TYPE D-5: ASTM C1071, Type II, rigid, glass fiber duct liner with coated air side.

1. Thermal Conductivity: 0.23 at 75 degrees F.

2. Density: 3.0 pound per cubic foot.

3. Maximum Operating Temperature: 250 degrees F.

4. Maximum Air Velocity: 4,000 feet per minute.

F. TYPE D-6: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.

1. Thermal Conductivity: 0.27 at 75 degrees F.

2. Service Temperature Range: Range: Minus 58 to 180 degrees F.

G. TYPE D-7: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet laminated with [white] <_____> thermoplastic rubber membrane.

1. Thermal Conductivity: 0.27 at 75 degrees F.

2. Service Temperature Range: Range: Minus 58 to 180 degrees F.

H. TYPE D-8: Inorganic blanket encapsulated with scrim reinforced foil meeting UL 1978.

1. Thermal Conductivity: 0.42 at 500 degrees F.

2. Weight: 1.4 pound per square foot.

3. Surface Burning Characteristics: Maximum 0/0 flame spread/smoke developed index when tested in accordance with ASTM E84.

2.9 DUCTWORK INSULATION JACKETS

A. Aluminum Duct Jacket:

1. [ASTM B209].

2. Thickness: [0.016] [0.020] [0.025] [0.032] [0.040] <_____> inch thick sheet.

3. Finish: [Smooth] [Embossed] <_____>.

4. Joining: Longitudinal slip joints and 2 inch laps.

5. Fittings: [0.016] <_____> inch thick die shaped fitting covers with factory attached protective liner.

6. Metal Jacket Bands: 3/8 inch wide; [[0.015] <_____> inch thick aluminum.] [[0.010] <_____> inch thick stainless steel.]

B. Vapor Retarder Jacket:

1. [Kraft paper with glass fiber yarn and bonded to aluminized film] [0.0032 inch vinyl].

2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

3. Secure with pressure sensitive tape.

C. Canvas Duct Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric with fire retardant lagging adhesive compatible with insulation.

D. Outdoor Duct Jacket: Asphalt impregnated and coated sheet, [50] [36] lb/square.

E. Membrane Duct Jacket: ASTM D4637; Type I, EPDM; non-reinforced, [0.045] [0.060] inch thick, [48] <_____> inch wide roll; [white] [black] <_____> color [as selected].

2.10 DUCTWORK INSULATION ACCESSORIES

A. Vapor Retarder Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

B. Vapor Retarder Lap Adhesive: Compatible with insulation.

C. Adhesive: Waterproof [, ASTM E162 fire-retardant] type.

D. Liner Fasteners: Galvanized steel, [self-adhesive pad] [impact applied] [welded] with [integral] [press-on] head.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Lagging Adhesive: Fire retardant type with maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

G. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.

H. Adhesives: Compatible with insulation.

I. Membrane Adhesives: As recommended by membrane manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 3000 - Administrative Requirements: Coordination and project conditions.

B. Verify [piping,] [equipment] [and] [ductwork] has been tested before applying insulation materials.

C. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07 8400 for penetrations of assemblies with fire resistance rating greater than one hour.

C. Piping Systems Conveying Fluids Below Ambient Temperature:

1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, [pump bodies,] and expansion joints.

2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.

3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

D. Glass Fiber Board Insulation:

1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.

E. [Polyisocyanurate Foam Insulation] [Extruded Polystyrene Insulation]:

1. Wrap elbows and fitting with vapor retarder tape.

2. Seal butt joints with vapor retarder tape.

F. Hot Piping Systems less than [140] <_____> degrees F:

1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.

G. Hot Piping Systems greater than [140] <_____> degrees F:

1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

3. Insulate flanges and unions at equipment.

H. Inserts and Shields:

1. Piping [1-1/2] <_____> inches Diameter and Smaller: Install [galvanized] steel shield between pipe hanger and insulation.

2. Piping [2] <_____> inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.

a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.

b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.

3. Piping Supported by Roller Type Pipe Hangers: Install [galvanized] steel shield between roller and inserts.

I. Insulation Terminating Points:

1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.

2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.

3. Condensate Piping: Insulate entire piping system and components to prevent condensation.

J. Closed Cell Elastomeric Insulation:

1. Push insulation on to piping.

2. Miter joints at elbows.

3. Seal seams and butt joints with manufacturer?s recommended adhesive.

4. When application requires multiple layers, apply with joints staggered.

5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.

K. High Temperature Pipe Insulation:

1. Install in multiple layers to meet thickness scheduled.

2. Attach each layer with bands. Secure first layer with bands before installing next layer.

3. Stagger joints between layers.

4. Finish with canvas jacket [sized for finish painting].

****** [OR] ******

5. Cover with [aluminum jacket] [stainless steel jacket] with seams located on bottom side of horizontal piping.

L. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces [(less than 10 feet above finished floor)]: Finish with [canvas jacket sized for finish painting] [PVC jacket and fitting covers] [ABS jacket and fitting covers] [aluminum jacket] [stainless steel jacket].

M. Piping Exterior to Building: [Provide vapor retarder jacket.] Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with [aluminum] [stainless steel] jacket with seams located at 3 or 9 o?clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal piping.

N. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

O. Heat Traced Piping Interior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer.

P. Heat Traced Piping Exterior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size insulation large enough to enclose pipe and heat tracer. Cover with [aluminum] [stainless steel] jacket with seams located at 3 or 9 o’clock position on side of horizontal piping with overlap facing down to shed water.

Q. Prepare pipe insulation for finish painting. Refer to Section 09 9000.

3.3 INSTALLATION - EQUIPMENT

A. Factory Insulated Equipment: Do not insulate.

B. Exposed Equipment: Locate insulation and cover seams in least visible locations.

C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

D. Equipment Containing Fluids Below Ambient Temperature:

1. Insulate entire equipment surfaces.

2. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

3. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.

4. Finish insulation at supports, protrusions, and interruptions.

E. Equipment Containing Fluids [140] <_____> degrees F Or Less:

1. Do not insulate flanges and unions, but bevel and seal ends of insulation.

2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.

3. Finish insulation at supports, protrusions, and interruptions.

F. Equipment Containing Fluids Over [140] <_____> degrees F:

1. Insulate flanges and unions with removable sections and jackets.

2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.

3. Finish insulation at supports, protrusions, and interruptions.

G. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with [canvas jacket sized for finish painting] [PVC jacket and fitting covers] [aluminum jacket] [stainless steel jacket].

H. Equipment Located Exterior to Building: Install vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement. Cover with [aluminum] [stainless steel] jacket with seams located on bottom side of horizontal equipment.

I. Cover [glass fiber] [cellular glass] [hydrous calcium silicate] [cellular foam] insulation with [metal mesh and finish with heavy coat of insulating cement] [aluminum jacket] [stainless steel jacket].

J. Nameplates and ASME Stamps: Bevel and seal insulation around; do not cover with insulation.

K. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

L. Prepare equipment insulation for finish painting. Refer to Section 09 9000.

3.4 INSTALLATION - DUCTWORK SYSTEMS

A. Duct dimensions indicated on Drawings are finished inside dimensions.

B. Insulated ductwork conveying air below ambient temperature:

1. Provide insulation with vapor retarder jackets.

2. Finish with tape and vapor retarder jacket.

3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated ductwork conveying air above ambient temperature:

1. Provide with or without standard vapor retarder jacket.

2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Ductwork Exposed in Mechanical Equipment Rooms or Finished Spaces [(below 10 feet above finished floor)]: Finish with [canvas jacket sized for finish painting] [aluminum jacket].

E. External Glass Fiber Duct Insulation:

1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.

2. Secure insulation without vapor retarder with staples, tape, or wires.

3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.

4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.

5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

F. External Elastomeric Duct Insulation:

1. Adhere to clean oil-free surfaces with full coverage of adhesive.

2. Seal seams and butt joints with manufacturer?s recommended adhesive.

3. When application requires multiple layers, apply with joints staggered.

4. Insulate standing metal duct seams with insulation of like material and thickness as adjacent duct surface. Apply adhesive at joints with flat duct surfaces.

5. Lift ductwork off trapeze hangers and insert spacers.

G. Duct [and Plenum] Liner:

1. Adhere insulation with adhesive for [90] [100] percent coverage.

2. Secure insulation with mechanical liner fasteners. Comply with SMACNA Standards for spacing.

3. Seal and smooth joints. Seal and coat transverse joints.

4. Seal liner surface penetrations with adhesive.

5. Cut insulation for tight overlapped corner joints. Support top pieces of liner at edges with side pieces.

H. Kitchen Exhaust Ductwork:

1. Cover duct by wrapping with insulation using [overlap method] [checkerboard overlap method] [butt joint with collar method].

2. Overlap seams of each method by 3 inches.

3. Attach insulation using steel banding or by welded pins and clips.

4. Install insulation without sag on underside of ductwork. Use additional fasteners to prevent sagging.

I. Ducts Exterior to Building:

1. Install insulation according to [external duct insulation] [duct liner] paragraph above.

2. Provide external insulation with vapor retarder jacket. Cover with [outdoor jacket finished as specified in Section <_____>] [with caulked aluminum jacket with seams located on bottom side of horizontal duct section].

3. Finish with [mineral fiber outdoor duct jacket] [aluminum duct jacket] [membrane duct jacket].

4. Calk seams at flanges and joints. Located major longitudinal seams on bottom side of horizontal duct sections.

J. Prepare duct insulation for finish painting. Refer to Section 09 9000.

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Duct materials.

2. Flexible ducts.

3. Single-wall, spiral round ducts.

4. Single-wall, spiral flat oval ducts.

5. Transverse duct connection system.

6. Casings.

7. Ductwork fabrication.

8. Buried underground duct fabrication.

B. Related Requirements:

1. Section 03 3000 - Cast-in-Place Concrete: Requirements for concrete curbs as specified in this Section.

2. Section 09 9000 - Painting and Coating: Requirements for painting or coating as specified in this Section.

3. Section 11 4000 - Foodservice Equipment: Requirements for kitchen range hoods for placement by this Section.

4. Section 23 3300 - Air Duct Accessories: Requirements for duct accessories as specified in this Section.

1.2 REFERENCE STANDARDS

A. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE Handbook - Fundamentals.

B. American Welding Society:

1. AWS D1.1 - Structural Welding Code - Steel.

2. AWS D1.1M - Structural Welding Code - Steel.

3. AWS D1.2 - Structural Welding Code - Aluminum.

4. AWS D1.2M - Structural Welding Code - Aluminum.

5. AWS D9.1 - Sheet Metal Welding Code.

6. AWS D9.1M - Sheet Metal Welding Code.

C. ASTM International:

1. ASTM A36 - Standard Specification for Carbon Structural Steel.

2. ASTM A36M - Standard Specification for Carbon Structural Steel.

3. ASTM A90 - Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

4. ASTM A90M - Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

5. ASTM A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

6. ASTM A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

7. ASTM A568 - Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.

8. ASTM A568M - Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.

9. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

10. ASTM A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

11. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

12. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

13. ASTM A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

14. ASTM A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

15. ASTM A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

16. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

17. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

18. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe.

19. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe (Metric).

20. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

21. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).

22. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. International Code Council:

1. International Energy Conservation Code (IECC).

2. International Mechanical Code (IMC).

E. NFPA:

1. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

3. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

F. Sheet Metal and Air Conditioning Contractors' National Association:

1. SMACNA 016 - HVAC Air Duct Leakage Test Manual.

2. SMACNA 1767 - Kitchen Ventilation Systems and Food Service Equipment Guidelines.

3. SMACNA 1884 - Fibrous Glass Duct Construction Standards.

4. SMACNA 1966 - HVAC Duct Construction Standards - Metal and Flexible.

G. UL:

1. UL 181 - Factory-Made Air Ducts and Air Connectors.

2. UL 181A - Closure Systems for Use With Rigid Air Ducts.

3. UL 1978 - Grease Ducts.

1.3 PREINSTALLATION MEETINGS

A. Section 01 3000 - Administrative Requirements: Requirements for preinstallation meeting.

B. Convene minimum [one week] [<_____> weeks] prior to commencing Work of this Section.

1.4 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information for [duct materials] [, duct liner] [, duct connectors] [, and] <_____>.

C. Shop Drawings:

1. Submit duct fabrication drawings, drawn to scale not smaller than <_____> inch equals 1 foot, on sheets same size as Contract Drawings, indicating following:

a. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other Work.

b. Duct layout that further indicates pressure classifications and sizes in plan view; exhaust duct systems that further indicate classification of materials handled as specified in this Section.

c. Fittings.

d. Reinforcing details and spacing.

e. Seam and joint construction details.

f. Penetrations through fire-rated and other walls.

g. Terminal unit, coil, and humidifier installations.

h. Hangers and supports, including methods for vibration isolation and building and duct attachment.

D. Samples: Submit [two] <_____> typical shop-fabricated [duct fittings] <_____>.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Welder Certificates: Certify welders and welding procedures employed on Work, verifying AWS qualification within previous 12 months.

G. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions for following:

1. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

2. Materials, fabrication, assembly, and spacing of hangers and supports.

3. Sheet metal thicknesses.

4. Joint and seam construction and sealing.

5. Reinforcement details and spacing.

H. Test and Evaluation Reports: Indicate pressure tests performed, including date, section tested, test pressure, and leakage rate according to SMACNA 016.

I. Manufacturer Instructions:

1. Submit detailed instructions on installation requirements, including storage and handling procedures.

2. Submit special procedures for glass-fiber ducts.

J. Qualifications Statements:

1. Submit qualifications for manufacturer, installer, and licensed professional.

2. Submit manufacturer's approval of installer.

3. Welders: Qualify procedures and personnel according to AWS D1.1 for hangers and supports, AWS D1.2for aluminum supports, and AWS D9.1 for duct joint and seam welding.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents:

1. Record actual locations of ducts and duct fittings.

2. Record changes in fitting location and type.

3. Show additional fittings used.

1.6 QUALITY ASSURANCE

A. Perform Work according to SMACNA 1884 and 1966.

B. Construct ductwork to [NFPA 90A] [, NFPA 90B] [, and] [NFPA 96] [standard] [standards].

C. Perform Work according to <_____> standards.

D. Maintain <_____> [copy] [copies] of each standard affecting Work of this Section on Site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum [three] <_____> years' [documented] experience.

B. Installer: Company specializing in performing Work of this Section with minimum [three] <_____> years' [documented] experience [and approved by manufacturer].

C. Welders: AWS qualified within previous 12 months for employed weld types.

D. Licensed Professional: [Professional engineer] <_____> experienced in design of specified Work and licensed [at Project location] [in State of <_____>].

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

2. Provide additional protection according to manufacturer instructions.

1.9 AMBIENT CONDITIONS

A. Section 01 5000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Minimum Conditions: Do not install duct sealant when temperatures are less than those recommended by sealant manufacturer.

C. Subsequent Conditions: Maintain temperatures during and after installation of duct sealant.

1.10 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.

2. Indicate field measurements on Shop Drawings.

1.11 WARRANTY

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for warranties.

B. Furnish [five] <_____>-year manufacturer's warranty for ducts.

PART 2 - PRODUCTS

2.1 Ducts: Metal ducts and seals per DUCTMATE less than 1% leakage, no exceptions except fiberboard transfer sound boots.

A. Performance and Design Criteria:

1. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission of [Owner] [Architect/Engineer].

2. Size round ducts installed in place of rectangular ducts according to ASHRAE Handbook - Fundamentals.

B. Materials:

C. Galvanized-Steel Ducts: +/- 4" wg.

1. Material: ASTM A653 galvanized-steel sheet.

2. Quality: Lock forming.

3. Finish: [G60] [G90] zinc coating according to ASTM A90.

D. Fasteners: Rivets, bolts, or sheet metal screws.

E. Hanger Rod:

1. Material: [Galvanized] steel.

2. Comply with ASTM A36.

3. Type: Threaded [both ends] [one end] [continuously].

2.2 GLASS-FIBER DUCTS (Transfer Sound Boots)

A. Manufacturers:

1. Certainteed CASCO.

B. Description:

1. Rigid glass fiber with aluminum foil, glass scrim, and kraft or plastic jacket vapor barrier.

2. Comply with UL 181.

3. Thickness: [1 inch] [1-1/2 inches] [<_____> inches].

4. Maximum Thermal Conductivity: [0.23] <_____> Btu/sq. ft. x h x deg. F at 75 degrees F.

C. Insulated flexible duct (last 7' connection to air outlets)

1. UL 181, Class 1, constructed with interior liner of round corrugated steel or aluminum duct.

2. Insulation: Exterior fiberglass.

3. Vapor Barrier Film: Vinyl.

4. Pressure Rating: 10-inch wg positive or negative.

5. Maximum Velocity: 4,000 fpm.

6. Temperature Range: Minus 20 to plus 210 degrees F.

7. Thermal Resistance: 6 sq. ft. x h x deg. F/Btu.

8. Furnish each flexible duct section with integral clamping devices for connection to round or oval fittings.

2.3 SINGLE-WALL, SPIRAL ROUND DUCTS

A. Manufacturers:

1. DUCTMATE SpiralMate.

2. Substitutions:Not permitted.

B. Description: +/- 4" wg.

1. UL 181, Class 1, round spiral lockseam duct.

2. Material: Galvanized steel.

C. Minimum Duct Wall Thicknesses:

1. Diameter 2 to 14 Inches 26 gage.16 to 26 Inches 24 gage 28 to 36 Inches 22 gage.38 to 50 Inches 20 gage 52 to 60 Inches 18 gage.

D. Minimum Fittings Wall Thicknesses:

1. Diameter 2 to 14 Inches 24 gage. 16 to 26 Inches 22 gage. 28 to 36 Inches 20 gage.38 to 50 Inches 20 gage.52 to 60 Inches 18 gage.

2.4 SINGLE-WALL, SPIRAL FLAT OVAL DUCTS

A. Manufacturers:

1. Ductmate

B. Description:

1. Machine made from round spiral lockseam duct.

2. Material: Galvanized steel.

3. Pressure Rating: 10-inch wg.

C. Joints:

1. Type: Fully welded or bolted flange.

2. Gasket Material: As recommended by manufacturer.

D. Minimum Duct Wall Thicknesses:

1. Major Axis Dimension 7 to 24 Inches24 gage.

2. Major Axis Dimension25 to 48 Inches22 gage.

3. Major Axis Dimension50 to 70 Inches20 gage.

4. Major Axis Dimension72 to 82 Inches18 gage.

5. Major Axis Dimension84 Inches16 gage.

E. Minimum Fittings Wall Thicknesses:

1. Major Axis Dimension 7 to 36 Inches20 gage.

2. Major Axis Dimension37 to 60 Inches18 gage.

3. Major Axis Dimension62 Inches16 gage.

2.5 TRANSVERSE DUCT CONNECTION SYSTEM

A. Manufacturers:

1. Ductmate.

2. Substitutions: Not permitted.

2.6 CASINGS

A. Fabricate casings according to SMACNA 1966 and construct for indicated operating pressures.

B. Doors:

1. Reinforce access door frames with steel angles tied to horizontal and vertical plenum supporting angles.

2. Furnish hinged access doors where indicated or required for access to equipment for cleaning and inspection.

3. [Furnish clear wire glass observation ports minimum 6 by 6 inches in size.]

C. Acoustic Casings:

1. Fabricate acoustic casings with reinforcing turned inward.

2. Furnish 16-gage back facing and 22-gage perforated front facing, with 3/32-inch-diameter holes at 5/32 inch o.c.

3. Construct panels 3 inches thick and packed with 4.5-pcf minimum glass-fiber media, on 16-gage inverted channels.

2.7 FABRICATION

A. Rectangular Ducts:

1. According to SMACNA 1966 [and as indicated on Drawings].

2. Provide duct material, gages, reinforcing, and sealing for indicated operating pressures.

B. Round Ducts:

1. According to SMACNA 1966 [and as indicated on Drawings].

2. Seams: Longitudinal.

3. Provide duct material, gages, reinforcing, and sealing for indicated operating pressures.

C. Tees, Bends, and Elbows:

1. Minimum Radius:

a. 1-1/2 times centerline duct width.

b. If not possible or if rectangular elbows are used, provide [airfoil] turning vanes.

2. If acoustical lining is indicated, furnish turning vanes of perforated metal with glass-fiber insulation.

D. Divergence:

1. Increase duct sizes gradually, not exceeding 15 degrees of divergence wherever possible.

2. Upstream of Equipment: Maximum 30 degrees.

3. Downstream of Equipment: Maximum 45 degrees.

E. Welding:

1. Continuously Welded Round and Oval Duct Fittings: Two gages heavier than duct gages according to SMACNA 1966.

2. Cemented Slip Joints:

a. Minimum 4 inches.

b. Brazed or electric welded.

3. Prime coat welded joints.

F. Takeoffs:

1. Provide standard 45-degree lateral wye takeoffs.

2. If not possible due to space limitations, provide 90-degree conical tee connections.

G. Sealing:

1. Seal joints between duct sections and duct seams with welds, gaskets, mastic adhesives, mastic plus embedded fabric systems, or tape.

2. Sealants, Mastics, and Tapes: Comply with UL 181A and provide products bearing appropriate UL 181A markings.

H. Glass-Fiber Ducts:

1. Fabricate according to SMACNA 1884[, except as indicated on Drawings].

2. Tape: [2-inch-wide pressure-sensitive tape, according to UL 181A] [3-inch-wide heat-activated chemical bonding tape].

3. Machine-fabricate glass-fiber ducts and fittings; only minor on-Site adjustments are permitted.

4. Staples for Duct Joints and Tape:

   a. Material: Aluminum.

   b. Size: [3 inches wide by 2 mils thick] [2 inches wide by 3 mils thick].

5. Do not use glass-fiber ducts within 12 inches of electric- or fuel-fired heaters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify sizes of equipment connections before fabricating transitions.

3.2 PREPARATION

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Obtain manufacturer's inspection and acceptance of fabrication and installation at beginning of installation.

C. Install temporary closures of metal or taped PE on open ductwork to prevent construction dust from entering ductwork system.

3.3 INSTALLATION

A. Install and seal ducts according to SMACNA 1966.

B. Glass-Fiber-Reinforced Ducts: Comply with SMACNA 1884.

C. Insulated Flexible Duct Fittings:

1. Join each flexible duct section to main trunk duct through sheet metal fittings.

2. Material: Galvanized steel.

3. Equip fittings with factory-installed volume damper having positive locking regulator.

4. Provide insulation guard with fittings installed in lined ductwork.

D. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes [8] <_____> inches and smaller.

E. Hanger and Supports:

1. Fabricate and support ducts according to SMACNA [1884] [and] [1966].

2. Threaded Rods: Provide double nuts and lock washers.

3. Building Attachments:

    a. Provide concrete inserts or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

    b. If possible, install concrete inserts before placing concrete.

    c. Powder-Actuated Concrete Fasteners:

        1) Use only for slabs more than 4 inches thick.

        2) Install after concrete is placed and completely cured.

        3) Do not use powder-actuated concrete fasteners for seismic restraints.

4. Hanger Spacing:

    a. Comply with SMACNA [1884] [and] [1966].

    b. Install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

    c. Extend strap supports down both sides of ducts and turn under bottom at least 1 inch.

    d. Secure hanger to sides and bottom of ducts with sheet metal screws.

5. Hangers Exposed to View: Provide threaded rod and angle or channel supports.

6. Vertical Ducts:

    a. Support with steel angles or channel secured to sides of duct with welds, bolts, sheet metal screws, or blind rivets.

    b. Support at each floor and at maximum intervals of 16 feet.

7. Upper Attachments:

    a. Attach to structures.

    b. Selection and Sizing: Provide pull-out, tension, and shear capacities as required for supported loads and building materials.

8. Penetrations:

    a. Avoid penetrations of ducts with hanger rods.

    b. If unavoidable, provide airtight rubber grommets at penetrations.

F. Connect flexible ducts to metal ducts with [adhesive] [liquid adhesive and tape] [draw bands] [adhesive plus sheet metal screws].

G. Plenum Doors:

1. Location: 6 to 12 inches above floor.

2. Arrange door swing such that fan static pressure holds door in closed position.

H. Casings:

1. Floor Mounting:

a. Install on [4] <_____>-inch-high concrete curbs as specified in Section 03 3000 - Cast-in-Place Concrete.

b. At floor, rivet panels to angles 8 inches o.c.

c. If floors are acoustically insulated, provide liner of 18-gage galvanized expanded metal mesh, supported 12 inches o.c. and turned up 12 inches at sides with sheet metal shields.

I. Interface with Other Work:

1. Install openings in ductwork as required to accommodate thermometers and controllers.

2. Install pitot tube openings for testing of systems, complete with metal can with spring device or screw to prevent air leakage.

3. If openings are provided in insulated ductwork, install insulation material inside metal ring.

4. Connect diffusers or light troffer boots to low-pressure ducts [directly or] with 5-foot maximum length of flexible duct held in place with strap or clamp.

5. Connect [air terminal units] [air outlets and inlets] to supply ducts [directly or] with 5-foot maximum length of flexible duct; do not use flexible duct to change direction.

3.4 FIELD QUALITY CONTROL

A. Section 01 4000 - Quality Requirements: Requirements for inspecting and testing.

B. Testing:

1. Ductwork Designed for 3-Inch wg above Ambient Pressure:

a. Pressure test minimum 25 percent of ductwork after duct cleaning but before duct insulation is applied or ductwork is concealed.

b. Comply with SMACNA 016.

c. Maximum Allowable Leakage: According to IECC.

3.5 CLEANING

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean duct system and force air at high velocity through duct to remove accumulated dust.

C. To obtain sufficient airflow, clean one half of system completely before proceeding to other half.

D. Vacuuming:

1. Clean duct systems with high-power vacuum machines.

2. Install access openings into ductwork for cleaning purposes.

E. Protect sensitive equipment with temporary filters or bypass during cleaning.

3.6 ATTACHMENTS

A. Ductwork Material Schedule:

1. Supply - Heating Systems: Steel

2. Supply - Systems with Cooling Coils: Steel

3. Return and Relief : Steel

4. General Exhaust: Steel

5. Outside Air Intake: Steel.

6. Intake and Exhaust: Steel.

B. Ductwork Pressure Class Schedule:

1. Variable-Volume, Variable-Temperature Supply: 4-inch wg, regardless of velocity.

2. Variable-Air-Volume Supply - Downstream of VAV Boxes: 2-inch wg, regardless of velocity.

3. Variable-Air-Volume Supply - Upstream of VAV Boxes: 4-inch wg.

4. Return and Relief: 2-inch wg.

5. General 4-inch wg.

END OF SECTION

SECTION 23 3700
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Diffusers.

2. Registers

3. Grilles.

4. Door grilles.

5. Louvers.

B. Related Sections:

1. Section <_____> - <_____>: Roof curb flashing.

2. Section <_____> - <_____>: Roof curbs.

3. Section <_____> - <_____>: Door grilles.

4. Section 08 9100 - Louvers: Wall Louvers.

5. Section 09 9000 - Painting and Coating: Execution and product requirements for Painting of ductwork visible behind outlets and inlets specified by this section.

6. Section 23 0900 - Instrumentation and Control for HVAC: Operators for adjustable louvers.

7. Section 23 0923 - Direct-Digital Control System for HVAC: Operators for adjustable louvers.

8. Section 23 0953 - Pneumatic and Electric Control System for HVAC: Operators for adjustable louvers.

9. Section 23 3300 - Air Duct Accessories: Volume dampers for inlets and outlets.

1.2 REFERENCES

A. Air Movement and Control Association International, Inc.:

1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets.

C. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit sizes, finish, and type of mounting. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Samples: Submit [two] <_____> of each required air outlet and inlet type.

D. Test Reports: Rating of air outlet and inlet performance.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 7000 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of air outlets and inlets.

1.5 QUALITY ASSURANCE

A. Test and rate diffuser, register, and grille performance in accordance with ASHRAE 70.

B. Test and rate louver performance in accordance with AMCA 500.

C. Perform Work in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

D. Maintain [one copy] [<_____> copies] of [each] document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' [documented] experience [, and with service facilities within [100] <_____> miles of Project].

1.7 MOCK-UP

A. Section 01 4000 - Quality Requirements: Mock-up requirements.

B. Construct typical [exterior] [interior] ceiling module with supply and return air outlets.

C. Locate [where directed by Architect/Engineer.] [where indicated on Drawings.]

D. Incorporate accepted mock-up as part of Work.

****** [OR] ******

E. Remove mock-up [when directed by Architect/Engineer] <_____>.

1.8 PRE-INSTALLATION MEETINGS

A. Section 01 3000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum [one] <_____> week prior to commencing work of this section.

1.9 WARRANTY

A. Section 01 7000 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish [five] <_____>-year manufacturer's warranty for air outlets and inlets.

1.10 EXTRA MATERIALS

A. Section 01 7000 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish <_____> [<_____> percent] extra air outlets and inlets.

PART 2 - PRODUCTS

2.1 ROUND CEILING DIFFUSERS

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Product Description: Type: Round, [adjustable pattern,] stamped or spun, multi-core diffuser to discharge air in 360 degree pattern, with sector baffles where indicated. Diffuser collar not more than 1 inch above ceiling. [In plaster ceilings, furnish plaster ring and ceiling plaque.]

D. Fabrication: Steel with baked enamel [off-white] <_____> finish.

E. Accessories: [Radial opposed-blade] [Butterfly] [Combination splitter] damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.2 RECTANGULAR CEILING DIFFUSERS

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: [Square, [adjustable pattern,] stamped, multi-core] [Square and rectangular, [adjustable pattern,] multi-louvered] diffuser to discharge air in [360 degree] [one way] [two-way] [three-way] [four-way] pattern [with sector baffles where indicated].

D. Frame: [Surface mount] [Snap-in] [Inverted T-bar] [Spline] type. [In plaster ceilings, furnish plaster frame and ceiling frame.]

E. Fabrication: [Steel] [Aluminum] with baked enamel [off-white] <_____> finish.

F. Accessories: [Radial opposed-blade] [Butterfly] [Combination splitter] damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.3 PERFORATED FACE CEILING DIFFUSERS

A. Manufacturers:

1. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: Perforated face with fully adjustable pattern and removable face.

D. Frame: [Surface mount] [Snap-in] [Inverted T-bar] [Spline] type. [In plaster ceilings, furnish plaster frame and ceiling frame.]

E. Fabrication: Steel with [steel] [or] [aluminum] frame and baked enamel [off-white] <_____> finish.

F. Accessories: [Radial opposed-blade] [Butterfly] [Combination splitter] damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.4 CEILING SLOT DIFFUSERS

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: Continuous [1/2] [3/4] [1] inch wide slot, [1] [two] [three] [four] slots wide, with adjustable vanes for left, right or vertical discharge [; integral ceiling fire damper].

D. Fabrication: [Aluminum extrusions] [Steel] with factory [clear lacquer] [off-white enamel] [baked enamel] <_____> finish [, color to be selected].

E. Frame: [1-1/4] [1] <_____> inch margin with [countersunk screw] [concealed] [support clips for suspension system] [support clips for T bar] mounting and gasket [mitered end border.] [open end construction.] [end cap.]

F. Plenum: Integral, galvanized steel, [insulated] [non-insulated].

2.5 CEILING SUPPLY REGISTERS/GRILLES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, [one-way] [two-way] deflection.

D. Frame: [1-1/4] [1] <_____> inch margin with [countersunk screw] [concealed] mounting and gasket.

E. Fabrication: Aluminum extrusions with factory [off-white enamel] [clear lacquer] [prime coat] <_____> finish.

F. Damper: Integral, gang-operated, opposed-blade type with removable key operator, operable from face.

2.6 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: Streamlined blades, [3/4 inch] <_____> minimum depth, [3/4 inch] <_____> maximum spacing, with blades set at 45 degrees, [vertical] [horizontal] face.

D. Frame: [1-1/4] [1] <_____> inch margin with [countersunk screw] [concealed] mounting.

E. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory [off-white enamel] [baked enamel] [prime coated] [clear lacquer] <_____> finish [, color as selected].

F. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

G. Gymnasiums: Furnish front pivoted or welded in place blades, securely fastened to be immobile.

2.7 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: Fixed grilles of [1/2 x 1/2 x 1 inch] [1 x 1 x 1 inch] louvers.

D. Fabrication: [Polystyrene] [Acrylic] plastic with [off-white] [chrome] <_____> finish.

****** [OR] ******

E. Fabrication: Aluminum with factory [clear lacquer] [off-white enamel] [baked enamel] <_____> finish.

F. Frame: [[1-1/4] [1] <_____> inch margin with [countersunk screw mounting.] [concealed mounting.]] [Channel lay-in frame for suspended grid ceilings.]

G. Damper: Integral, gang-operated, opposed-blade type with removable key operator, operable from face.

2.8 CEILING LINEAR EXHAUST AND RETURN GRILLES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: Streamlined blades with 90 degree [one-way] [two-way] deflection, 1/8 x 3/4 inch on [1/4] [1/2] inch centers.

D. Frame: [1-1/4] [1] <_____> inch margin [,extra heavy for floor mounting,] with [countersunk screw] [concealed] mounting.

E. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory [off-white enamel] [baked enamel] [prime coated] [clear lacquer] <_____> finish [, color to be selected].

F. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.9 WALL SUPPLY REGISTERS/GRILLES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: Streamlined and individually adjustable blades, [3/4 inch] <_____> minimum depth, [3/4 inch] <_____> maximum spacing with spring or other device to set blades, [vertical] [horizontal] face, [single] [double] deflection.

D. Frame: [1-1/4] [1] <_____> inch margin with [countersunk screw] [concealed] mounting and gasket.

E. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory [off-white enamel] [baked enamel] [prime coat] [clear lacquer] <_____> finish [, color to be selected].

F. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

G. Gymnasiums: Furnish front pivoted or welded in place blades, securely fastened to be immobile.

2.10 WALL SUPPLY REGISTERS/GRILLES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille with [one-way] [two-way] <_____> deflection.

D. Frame: [1-1/4] [1] <_____> inch margin with [countersunk screw] [concealed] mounting and gasket.

E. Fabrication: Aluminum extrusions with factory [off-white enamel] [clear lacquer] [prime coat] <_____> finish.

F. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.11 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: Streamlined blades, [3/4 inch] <_____> minimum depth, [3/4 inch] <_____> maximum spacing, with spring or other device to set blades, [vertical] [horizontal] face.

D. Frame: [1-1/4] [1] <_____> inch margin with [countersunk screw] [concealed] mounting.

E. Fabrication: [Steel with 20 gage minimum frames and 22 gage minimum blades,] [Steel and aluminum with 20 gage minimum frame,] [or] [Aluminum extrusions,] with factory [off-white enamel] [baked enamel] [prime coated] [clear lacquer] <_____> finish [, color to be selected].

F. Damper: Integral, gang-operated, opposed-blade type with removable key operator, operable from face.

G. Gymnasiums: Furnish front pivoted or welded in place blades, securely fastened to be immobile.

2.12 WALL GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: Fixed grilles of [1/2 x 1/2 x 1/2 inch] [1/2 x 1/2 x 1 inch] [1 x 1 x 1 inch] louvers.

D. Frame: [[1-1/4] [1] <_____> inch margin with [countersunk screw mounting.] [concealed mounting.]] [Lay-in frame for suspended grid ceilings.]

E. Fabrication: Aluminum with factory [clear lacquer] [off-white enamel] [baked enamel] finish [, color to be selected].

F. Damper: Integral, gang-operated, opposed-blade type with removable key operator, operable from face.

2.13 LINEAR WALL REGISTERS/GRILLES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: Streamlined blades with [0] [15] degree deflection, 1/8 x 3/4 inch on [1/4] [1/2] inch centers.

D. Frame: [1-1/4] [1] <_____> inch margin with [countersunk screw] [concealed] mounting and gasket.

E. Fabrication: Aluminum extrusions, with factory [off-white enamel] [clear lacquer] [prime coat] <_____> finish.

F. Damper: Integral [gang-operated opposed blade] [hinged single blade] damper with removable key operator, operable from face.

2.14 LINEAR FLOOR SUPPLY REGISTERS/GRILLES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Type: Streamlined blades with [0] [15] degree deflection, 1/8 x 3/4 inch on [1/4] [7/16] [1/2] inch centers [, assembled on expanded tubes mandrel construction].

D. Frame: [1-1/4] [1] <_____> inch [heavy] margin frame with [countersunk screw mounting] [concealed mounting and gasket] [, and mounting frame.]

E. Fabrication: Aluminum extrusions with factory [off-white enamel] [clear lacquer] <_____> finish.

F. Damper: Integral [gang-operated opposed blade] [hinged single blade] damper with removable key operator, operable from face.

2.15 FLOOR SUPPLY REGISTERS/GRILLES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. [Individually adjustable] [Fixed] blades, wide stamped border, single or double blade damper with setscrew adjustment.

D. Fabricate of steel, welded construction, with factory baked enamel finish.

2.16 DOOR GRILLES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Door grilles: As specified in Section <_____>.

****** [OR] ******

D. Type: V-shaped louvers of 20 gage thick steel, 1 inch deep on 1/2 inch centers.

E. Frame: 20 gage steel with auxiliary frame to give finished appearance on both sides of door, with factory prime coat finish.

2.17 LOUVERS

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

****** [OR] ******

B. Furnish materials in accordance with [State] [Municipality] of <_____> [Highways] [Public Work's] standards.

C. Louvers: As specified in Section 08 9100.

****** [OR] ******

D. Product Description: [[Stationary] [Adjustable] [Combination]] [[Drainable] [Non-Drainable] [Double drainable]] [Thinline].

E. Type: [4] [6] inch deep with blades on 45 degree slope [with center baffle and return bend], heavy channel frame.

F. Fabrication: [16 gage thick galvanized steel] [or] [12 gage thick extruded aluminum], welded assembly, with factory [prime coat] [baked enamel] [anodized] [fluoropolymer spray] <_____> finish [color to be selected].

G. Mounting: Furnish with [interior] [exterior] [flat flange] [angle flange] [screw holes in jambs] [masonry strap anchors] for installation.

H. Bird Screen: Bird screen with 1/2 inch square mesh for exhaust and 3/4 inch for intake.

I. Insect Screen: [Aluminum] [Steel] mesh, set in [aluminum] [steel] frame.

J. Louver Operator: Refer to Section [230900] [230923] [230953].

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 3000 - Administrative Requirements: Coordination and project conditions.

B. Verify inlet and outlet locations.

C. Verify [ceiling] [wall] systems are ready for installation.

3.2 INSTALLATION

A. Install diffusers to ductwork with airtight connection.

B. Install balancing dampers on duct take-off to diffusers, grilles, and registers, whether or not dampers are furnished as part of diffuser, grille, and register assembly. Refer to Section 23 3300.

C. Paint visible portion of ductwork behind air outlets and inlets matte black. Refer to Section 09 9000.

D. Do not locate air registers, diffusers or grilles in floors of toilet or bathing rooms.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

END OF SECTION

SECTION 23 4000
HVAC AIR CLEANING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extended surface retained media filters.

2. Filter frames and housings.

3. Filter gages.

B. Related Sections:

1. Section 23 0513 - Common Motor Requirements for HVAC Equipment: Product requirements for motors for placement by this section.

2. Section 26 0503 - Equipment Wiring Connections: Execution requirements for wiring products for placement by this section.

1.2 REFERENCES

A. Air-Conditioning and Refrigeration Institute:

1. ARI 850 - Commercial and Industrial Air Filter Equipment.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

C. Military Standardization Documents:

1. MIL MIL-STD-282 - Filter Units, Protective Clothing, Gas-Mask Components, and Related Products: Performance-Test Methods.

D. Underwriters Laboratories Inc.:

1. UL 586 - High-Efficiency. Particulate, Air Filter Units.

2. UL 867 - Electrostatic Air Cleaners.

3. UL 900 - Air Filter Units.

1.3 PERFORMANCE REQUIREMENTS

A. Conform to ARI 850 Section 7.4.

B. Dust Spot Efficiency: Plus or minus 5 percent.

1.4 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate filter assembly and filter frames, dimensions, motor locations, and electrical characteristics and connection requirements.

C. Product Data: Submit data on filter media, filter performance data, dimensions, and electrical characteristics.

D. Samples: Submit [two] <_____> samples of replacement filter media of each type and each filter frame.

E. Manufacturer's Installation Instructions: Submit assembly and change-out procedures.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 7000 - Execution and Closeout Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit instructions for operation, changing, and periodic cleaning.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years' documented experience approved by manufacturer.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 3000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 WARRANTY

A. Section 01 7000 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for air cleaning devices.

1.9 EXTRA MATERIALS

A. Section 01 7000 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish one set of [disposable panel filters] [renewable media filters].

PART 2 - PRODUCTS

2.1 EXTENDED SURFACE RETAINED MEDIA FILTERS

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

B. Media: [UL 900 Class 1] [UL 900 Class 2] pleated, non-woven cotton fabric, scrim reinforced; supported by welded steel retainer; in 16 gage steel holding frame with corrosion resistant coating.

1. Effective Media Area: [16] [20] <_____> sq ft per 1000 cfm capacity rating.

2. Nominal Size: [24 x 24 x 12 inches] <_____> deep.

C. Performance Rating: ASHRAE 52.1:

1. Percent Dust Spot Efficiency: 90.

2. Percent Average Weight Arrestance: 92.

3. Initial Resistance at 500 fpm Face Velocity: 0.20 inch wg.

4. Recommended Final Resistance: 0.50 inch wg above initial resistance.

2.2 FILTER FRAMES AND HOUSINGS

A. Manufacturers:

1. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

B. General: Fabricate filter frames and supporting structures of [16 gage] galvanized steel or extruded aluminum T-section construction with necessary gaskets between frames and walls.

C. Standard Sizes: For interchange ability of filter media of other manufacturers; for panel filters, size for [24 x 24 inches] <_____> filter media, minimum 2 inches thick; for extended surface and high efficiency particulate air filters, provide for upstream mounting of panel filters.

D. Side Servicing Housings: Flanged for insertion into ductwork, of reinforced 16 gage galvanized steel; access doors with continuous gaskets and positive locking devices on both sides; extruded aluminum tracks or channels for primary [and secondary] [, secondary and tertiary] filters with positive sealing gaskets.

2.3 FILTER GAGES

A. Manufacturers:

1. <Click link above to find, evaluate, and insert list of manufacturers from SpecAgent>.

2. Substitutions: [Section 01 6000 - Product Requirements] [Not Permitted].

B. Direct Reading Dial: [3-1/2 inch] [2 inch] diameter diaphragm actuated dial in metal case. Furnish vent valves, black figures on white background, front calibration adjustment, range [0-0.5 inch wg] [0-1.0 inch wg] [0-2.0 inch wg] [0-3.0 inch wg] [0-4.0 inch wg], [2] [3] percent of full scale accuracy.

****** [OR] ******

C. Inclined Manometer: One piece molded plastic with epoxy coated aluminum scale, inclined-vertical indicating tube and built-in spirit level, range 0-3 inch wg, 3 percent of full scale accuracy.

D. Accessories: Static pressure tips with integral compression fittings, 1/4 inch [aluminum] [plastic] tubing, 2-way or 3-way vent valves.

2.4 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics: In accordance with Section 26 0503 and the following:

1. [<_____>hp.] [<_____> rated load amperes.]

2. <_____> volts, [single] [three] phase, 60 Hz.

3. <_____> amperes maximum [fuse size] [circuit breaker size] [overcurrent protection].

4. <_____> minimum circuit ampacity.

5. <_____> percent minimum power factor at rated load.

B. Motors: In accordance with Section 23 0513.

C. Disconnect Switch: Factory mount [in control panel] [on equipment].

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install filters with felt, rubber, or neoprene gaskets to prevent passage of unfiltered air around filters.

B. Install filter gage static pressure tips upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum, in accessible position. Adjust and level.

C. Do not operate fan system until [temporary] [permanent] filters are in place. Replace temporary filters used during construction and testing, with clean set.

D. Install filter gages on filter banks with separate static pressure tips upstream and downstream of filters.

END OF SECTION

SECTION 23 8126
VARIABLE REFRIGERANT FLOW UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Variable Refrigerant Flow (VRF) HVAC system shall be a variable capacity, direct expansion (DX) heat recovery engineered system. The outdoor unit(s) shall consist of one or more frame(s) connected through common refrigerant piping. Each system shall have a single or multiple, inverter compressor(s). Each system shall be connected to a single or multiple indoor units (ducted, non-ducted or combination thereof) with a common refrigerant piping. System controls shall be provided by the VRF manufacturer and shall be an integral part of the VRF equipment. Each indoor unit shall be capable of operating in the heating or cooling mode independent of the operating mode of other indoor units. All indoor units shall operate in the same mode (heating or cooling) and controlled individually.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include nominal capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, static pressures, sound power characteristics, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1.04 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Warranty: Sample of special warranty.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VRF HVAC system to include operation, and maintenance manuals.

1.06 QUALITY ASSURANCE

A. LG Multi V IV VRF (variable refrigerant flow) heat pump and heat recovery systems shall have published performance ratings certified by AHRI (Air-Conditioning, Heating, and Refrigeration Institute) and listed in the AHRI Standard 1230 certified product directory.

B. LG Multi V IV VRF heat pump and heat recovery system components shall be manufactured in production facilities maintaining the following ISO certifications:

1. ISO 9001 Quality Management System

2. ISO 14001 Environmental Management System

C. LG Multi V IV VRF heat pump and heat recovery system components shall comply with Underwriters Laboratories (UL) 1995 Heating and Cooling Equipment Standard for Safety and bear the Electrical Testing Laboratories (ETL) label.

D. LG Multi V IV VRF heat pump and heat recovery system electrical power wiring shall be installed according to National Electrical Code (NEC) and all applicable state and local building codes.

1.07 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 03 3000 "Cast-in-Place Concrete."

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.08 WARRANTY

A. Standard Warranty:

1. STANDARD ONE-YEAR PARTS WARRANTY FOR A QUALIFIED SYSTEM -The Part(s), including compressor shall be warranted for a period of one (1) year period beginning on the date of original installation or twenty four (24) months from the date of manufacture, whichever occurs first.

2. STANDARD SIX-YEAR COMPRESSOR PARTS WARRANTY – The Compressor shall be warranted for an additional five (5) year period from the second (2nd) through the sixth (6th) year after the date of original installation or twenty four (24) months from the date of manufacture, whichever occurs first.

B. SPECIAL WARRANTY: The standard one (1) year parts warranty shall be extended to two (2) years and the six (6) year compressor warranty is extended to seven (7) years for a qualified system that has a completed commissioning report submitted to LG which includes two (2) hours of LGMV data. Extended parts and compressor warranty begins from the date of the original installation or twenty four (24) months from the date of manufacture, whichever occurs first.

C. The Multi-V VRF system shall be installed by a contractor with extensive VRF install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following to be same manufacturer as outdoor unit;

1. LG Electronics USA, Inc.

2. Mitsubishi Electric.

3. Daiken.

4. Carrier (Toshiba).

5. Fujitsu.

6. Trane.

2.02 INDOOR UNITS (5k to 96k Btu/h Nominal)

A. Wall Mounted – Standard

1. General

a. Unit shall be factory assembled, wired, piped and run tested.

b. Unit shall be designed to be installed for indoor application.

c. Unit shall be attached to an installation plate/bracket that secures unit to the wall.

d. Unit shall be capable to be installed with heat pump or heat recovery or cooling VRF system.

e. The depth of the unit shall not exceed 7 inches.

2. Casing/Panel

a. Unit case shall be manufactured using Acrylonitrile Butadiene Styrene (ABS) polymeric resin and has a morning fog finish.

3. Cabinet Assembly

a. Unit shall have one supply air outlet and one return air inlet.

b. Unit shall be equipped with factory installed temperature thermistors for

1) Return air

2) Refrigerant entering coil.

3) Refrigerant leaving coil.

c. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.

d. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.

e. Unit shall have the following functions as standard

1) Self-diagnostic function

2) Auto restart function

3) Auto changeover function (Heat Recovery system only)

4) Auto operation function

5) Auto clean function

6) Child lock function

7) Forced operation

8) Dual thermistor control

9) Sleep mode

f. Unit shall be capable of refrigerant piping in 4 different directions.

g. Unit shall be capable of drain piping in 2 different directions.

4. Fan Assembly

a. The unit shall have a direct driven cross flow fan made of high strength ABS.

b. The fan motor is Brushless Digitally controlled (BLDC) with permanently lubricated and sealed ball bearings.

c. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.

d. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm.

e. In cooling mode, the indoor fan shall have the following settings: Low, Med, High, Power Cool, and Auto.

f. In heating mode, the indoor fan shall have the following settings: Low, Med, High, and Auto.

g. The Auto fan setting shall adjust the fan speed to most effectively achieve the set-point.

h. Unit shall have factory installed motorized louver to provide flow of air in up and down direction for uniform airflow.

i. Unit shall have factory installed manual guide vane to control the direction of flow of air from side to side.

5. Filter Assembly

    a. The return air inlet shall have a factory supplied removable, washable filter.

    b. The unit shall be equipped with factory supplied secondary plasma filter.

    c. The filter access shall be from the front of the unit.

6. Coil Assembly

    a. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.

    b. Unit shall have minimum of 2 rows of coils.

    c. Unit shall have a factory supplied condensate drain pan below the coil.

    d. Unit shall be designed for gravity drain.

    e. Unit shall have a factory insulated drain hose to handle condensate.

    f. Unit shall have provision of 45° flare refrigerant pipe connections

    g. The coil shall be factory pressure tested at a minimum of 551 psig.

    h. All refrigerant piping from outdoor unit to indoor unit shall be field insulated.

7. Microprocessor Control

    a. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system.

    b. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, 2 core, stranded and shielded communication cable.

    c. The unit controls shall operate the indoor unit using one of the five operating modes:

        1) Auto changeover (Heat Recovery System only)

        2) Heating

        3) Cooling

        4) Dry

        5) Fan only

8. Electrical

    a. The unit electrical power shall be 208-230/1/60 (V/Ph/Hz)

    b. The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.

9. Controls

a. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS485 daisy chain.

B. Ceiling Cassette – 4 Way

1. General

a. Unit shall be factory assembled, wired, piped and run tested.

b. Unit shall be designed to be installed for indoor application.

c. Unit shall be designed to mount recessed in the ceiling and has a surface mounted concentric grille on the bottom of the unit.

d. The unit shall be available in both 2’ x 2’ and 3’ x 3’ chassis.

e. Unit shall be capable to be installed with heat pump or heat recovery or cooling VRF system.

2. Casing/Panel

a. Unit case shall be manufactured using galvanized steel plate.

b. The unit shall be provided with an off-white Acrylonitrile Butadiene Styrene (ABS) polymeric resin architectural grille.

c. The grille shall have a tapered trim edge, and a hinged, spring clip (screw-less) return air filter-grille door.

d. Unit shall be provided with metal ears designed to support the unit weight on four corners.

e. Ears shall have pre-punched holes designed to accept field supplied all thread rod hangers.

3. Cabinet Assembly

a. Unit shall have four supply air outlets and one return air inlet.

b. The supply air outlet shall be through four-directional slot diffuser each equipped with independent oscillating motorized guide vane designed to change the airflow direction.

c. The grille shall have a discharge range of motion of 40° in an up/down direction with capabilities of locking the vanes.

d. The unit shall have a guide vane algorithm designed to sequentially change the predominant discharge airflow direction in counterclockwise pattern.

e. Guide vanes shall provide airflow in all directions.

f. Unit shall be equipped with factory installed temperature thermistors for

1) Return air

2) Refrigerant entering coil.

3) Refrigerant leaving coil.

g. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.

h. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.

i. The unit shall have factory designated branch duct knockouts on the unit case.

j. The unit shall have provision of fresh air ventilation through a knock-out on the cabinet.

k. The branch duct knockouts shall have the ability to duct upto ½ the unit airflow capacity.

l. The branch duct cannot be ducted to another room.

m. Unit shall have the following functions as standard

1) Self-diagnostic function

2) Auto restart function

3) Auto changeover function (Heat Recovery system only)

4) Auto operation function

5) Child lock function

6) Forced operation

7) Dual thermistor control

8) Sleep mode

4. Fan Assembly

a. The unit shall have a single direct driven turbo fan.

b. The fan shall be made of high strength ABS HT-700 polymeric resin.

c. The fan motor is Brushless Digitally controlled (BLDC) with permanently lubricated and sealed ball bearings.

d. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.

e. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm.

f. In cooling mode, the indoor fan shall have the following settings: Super Low, Low, Med, High, Power Cool and Auto.

g. In heating mode, the indoor fan shall have the following settings: Super Low, Low, Med, High and Auto.

h. The Auto fan setting shall adjust the fan speed to most effectively achieve the set-point.

i. Unit shall have factory installed motorized louver to provide flow of air in up and down direction for uniform airflow.

5. Filter Assembly

a. The return air inlet shall have a factory supplied primary removable, washable filter.

b. The filter access shall be from the bottom of the unit.

6. Coil Assembly

a. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.

b. Unit shall have minimum of 2 rows of coils.

c. Unit shall have a factory supplied condensate drain pan below the coil.

d. Unit shall be installed and wired condensate drain pump capable of providing minimum 27.5 inch lift from bottom surface of the unit.

e. The drain pump shall have a safety switch to shut off the unit if condensate rises too high in the drain pan.

f. Unit shall have provision of 45° flare refrigerant pipe connections

g. The coil shall be factory pressure tested at a minimum of 551 psig.

h. All refrigerant piping from outdoor unit or Heat Recovery (HR) unit to indoor unit shall be field insulated.

7. Microprocessor Control

a. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system.

b. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, 2 core, stranded and shielded communication cable.

c. The unit controls shall operate the indoor unit using one of the five operating modes:

1) Auto changeover (Heat Recovery System only)

2) Heating

3) Cooling

4) Dry

5) Fan only

8. Electrical

a. The unit electrical power shall be 208-230/1/60 (V/Ph/Hz)

b. The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.

9. Controls

a. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS485 daisy chain.

C. Ducted – High Static

1. General

a. Unit shall be factory assembled, wired, piped and run tested.

b. Unit shall be designed to be installed for indoor application.

c. Unit shall be designed to mount fully concealed above the finished ceiling.

d. Unit shall have opening to supply air from front horizontal and a dedicated rear horizontal return.

e. The supply air shall be flanged for field installed ductwork that shall not exceed the external static pressure limitation of the unit.

f. Unit shall be capable to be installed with heat pump or heat recovery or cooling VRF system.

2. Casing/Panel

a. Unit case shall be manufactured using galvanized steel plate.

b. The cold surfaces of the unit shall be covered internally with a coated polystyrene insulating material.

c. The cold surfaces of the unit shall be covered externally with sheet insulation made of Ethylene Propylene Diene Monomer (M-Class) (EPDM)

d. The external insulation shall be plenum rated and conform to ASTM Standard D-1418.

e. Unit shall be provided with hanger brackets designed to support the unit weight on four corners.

f. Hanger brackets shall have pre-punched holes designed to accept field supplied, all thread rod hangers.

3. Cabinet Assembly

   a. Unit shall have supply air discharge outlets horizontal and a return air inlet horizontal.

   b. Unit shall be equipped with factory installed temperature thermistors for

      1) Return air

      2) Refrigerant entering coil.

      3) Refrigerant leaving coil.

   c. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.

   d. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.

   e. Unit shall have the following functions as standard

      1) Self-diagnostic function

      2) Auto restart function

      3) Auto changeover function (Heat Recovery system only)

      4) Auto operation function

      5) Child lock function

      6) Forced operation

      7) Dual thermistor control

      8) Sleep mode

      9) External static pressure (ESP) control

4. Fan Assembly

   a. The unit shall have two direct driven Sirocco fans.

   b. The fan shall be made of high strength ABS GP-2200 polymeric resin.

   c. The fans shall be mounted on a common shaft.

   d. The fan motor shall be Brushless Digitally controlled (BLDC) with permanently lubricated and sealed ball bearings.

   e. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.

   f. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm.

g. In cooling mode, the indoor fan shall have the following settings: Low, Med, High and Auto.

h. In heating mode, the indoor fan shall have the following settings: Low, Med, High and Auto.

i. The Auto fan setting shall adjust the fan speed to most effectively achieve the set-point.

j. Each of the settings can be field adjusted from the factory setting (RPM/ESP).

k. Unit shall be designed for high speed air volume against an external static pressure of up to 1.0” water gauge.

5. Filter Assembly

a. The return air inlet shall have a factory supplied removable, washable filter.

b. The filter access shall be from the rear of the unit.

c. Optional Return filter box with high-efficiency filter shall be field provided and installed not to exceed external static pressure limitation of the high static ducted indoor unit.

1) The unit shall have provision to mate directly with high efficiency filter box to accommodate 1” or 2”thick field provided MERV rated filter.

2) LG/Dynamic supplied Air cleaner shall be compatible with the ducted unit.

6. Coil Assembly

a. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.

b. Unit shall have minimum of 2 rows of coils.

c. Unit shall have a factory supplied condensate drain pan below the coil.

d. Unit shall be installed and wired condensate drain pump capable of providing minimum 27.5 inch lift from bottom surface of the unit.

e. Unit drain pan shall be provided with a secondary drain port/plug allowing pan to be drained for service.

f. The drain pump shall have a safety switch to shut off the unit if condensate rises too high in the drain pan.

g. Unit shall have provision of 45° flare refrigerant pipe connections

h. The coil shall be factory pressure tested at a minimum of 551 psig.

i. All refrigerant piping from outdoor unit or Heat Recovery (HR) unit to indoor unit shall be field insulated.

7. Microprocessor Control

a. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system.

b. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, 2 core, stranded and shielded communication cable.

c. The unit controls shall operate the indoor unit using one of the five operating modes:

1) Auto changeover (Heat Recovery System only)

2) Heating

3) Cooling

4) Dry

5) Fan only

8. Electrical

a. The unit electrical power shall be 208-230/1/60 (V/Ph/Hz)

b. The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.

9. Controls:

a. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS485 daisy chain.

2.03 OUTDOOR UNITS VARIABLE REFRIGERANT FLOW SYSTEM (6 TO 30 TONS NOMINAL)

A. Simultaneous Cooling and Heating VRF System (Heat Recovery System)

1. Heat recovery system shall be an air cooled, system consisting of an outdoor unit consisting of one frame (6 tons to 14 tons), two frames (16 tons to 24 tons) or three frames (24 tons to 30 tons) connected to Heat Recovery (HRU) units and single/multiple indoor units. Multi-port heat recovery units shall allow simultaneous heating and cooling of individual zones.

2. The heat recovery system shall be capable of operating with 208/230V, 60Hz, 3 phase power with a tolerance of +/- 10%.

B. Outdoor Unit shall be capable at the following operating ambient air conditions.

1. Heat Recovery System

a. Cooling: 14°F DB to 122°F DB

b. Heating: -13°F WB to 61°F WB

c. Synchronous Cooling: 14°F DB to 81°F DB

d. Synchronous Heating: 14°F WB to 61°F WB

2. The system shall be capable of performing continuous operation when an individual indoor unit is being serviced or power to indoor unit is disconnected.

3. The maximum allowable system combination ratio shall be 130%. Systems designed with combination ratio above 130% are not acceptable.

4. The total nominal capacity of all indoor units shall be no less than 50% and no more than 130% of outdoor unit's nominal capacity to ensure the VRF system will have sufficient capacity to meet the building's cooling and heating load at design day weather conditions.

C. General

1. The air-conditioning system shall use R410A refrigerant.

2. Each system shall consist of one, two or three air source outdoor unit frame.

3. Dual and triple frame configurations shall be field piped together using manufacturer's designed and supplied Y-branch kit in conjunction with field provided interconnecting pipe to form a common refrigerant circuit.

4. Refrigerant circuit configuration for Heat Recovery System

a. The refrigerant circuit shall be constructed using field provided copper piped together with manufacturer supplied Heat Recovery unit(s) ,Y- branches or Header fittings, connected to (ducted, non-ducted or combination thereof) single/multiple indoor units to effectively and efficiently control the simultaneous heating and cooling operation of the VRF system.

b. Each refrigerant pipe, y-branch, header kit, elbows and isolation ball valves shall be individually insulated with no air gaps. All joints shall be glued and sealed.

5. Refrigerant circuit configuration for Heat Pump System

a. The refrigerant circuit shall be constructed using field provided copper piped together with manufacturer supplied Y- branches and/or Headers connected to (ducted, non-ducted or combination thereof) single/multiple indoor units to effectively and efficiently control heating or cooling operation of the VRF system.

b. All refrigerant pipe, Y-branches, header kits, elbows and valves shall be individually insulated with no air gaps. All joints shall be glued and sealed.

6. Factory installed microprocessor controls in the outdoor unit(s), HR unit(s), and indoor unit(s) shall perform functions to efficiently operate the VRF system and communicate in a daisy chain configuration between each other. Communications and cabling shall conform to RS485 standard.

7. The system shall be designed to accept connection up to 58 indoor units depending on the outdoor unit model selected.

8. The outdoor unit shall have a fusible plug.

9. The fusible plug shall have a threaded connector.

10. The unit shall be shipped from the factory fully assembled including internal refrigerant piping, compressor, contacts, relay(s), power and communications wiring necessary.

11. Each refrigeration circuit shall have the following components:

    a. Refrigerant strainers

    b. Check valves

    c. Oil separator

    d. Accumulator

    e. 4-way reversing valve

    f. Vapor injection valve

    g. Variable path valve

    h. Oil Level sensor

    i. Electronic expansion valves

    j. Sub-cooler

    k. High and low side Schrader valve service ports with caps.

    l. Service valves

D. Refrigerant Pipe System Design Parameters

1. The outdoor unit shall be capable of operating at an elevation difference of up to 360 feet above or below the lowest or highest indoor unit respectively.

2. The outdoor unit shall be capable of operating with up to 3280 equivalent length feet of interconnecting liquid line refrigerant pipe in the network.

3. The outdoor unit shall be capable of operating with up to 656 actual feet or 738 equivalent length feet of liquid line refrigerant pipe spanning between outdoor unit and farthest indoor unit.

E. Defrost Operations

1. The outdoor units shall be capable of auto defrost operation to melt accumulated frost off the outdoor unit heat exchanger. The defrost cycle control shall be based on outdoor ambient temperatures and outdoor unit heat exchanger temperatures.

    a. Continuous Heating Defrost: During first two defrost cycles the unit shall allow heating mode indoor unit fans to stay “on” in low speed continuing to heat.

    b. Complete Defrost: The third defrost cycle shall switch all outdoor units to defrost mode to fully melt and clear frost, snow or ice accumulations off the outdoor coil while turning “off” heating mode indoor unit fans to maintain efficient performance.

F. Oil Management

1. The system shall have Hi-POR (High Pressure Oil Return) to ensure a consistent film of oil on all moving compressor parts at low speed. Oil is returned to compressor through a separate oil injection pipe.

    a. Oil return system shall maintain high side pressure return to the compressor

2. The system shall be provided with a centrifugal oil separator designed to extract oil from the oil/refrigerant gas stream leaving the compressor and return the extracted oil to the compressor oil sump.

3. The system shall have an oil level sensor in the compressor to provide direct oil level sensing.

4. The system shall only initiate an oil return cycle if the oil level is too low.

5. Timed oil return operations or non-oil level sensing systems shall not be permitted.

G. Refrigerant Management

1. System shall have advanced refrigerant control functions that optimize operating efficiency at all ambient operating conditions. Advanced refrigerant control functions shall include:

    a. Accumulator shall be equipped with controls that vary the amount of refrigerant charge being circulated based on operating mode.

    b. Outdoor unit coil shall be equipped with controls that maximizes heat transfer. Controls shall vary the coil circuiting between parallel and series configurations and be able to change flow direction in response to multiple refrigerant monitoring parameters and operating conditions.

    c. Compressors shall be equipped with an intermediary port that introduces additional refrigerant to the compression chamber based on multiple refrigerant system monitoring parameters. This feature increases heating capacity at low ambient conditions.

H. Cabinet

1. Outdoor unit cabinet shall be made of 20 gauge galvanized steel with an enamel finish.

2. Outdoor unit cabinet finish shall be tested in accordance with ASTM B-117 salt spray test procedure for a minimum of 1000 hours.

3. The front panels of the outdoor units shall be removable type for access to internal components.

4. A smaller service access panel, not larger than 6.25”x 6.67” and secured by a maximum of (2) screws shall be provided to access the following:

    a. Service tool connection

    b. DIP switches

    c. Auto addressing

    d. Error codes

5. The cabinet shall have piping knockouts to allow refrigerant piping to be connected at the front or through the bottom of the unit.

I. Fan Assembly

1. Each 8 to 14 ton cabinet shall be equipped with two direct drive variable speed propeller fans with BLDC motors with a vertical air discharge.

2. The fans blades shall be made of Acrylonitrile Butadiene Styrene (ABS) material.

3. The fans motor shall be equipped with permanently lubricated bearings.

4. The fan motor shall be variable speed with a maximum operating speed of 1050 RPM.

5. The fan shall have a raised guard to help prevent contact with moving parts.

6. The cabinet shall have option to change the discharge air direction from vertical to horizontal using optional factory provided air guides.

7. The cabinet shall have DIP switch setting to raise external static pressure up to 0.32 in-wg.

J. Outdoor Unit Coil

1. The outdoor unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.

2. The copper tubes shall have inner groves.

3. The aluminum fins shall have factory applied corrosion resistant GoldFin™ material.

4. Hydrophilic Coil coating shall be tested in accordance with ASTM B-117 salt spray test procedure for a minimum of 1000 hours

5. The outdoor unit coil shall be tested to a pressure of 551 psig.

6. The coil for each cabinet shall have 14 Fins per Inch (FPI).

7. All the outdoor units shall have a 3 rows heat exchanger.

8. The cabinet shall have a coil guard.

K. Compressor(s)

1. Each 6, 8, 10 ton cabinet shall be equipped with one hermetically sealed, inverter driven, High Side Shell (HSS) scroll compressor.

2. The 12 and 14 ton cabinet shall be equipped with two hermetically sealed, inverter driven, HSS controlled scroll compressors.

3. Each inverter driven, HSS scroll compressor shall be capable of operating in a frequency range from 15 Hz to 150 Hz with control in 0.5 Hz increments.

4. The compressor(s) shall be equipped with a 60 Watt crankcase heater.

5. The compressor shall use a factory charge of Polyvinyl Ether (PVE) oil.

6. The compressor bearing(s) shall have Teflon™ coating.

7. The compressor(s) shall be protected with:

   a. High Pressure switch

   b. Over-current /under current protection

   c. Phase failure

   d. Phase reversal

8. Standard, non-inverter driven compressors shall not be permitted

L. Sound Levels

1. Each cabinet shall be rated with a sound level not to exceed 59.5 dB(A) when tested in an anechoic chamber under ISO3745 standard.

M. Sensors

1. Each single cabinet shall have

   a. Suction temperature sensor

   b. Discharge temperature sensor

   c. High Pressure sensor

   d. Low Pressure sensor

   e. Outdoor temperature sensor

   f. Outdoor unit heat exchanger temperature sensor

2.04 HEAT RECOVERY UNIT (HRU)

A. General

1. HR unit shall be designed and manufactured by the same manufacturer of VRF indoor unit(s) and outdoor unit(s).

2. HR unit casing shall be made with galvanized steel.

3. HR unit shall require 208-230V/1-phase/60Hz power supply.

4. HR Unit shall be an intermediate refrigerant control device between the air source outdoor unit and the indoor units to control the systems simultaneous cooling and heating operation.

5. HR unit shall be engineered to work with a three pipe VRF system comprising of

   a. High Pressure Vapor Pipe

   b. Low Pressure Vapor Pipe

c. Liquid Pipe

6. HR unit shall be designed to be piped in series or parallel.

7. HR unit shall have 2, 3 or 4 ports.

8. Each port shall be capable of operating in cooling or heating independently regardless of the operating mode of any other port on the HR unit or in the system.

9. Each port shall be capable of connecting from 1 to 8 indoor units to a maximum nominal capacity of 54MBh.

10. Maximum nominal capacity per HR unit shall not exceed 192MBh.

11. Indoor units greater than 54MBh nominal capacity shall be twinned using a reverse Y-branch.

12. HR unit shall be internally piped, wired, assembled and run tested at the factory.

13. HR unit shall be designed for installation in a conditioned environment.

14. HR unit shall have a liquid bypass valve.

15. HR unit shall have (2) two-position solenoid valves per port.

16. HR unit shall have a balancing valve to control the pressure between the high pressure and low pressure pipe during mode switching.

17. HR unit shall have an electronic expansion valve for subcooling.

18. HR unit shall not require a condensate drain.

19. HR unit shall be internally insulated.

20. All field refrigerant lines between outdoor unit and HR unit and from HR unit to indoor unit shall be field insulated.

21. The HR unit shall not exceed a net weight of 49 lbs.

22. The system shall be designed to accommodate 16 HR units connected to Heat Recovery units piped in single series string.

23. A single series pipe string of 1 to 16 HR units shall be capable of serving indoor units with a total nominal capacity of 192 MBH per HR unit.

B. Piping Capabilities

1. The elevation difference between indoor units on heat pump systems shall be 131 feet.

2. The elevation differences for heat recovery systems shall be:

a. Heat recovery unit (HRU) to connected indoor unit shall be 49 feet

b. HRU to HRU shall be 49 feet

c. Indoor unit to indoor unit connected to same HRU shall be 49 feet

d. Indoor unit to indoor unit connected to separate parallel HRU's shall be 131 feet.

3. The acceptable elevation difference between two series connected HR units shall be 16 feet.

C. Controls

1. HR unit(s) shall have factory installed unit mounted control boards and integral microprocessor to communicate with other devices in the VRF system.

2. HR unit shall communicate with the air source unit via the air source/indoor unit 2-conductor shielded communications cable terminated using a daisy chain configuration.

3. The VRF manufacturer shall provide published documentation that specifically allows the installation of field provided isolation valves on all pipes connected to the Heat Recovery unit to allow the servicing of HR units refrigerant circuit or the replacement of HR unit without evacuating the balance of the piping system.

PART 3 - EXECUTION

3.01 Install in accordance with manufacturer's instructions.

A. Install units level and piping straight.

B. Install VRF Indoor units using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, VRF Outdoor Unit(s) on equipment supports specified in Section 07 7200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Equipment Mounting:

1. Pre-fabricated rooftop VRF Condenser Skid to be manufactured of prime galvanized steel construction, 10 gauge, meeting ASTM A653/653M with welded corner and seams joined by continuous water tight welds. VRF Condenser Skid shall be internally reinforced as necessary to support the weight of the condensers. VRF condensers shall be mounted on vibration isolating neoprene pads.

2. A walkway with removable Grip Strut walking panels shall be provided, which shall cover an Electrical/Refrigeration Pipe chase.

3. All electrical wiring shall be factory pre-wired from each of the condensing units to an electrical fuse panel. All wiring and fuse panel to be sized by the VRF Condenser Skid manufacturer and shall comply with applicable electrical codes. Power to the electrical panel shall be wired in the field by installing contractor.

4. All Control wiring shall be factory pre-wired from each of the condensing units to a Control Junction Box. Control wiring from the building to the Control Junction Box shall be field wired by the installing contractor.

E. Refrigerant Piping:

1. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

2. Install and connect refrigerant piping per manufacturer’s recommendations and design software.

3. Locate piping in a manner that allows service panel removal and does not hinder maintenance access at all system components,

3.02 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and commission system components and controls.

B. System Commissioning.

1. Manufacturer's Field Service: Engage a factory-trained and authorized commissioning agent to inspect the installation including connections, controls cabling, and to adjust the refrigerant charge.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

4. Remove and replace malfunctioning units and retest as specified above.

5. Prepare test and inspection reports.

3.03 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

3.05 Allow access to filters, motors, panels, etc.

END OF SECTION

SECTION 23 8142
100% OSA HEAT PUMPS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Packaged and Split System Outdoor Air Unit

B. Refrigeration Components

C. Unit Operating Controls

D. Electrical Power Connections

E. Operation and Maintenance Service

1.2 RELATED SECTIONS

A. Section 15170 - Motors.

B. Section 15242 – Vibration Isolation.

C. Section 15290 – Ductwork Insulation

D. Section 15885 – Air Cleaning

E. Section 15952 – Controls and Instrumentation

F. Section 16180 – Equipment Wiring Systems

1.3 REFERENCES

A. NFPA 90 A & B – Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems (all) ETL Listed and Labeled ANSI/ASHRAE 15 – Safety Code for Mechanical Refrigeration.

B. Standard for Safety, Heating and Cooling Equipment – Third Edition, UL 1995 CSA C22.2 236-05, dated February 18, 2005, with revisions through July 30, 2009 (all for cooling and for electric heat)

C. ANSI/ASHRAE/IESNA 90.1-2010 – Energy Standard for New Buildings except Low Rise Residential Buildings.

D. ANSI Z21.47/UL 1995 – Unitary Air Conditioning Standard for Safety Requirements.

E. California Energy Commission Administrative Code – Title 20/24 – Establishes the Minimum Efficiency Requirements for HVAC Equipment Installed in New Buildings in the State of California. (all)

F. ANSI/NFPA 70-1995 – National Electric Code. (all)

G. International Fuel Gas Code (g/e)

1.4 SUBMITTALS

A. Submit unit performance data including: capacity, nominal and operating performance.

B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.

C. Submit shop drawings including overall dimensions as well as installation, operation and service clearances. Indicate lift points and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.

D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

1.5 DELIVERY AND STORAGE

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting of units.

B. Protect units from physical damage. Leave factory shipping covers in place untilInstallation.

1.6 WARRANTY

A. Provide all parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.

B. Provide 2nd thru 5th year parts only warranty for compressor(s).

C. Provide 2nd thru 10th year limited parts only warranty for heat exchanger (gas fired units only).

PART 2 - PRODUCTS

2.1 SUMMARY

A. The contractor shall furnish and install packaged or split system outdoor air unit(s) as shown and scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

B. APPROVED MANUFACTURERS: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:

1. Carrier

2.2 GENERAL DESCRIPTION

A. Unit(s) furnished and installed shall be packaged or split system (as shown and scheduled on the contract documents). Unit(s) shall consist of an insulated, weather-tight metal cabinet, downturn outdoor air intake with metal mesh filter assembly, evaporator coil, condensate drain pan, hot gas reheat coil, electric post-heater or indirect gas heater, supply air blower assembly and an electrical control center. All specified components and internal accessories shall be factory installed.

2.3 UNIT CONTRUCTION

A. Materials: Formed, single wall or double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.

1. Outside casing: galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Pre-painted components as supplied by the factory shall have a baked enamel finish.

2. Internal assemblies: galvanized (G90) steel except for motor supports which shall be minimum14 gauge galvanized (G90) steel.

B. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.

1. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.

a. Thickness: 1/2 inch (50 mm)

b. Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.

C. Access Panels / Doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of galvanized G90 steel or painted galvanized steel.

D. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and a belt or direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.

E. Evaporator Coil: Evaporator coil shall be AHRI Certified and shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of circuited configuration, permitting independent operation of either compressor without conflict with the other compressor. Optional ElectroFin® coil coatings are available.

F. Control panel / connections: Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections.

G. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be non-corrosive composite or welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.

H. Electric heater shall be provided for heating cycle and / or temperature control. Heater shall comply with UL 1995 and be constructed on a galvanized steel frame. heater shall be staged or SCR control and shall include a temperature sensor with field adjustable set point, located in the air stream.

I. Reheat Coil with factory installed modulating hot gas reheat valve, shall be of the copper tube / aluminum fin design and shall be located downstream of the evaporator coil. Optional ElectroFin® coil coating is available.

J. Packaged DX System: unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. The evaporator and condenser coils can be coated with ElectroFin® coil coating (optional). Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit. Condenser fan motors shall be three phase type 56 frame, Open Air Over and Shaft Up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Motors shall be UL Recognized and CSA Certified. The refrigerant compressor(s) shall be hermetic scroll-type modulating using a RAWAL A.P.R. device for modulation of compressor capacity and to help prevent icing of the evaporator coil under low load conditions. The refrigeration circuit shall be equipped with liquid line filter drier, metering device, manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-410A refrigerant. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil.

K. Capacity Modulation: RAWAL Automatic Pressure Regulators (APR) shall be used to modulate capacity of the first stage only.

L. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard microprocessor based digital controller (DDC) that indicates both owner-supplied settings, unit status and fault conditions that may occur. The DDC shall be programmed for discharge air control or space control.

M. Motorized dampers: Motorized damper of [low leakage type shall be shipped loose to prevent shipping damage.

N. Sensors are considered to be part of various optional operational modes or device controllers and are to be factory supplied and installed as specified by the A/E.

O. Blower section construction: Supply air blower shall be forward curved, direct drive (smaller units) or belt drive type (larger units). Blowers hall include neoprene pad isolation.

P. Filters: Filters shall be MERV 7 minimum.

Q. Ratings are to be established in accordance with AMCA 210, “Laboratory Methods of Testing Fans for Rating.”

2.4 UNIT CONTROLS

A. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors or it can be operated as a heating and cooling system controlled by a Building Management System (BMS) with optional BACnet gateway interface. This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.

B. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable.

C. Operating protocol: The DDC shall be factory-programmed for [BACnet MSTP] and [BACnet IP]. Variable Frequency Drive (VFD): Unit shall have factory installed variable frequency drive for modulation of the supply air blower assembly. The VFD shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.

2.5 FANS AND MOTORS

A. Indoor Fan shall direct or belt drive, factory installed and wired to on-board Variable Frequency Drive and shall be equipped with slide out service access.

B. All fan motors shall meet the U.S. Energy Policy of 2005/10 (EPACT).

C. All fan motors shall be permanently lubricated and / or have thermal overload protection.

D. Outdoor fans shall be direct drive, statically and dynamically balanced, draw through in the vertical discharge position.

E. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.

2.6 INDOOR, OUTDOOR, AND REHEAT COILS

A. Indoor and Hot Gas Reheat Coils shall be constructed of copper tubes mechanically bonded to aluminum fins. Micro-Channel Coils shall NOT be acceptable in these positions.

B. Coils shall be leak tested at the factory to ensure pressure integrity. The Indoor, Outdoor, and Reheat Coils shall be pressure and leak tested.

C. The Outdoor coil shall be copper tubes mechanically bonded to aluminum fins, or micro channel design.

D. To prevent re-hydration of condensate from the Indoor coil, the hot gas reheat coil face, and the Indoor coil face shall be separated.

2.7 REFRIGERANT CAPACITY CONTROL

A. Units with scroll compressors shall be equipped with Rawal capacity control device (RCC) on the lead circuit to modulate compressor capacity, and prevent evaporator frosting or freezing

B. RCC set-point is factory set, and field adjustable to maintain desired suction pressure, and compressor discharge pressure.

C. The Condenser coil shall be copper tubes mechanically bonded to aluminum fins, or micro channel design.

D. To prevent re-hydration of condensate from the evaporator coil, the hot gas reheat coil face, and the evaporator coil face shall be separated.

E. Compressors that pulse refrigerant as a means of capacity control will not be acceptable.

2.8 REFRIGERATION SYSTEM.

A. Compressor(s):All units shall have direct drive hermetic or semi-hermetically sealed compressors with centrifugal oil pumps

B. Motor shall be suction gas cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate rated voltage.

C. Internal overloads shall be provided in each compressor.

D. Each compressor shall have a crankcase heater to minimize the amount of liquid refrigerant present in the oil sump during off cycles.

E. Provide each circuit with hermetically sealed refrigerant circuit(s) factory supplied completely piped with liquid line filter drier, liquid line charging port suction and liquid line charging ports, accumulator, and/or liquid receiver.

2.9 SEQUENCE OF OPERATION.

A. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and / or sensors. The unit can also be operated as a heating and cooling system controlled by a Building Management System (BMS). The unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors to control its operation by one of the following two sequences.

2.10 DISCHARGE AIR CONTROLLED (DAT)

A. In the UNOCCUPIED mode, the outside air unit will be off and the outside air damper, if supplied, will be closed. Occupied or Unoccupied is signaled to the IAIRE controller via a normally open or normally closed contact on the OCCUPIED input with a clock or switch. An open contact on the input indicates OCCUPIED, a closed contact indicates UNOCCUPIED.

B. In the OCCUPIED mode, the outside air damper will open and the supply fan will ramp up to the configured fan speed (dependent on whether the unit is heating or cooling). The Fan input is monitored to determine if the fan is operating or not. If not operating, the IAIRE controller will enter into an alarm state, stage OFF cooling or heating and attempt to cycle the fan until it starts.

C. There is a configurable EAT Heat Lockout (default 58F). If the entering air temperature (EAT) is less than or equal to the lockout, then the heat stages will cycle to maintain the discharge air temperature DAT set-point.

D. There is a configurable EAT Cool Lockout (default 61F). If the EAT is more than or equal to this lockout then Y1 is always on and Y2-Y4 is staged on depending on demand (if enabled). The modulating hot gas re-heat cycle will be used to maintain the DAT.

E. If the EAT is greater than the EAT Heat Lockout (default 58F) and less than the EAT Cool Lockout (default 61F), Y1 will stage on and the modulating hot gas reheat cycle will maintain DAT unless DAT set-point equals EAT then free-cooling will engage and Y1 will be off. While in this mode, if discharge humidity is > 50% then Y1 will stage on and if its >70% then Y2 will stage on as well.

2.11 SPACE CONTROLLED

A. In the unoccupied mode, the outside air unit will be off and the outside air damper, if supplied, will be closed. Occupied or Unoccupied is signaled to the IAIRE controller via a normally open or normally closed contact on the OCCUPIED input with a clock or switch. An open contact on the input indicates OCCUPIED, a closed contact indicates UNOCCUPIED.

B. In the OCCUPIED mode, the outside air damper will open and the supply fan will ramp up to the configured fan speed (dependent on whether the unit is heating or cooling). The Fan input is monitored to determine if the fan is operating or not. If not operating, the IAIRE controller will enter into an alarm state, stage OFF cooling or heating and attempt to cycle the fan until it starts.

C. There is a configurable EAT Heat Lockout (default 58F). If the entering air temperature (EAT) is less than or equal to the lockout, then the heat stages will cycle to maintain the discharge air temperature and space temperature set-point.

D. There is a configurable EAT Cool Lockout (default 61F). If the EAT is more than or equal to this lockout then Y1 is always on and Y2-Y4 is staged on depending on demand (if enabled). The modulating hot gas reheat cycle will be used to maintain the space temperature.

E. If the EAT is greater than the EAT Heat Lockout (default 58F) and less than the EAT Cool Lockout (default 61F), Y1 will turn on and the modulating hot gas reheat cycle will be used to maintain space temperature. If EAT less than Space Temperature and Space Temperature is greater than the set-point, free-cooling will engage and Y1 will be off. While in this mode, if space humidity is > 50% then Y1 will stage on and if its > 70% then Y2 will stage on as well. The modulating hot gas reheat cycle will be used to maintain space temperature.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 3000 - Administrative Requirements: Coordination and project conditions.

B. Verify roof curbs are installed and dimensions are [**as indicated on shop drawings**] [**instructed by manufacturer**].

C. Verify concrete housekeeping pad is sized and located correctly.

D. Verify piping rough-in is at correct location.

E. Verify electrical rough-in is at correct location.

3.2 INSTALLATION

A. Install rooftop units on factory built roof-mounting curb with watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

B. Install unit on concrete housekeeping pad, minimum 3-1/2 inches high and 6 inches larger than unit on each side. Refer to Section 03 3000.

C. Locate remote panels [**as indicated on Drawings.**] <_____**.>**

D. Install indoor units on vibration isolators. Refer to Section 23 0548.

E. Connect indoor units to supply and return ductwork with flexible connections. Refer to Section 23 3300.

F. Install refrigerant piping from indoor to outdoor unit. Install refrigerant specialties [**furnished with unit**] [**specified in Section** 23 2300**]**. [**Refer to Section** 23 2300.]

G. Install the following piping accessories on condenser water piping connections. Refer to Section 23 2113.

1. On inlet:

a. Thermometer well for temperature limit controller.

b. Thermometer well and thermometer.

c. Strainer.

d. Flow switch.

e. Flexible pipe connection.

f. Pressure gage.

g. Shut-off valve.

2. On outlet:

a. Thermometer well and thermometer.

b. Flexible pipe connection.

c. Pressure gage.

d. [**Shut-off**] [**Balancing**] valve.

H. Install condensate piping from drain pan to [**nearest floor drain.**] [**condensate drainage system.**] <_____**.>**

I. Install accessories furnished loose for field mounting.

J. Install electrical devices furnished loose for field mounting.

K. Install control wiring between unit control panel and field mounted control devices.

****** [OR] ******

L. Install Work in accordance with [**State**] [**Municipality**] of <_____**>** [**Highways**] [**Public Work's**] standards.

3.3 MANUFACTURER'S FIELD SERVICES

A. Section 01 4000 - Quality Requirements: Manufacturers' field services.

B. Furnish initial start-up and shutdown during first year of operation, including routine servicing and checkout.

3.4 CLEANING

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for cleaning.

B. After construction is completed, including painting, clean exposed surfaces of units.

C. Vacuum clean coils and inside of cabinets.

D. Touch up marred or scratched surfaces of factory finished cabinets, using finish materials furnished by manufacturer.

E. Install new throwaway filters in units after Substantial Completion.

****** [OR] ******

F. Install temporary filters during construction period. Replace with permanent filters after Substantial Completion.

3.5 DEMONSTRATION

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate unit operation and maintenance.

C. Furnish services of manufacturer's technical representative for [**one**] <_____**>** [**8**] <_____**>** hour day to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner, provide at least 7 days notice to [**Architect/Engineer**] <_____**>** of training date.

3.6 PROTECTION OF FINISHED WORK

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for starting and adjusting.

B. Protect finished surfaces of cabinets with protective covers during remainder of construction.

3.7 SCHEDULES

A. Roof top Heat Pumps:

Drawing Code	RT-1	RT-2	RT-3
Location			
[Manufacturer]			
[Model]			
Supply Fan			
Air Flow			
External Static Pressure			
Fan Motor Power			
[**Return**] [**Exhaust**] Fan			
Air Flow			
External Static Pressure			
Fan Motor Power			
Cooling			
Sensible			
Total			
Evaporator entering DB temp			
Evaporator entering WB temp			

Evaporator leaving DB temp			
Evaporator leaving WB temp			
Condenser ambient air temp			
Energy Efficiency Ratio			
Heat			
Input			
Output			
Outdoor DB Air Temp			
Outdoor WB Air Temp			
Co-efficient of Performance			
Sound Rating Number			
Compressor Power Input			
Nominal Capacity			

B. Unitary Heat Pump Units:

Drawing Code	AC-1	AC-2	AC-3
Location			
[Manufacturer]			
[Model Number]			
Total Cooling Capacity			
Space supply			
Air Flow			
Entering Air DB Temperature			
Entering Air WB Temperature			
Leaving Air DB Temperature			
Leaving Air WB Temperature			
Fan Motor			
Heat Pump source			
[Water Flow]			
[Water Temperature]			
Air Flow			
Entering Air Temperature			
Fan [**Pump**] Motor power			
Heating			
Heat Pump Capacity			

Supplemental Coil Capacity			
Number of stages			

END OF SECTION

SECTION 23 8143
AIR-SOURCE UNITARY HEAT PUMPS

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Outdoor, packaged, air-to-air heat pump unit utilizing a hermetic scroll compressor for cooling duty and optional electric heating. Unit shall discharge supply air vertically or horizontally as shown on contract drawings. Outdoor fan/coil section shall have a draw-thru design with vertical discharge for minimum sound levels.

1.2 QUALITY ASSURANCE

A. Unit shall be rated in accordance with AHRI Standards 210/240 and 270.

B. Unit shall be designed in accordance with UL Standard 1995.

C. Unit shall be manufactured in a facility registered to ISO 9001 manufacturing quality standard.

D. Unit shall be UL listed and c--UL certified as a total package for safety requirements.

E. Roof curb shall be designed to conform to NRCA Standards.

F. Insulation and adhesives shall meet NFPA 90A requirements for flame spread and smoke generation.

G. Cabinet insulation shall meet ASHRAE Standard 62P.

1.3 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and handled per manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 CARRIER EQUIPMENT

A. General: Factory-assembled, single-piece, heat pump unit. Contained within the enclosure shall be all factory wiring, piping, controls, refrigerant charge (R-410A), and special features required prior to field start-up.

B. Unit Cabinet:

1. Unit cabinet shall be constructed of phosphated, zinc--coated, pre--painted steel capable of withstanding 500 hours of salt spray.

2. Normal service shall be through 3 removable cabinet panels.

3. The unit shall be constructed on a rust proof unit base that has an externally trapped, integrated sloped drain.

4. Indoor fan compartment top surface shall be insulated with a minimum 1/2--in. (13 mm) thick, flexible fiberglass insulation, coated on the air side and retained by adhesive and mechanical means. The indoor wall sections will be insulated with a minimum semi--rigid, foil--faced board capable of being wiped clean. Aluminum foil--faced fiberglass insulation shall be used in the entire indoor air cavity section.

5. Unit shall have a field--supplied condensate trap.

6. Metal Insulated Duct Covers for side discharge will be standard on all sizes.

7. Unit insulation conforms to ASHRAE 62P.

C. Fans:

1. The indoor fan shall be 5-speed, direct-drive, as shown one equipment drawings.

2. Fan wheel shall be made from steel and shall be double-inlet type with forward-curved blades with corrosion resistant finish. Fan wheel shall be dynamically balanced.

3. Outdoor fan shall be direct--drive, propeller--type with aluminum blades riveted to corrosion resistant steel spiders, be dynamically balanced, and discharge air vertically.

D. Compressor:

1. Fully hermetic compressors with factory--installed vibration isolation.

2. Scroll compressors shall be standard on all units.

E. Coils: Indoor and outdoor coils shall have aluminum plate fins mechanically bonded to seamless copper tubes with all joints brazed. Tube sheet openings shall be belled to prevent tube wear.

F. Refrigerant Metering Device: Refrigerant metering device shall be thermostatic expansion valve or fixed orifice for cooling, and fixed orifice for heating.

G. Filters: Filter section shall consist of field-installed, throwaway, 1in. thick fiberglass filters of commercially available sizes.

H. Controls and Safeties:

1. Unit controls shall be complete with a self--contained, low-voltage control circuit.

2. Units shall incorporate an internal compressor protector that provides reset capability.

I. Operating Characteristics:

1. Unit shall be capable of starting and running at 125°F (51.7°C) ambient outdoor temperature.

2. Compressor with standard controls shall be capable of operation down to 40°F (4.4°C) ambient outdoor temperature in cooling mode.

3. Unit shall be provided with 90-second fan time delay after the thermostat is satisfied.

J. Electrical Requirements: All unit power wiring shall enter the unit cabinet at a single location.

K. Motors:

1. Compressor motors shall be of the refrigerant--cooled type with line--break thermal and current overload protection.

2. All fan motors shall have permanently lubricated bearings, and inherent, automatic reset, thermal overload protection.

3. Condenser fan motor shall be totally enclosed.

4. Evaporator fan motor to be ECM Motor.

L. Special Features Available:

1. Coil Options: Base unit with tin plated indoor coil hairpins available as a factory installed option.

2. Compressor Start Kit (single phase units only): Shall provide additional starting torque for single-phase compressors.

3. Thermostat: To provide for two-stage heating and one-stage cooling in addition manual or automatic changeover and indoor fan control.

4. Crankcase Heater: Shall provide anti-floodback protection for lowload cooling applications.

5. Economizer: (Horizontal - Field installed accessory) (Vertical - Field installed accessory)

   a. Economizer controls capable of providing free cooling using outside air.

   b. Equipped with low leakage dampers not to exceed 3% leakage, at 1.0 IN. W.C pressure differential.

   c. Spring return motor shuts off outdoor damper on power failure.

6. Electric Heaters:

   a. Electric heater shall be available as a field installed option.

   b. Heater elements shall be open wire type, adequately supported and insulated with ceramic bushings.

   c. Electric heater packages must provide single point power connection capability.

7. Filter Rack Kit: Shall provide filter mounting for downflow applications. Offered as a field installed accessory.

8. Flat Roof Curb: Curbs shall have seal strip and a wood nailer for flashing and shall be installed per manufacturer’s instructions.

9. Low Ambient Package: Shall consist of a solid-state control and outdoor coil temperature sensor for controlling outdoor-fan motor operation, which shall allow unit to operate down to 0°F (-17.7°C) outdoor ambient temperature.

10. Manual Outdoor Air Damper: Package shall consist of damper, birdscreen, and rainhood which can be preset to admit outdoor air for year-round ventilation.

11. Square-To-Round Duct Transitions (24-48 size): Shall have the ability to convert the supply and return openings from rectangular to round.

12. Time Guard II: Automatically prevents the compressor from restarting for at least 4 minutes and 45 seconds after shutdown of the compressor. Not required when a corporate programmable thermostat is applied or with a RTU-MP control. Offered as a field installed accessory.

13. Dual Point Electric Heaters: Allows you to power the electric heater and unit contactor separately by having two individual field power supply circuits connected respectively.

14. Cabinet Leakage: Certified to leak 2% or less of nominal air conditioning CFM delivered when pressurized to 1-in. W.C. With all present air inlets, air outlets, and condensate drain port(s) sealed. Available as a factory installed option.

15. Louver Metal Outdoor Coil Grille: Shall provide hail and vandalism protection. Available as a factory installed option and a field installed accessory.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 3000 - Administrative Requirements: Coordination and project conditions.

B. Verify roof curbs are installed and dimensions are [**as indicated on shop drawings**] [**instructed by manufacturer**].

C. Verify concrete housekeeping pad is sized and located correctly.

D. Verify piping rough-in is at correct location.

E. Verify electrical rough-in is at correct location.

3.2 INSTALLATION

A. Install rooftop units on factory built roof-mounting curb with watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

B. Install unit on concrete housekeeping pad, minimum 3-1/2 inches high and 6 inches larger than unit on each side. Refer to Section 03 3000.

C. Locate remote panels [**as indicated on Drawings.**] <_____**.>**

D. Install indoor units on vibration isolators. Refer to Section 23 0548.

E. Connect indoor units to supply and return ductwork with flexible connections. Refer to Section 23 3300.

F. Install refrigerant piping from indoor to outdoor unit. Install refrigerant specialties [**furnished with unit**] [**specified in Section** 23 2300**]**. [**Refer to Section** 23 2300.]

G. Install the following piping accessories on condenser water piping connections. Refer to Section 23 2113.

1. On inlet:

    a. Thermometer well for temperature limit controller.

    b. Thermometer well and thermometer.

    c. Strainer.

    d. Flow switch.

    e. Flexible pipe connection.

    f. Pressure gage.

    g. Shut-off valve.

2. On outlet:

    a. Thermometer well and thermometer.

    b. Flexible pipe connection.

    c. Pressure gage.

    d. [**Shut-off**] [**Balancing**] valve.

H. Install condensate piping from drain pan to [**nearest floor drain.**] [**condensate drainage system.**] <_____**.>**

I. Install accessories furnished loose for field mounting.

J. Install electrical devices furnished loose for field mounting.

K. Install control wiring between unit control panel and field mounted control devices.

3.3 MANUFACTURER'S FIELD SERVICES

A. Section 01 4000 - Quality Requirements: Manufacturers’ field services.

B. Furnish initial start-up and shutdown during first year of operation, including routine servicing and checkout.

3.4 CLEANING

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for cleaning.

B. After construction is completed, including painting, clean exposed surfaces of units.

C. Vacuum clean coils and inside of cabinets.

D. Touch up marred or scratched surfaces of factory finished cabinets, using finish materials furnished by manufacturer.

E. Install temporary filters during construction period. Replace with permanent filters after Substantial Completion.

3.5 DEMONSTRATION

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate unit operation and maintenance.

C. Furnish services of manufacturer's technical representative for [**one**] <_____**>** [**8**] <_____**>** hour day to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner, provide at least 7 days notice to [**Architect/Engineer**] <_____**>** of training date.

3.6 PROTECTION OF FINISHED WORK

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for starting and adjusting.

B. Protect finished surfaces of cabinets with protective covers during remainder of construction.

END OF SECTION

SECTION 26 0500
ELECTRICAL GENERAL PROVISIONS

PART 1 GENERAL

1.1 GENERAL PROVISIONS

A. This division supplements the applicable requirements of other divisions.

1.2 DEFINITIONS

A. For the purpose of Division 26, the following definitions apply:

1. Provide: Furnish and install.

2. Indicated: As shown on the drawings or specified herein.

3. Circuit Designation: panel designation and circuit number, i.e., LA-13.

1.3 SUMMARY

A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this division, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all divisions for related work required to be included as work under this division.

B. Related Documents: The drawings and specifications are complementary; that is, electrical work indicated on any drawing or in any division or any section of specifications shall be provided as though specified herein and drawn in detail on the E-series drawings. In case of ambiguity or conflict among the documents and rules, regulations or requirements, the most stringent provision or the largest quantity of the highest quality shall apply.

1. General provisions for electrical work.

C. Related Work Specified Elsewhere:

1. Motors and installation.

2. Control wiring and conduit for heating, ventilating and air conditioning.

3. Variable frequency drives.

D. Work Not In Contract (N.I.C.):

1. Telephone instruments.

1.4 REFERENCE STANDARDS

A. American National Standards Institute (ANSI).

B. Association of Edison Illuminating Companies (AEIC).

C. Electrical Testing Laboratories (ETL).

D. Illuminating Engineering Society (IES).

E. Institute of Electrical and Electronic Engineers (IEEE).

F. Insulated Cable Engineers Association (ICEA).

G. National Electrical Manufacturers Association (NEMA).

H. National Fire Protection Association (NFPA).

I. Underwriters Laboratories, Inc. (UL).

1.5 QUALITY ASSURANCE

A. Regulations: All the electrical equipment and materials shall be listed by a nationally recognized testing laboratory (NRTL) on equipment where such listing exists. Their installations shall also conform to those listings and the following applicable listings and latest codes and standards:

1. California Electric Code, 2010 Edition (CEC) with Local Amendments.

2. Local and State Fire Marshal.

3. Occupational Safety and Healthy Act (OSHA).

4. Local Codes and Ordinances.

5. Americans with Disabilities Act (ADA).

B. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply.

C. Contractor's Expense: Obtain and pay for all required bonds, insurance, licenses, permits, and pay for all taxes, fees and utility charges required for the electrical work.

D. Testing and Adjustment:

1. Perform all necessary tests required to ascertain that the electrical system has been properly installed, that the power supply to each item of equipment is correct, and that the system is free of grounds, ground faults, and open circuits, and such other tests and adjustments as may be required for the proper completion and operation of the electrical system. Insulation resistance between phase conductors and ground shall not be less than 250,000 ohms.

1.6 CLEANING

A. Clean exterior surfaces of equipment and remove all dir, cement, plaster and other debris. Protect interior of equipment from dirt during construction and clean thoroughly.

B. Clean out cracks, corners and surfaces on equipment to be painted. Remove grease and oil spots so that paint may be applied without further preparation.

1.7 PROJECT RECORD DOCUMENTS

A. Mark Project Record Documents daily to indicate all changes made in the field.

1. In addition to general requirements of Project Record Drawings, indicate on drawings, changes of equipment locations and ratings, trip sizes, and settings on circuit breakers, alterations in raceway runs and sizes, changes in wire sizes, circuit designations, installation details, one-line diagrams, control diagrams and schedules.

2. Project record drawings are to be available on the jobsite for review by the Architect/Engineer.

B. Use green to indicate deletions and red to indicate additions.

C. At project completion, obtain electronic files of electrical CAD drawings and revise per red-line mark-up. Drawings are to be indicated as “Record Drawings”, signed by the Contractor and submitted to the Owner along with project red-lines.

1. Use the same symbols and follow, as much as possible, the same drafting procedures used on the Contract Drawings.

D. Locate underground conduit(s) stubbed-out for future use, underground feeder conduits, and feeder pull box locations using building lines and GPS Coordinates by indicating on the Project Record Drawings.

E. Locate changes in directions of underground conduits using GPS coordinates and by indicating on Project Record Drawings.

1.8 SERVICE INTERRUPTIONS AND UTILITY

A. Coordinate with the Owner the interruption of services necessary to accomplish the work.

B. Coordinate with the Owner all work associated with power and communications distribution systems and service entrance equipment.

1.9 MINIMUM SPECIFICATION REQUIREMENTS (ALL WORK DIVISION 26)

A. As a minimum specification requirements, all materials and methods shall comply with applicable governing codes.

1.10 PENETRATION SEALING

A. Seal penetrations through exterior walls and fire rated walls, floors, ceilings, and roofs.

B. Firestop System installation must meet requirements of ASTM E-814, or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated. Only UL tested firestop systems shall be used in specific locations as follows:

1. Penetrations for the passage of cables, conduit, and other electrical equipment through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

C. A manufacturer's representative shall be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature, drawing details and in accordance with the product listings.

D. Subject to compliance with through penetration firestop systems listed in the UL Fire Resistance Director, unless otherwise noted, provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma.

2. Tremco Sealants & Coatings, Beechwood, Ohio.

3. 3M Fire Protection Products, St. Paul, Minnesota.

1.11 PLACING EQUIPMENT IN SERVICE

A. Do not energize or place electrical equipment in service until all interested parties have been duly notified and are present or have waived their rights to be present. Where equipment to be placed in service involves service or connection from another contractor of the Owner, notify the Owner in writing when the equipment will be ready. Notify the Owner two weeks in advance of the date the various items of equipment will be complete.

1.12 OWNER-FURNISHED ITEMS

A. Pick up or receive Owner-furnished items and handle, deliver, install, and make all final connections.

1. Assume responsibility for the items when consigned at the storage facility in accordance with requirements of the Contract Documents.

1.13 ELECTRIC ITEM LOCATION

A. Electrical drawings are generally diagrammatic. Verify equipment sizes with shop drawings and manufacturers' data and coordinate location layout with other trades. Notify the Owner of any changes of location requirements prior to installation.

1.14 DEMOLITION

A. Scope: Provide and perform demolition, preparatory and miscellaneous work as indicated and specified, complete.

B. Principle Items of Work:

1. Demolition and removal of existing lighting fixtures, outlets, electrical conduit, wiring, and equipment required to complete the project. Demolished materials shall be handled and disposed of in accordance with generally accepted safety procedures and the law.

2. Preparation of the existing building to receive or connect the new work.

3. Miscellaneous demolition, cutting, alteration, and repair work in the existing building necessary for the completion of the entire project.

4. Disconnecting and reconnecting of electrical equipment as required by the construction modifications.

5. Service Continuity: Uninterrupted services, including life safety systems where applicable, shall be maintained to all parts of the building other thank work areas. Schedules shutdowns with the Owner to make alterations and/or additions.

C. Existing Conditions: Make a detailed survey of the existing conditions pertaining to the work. Check the locations of all existing structures, equipment and wiring (branch circuiting and controls).

D. Salvage and Disposal: All removed material (other than items to be reused), shall be returned to the Owner or disposed of in accordance with instructions from the Owner's representative.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes building wire and cable; nonmetallic-sheathed cable; direct burial cable; service entrance cable; armored cable; metal clad cable; and wiring connectors and connections.

B. Related Sections:

1. Section 26 0553 - Identification for Electrical Systems: Product requirements for wire identification.

2. Section 31 2317 - Trenching: Execution requirements for trenching required by this section.

3. Section 31 2323 - Fill: Requirements for backfill to be placed by this section.

1.2 REFERENCES

A. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

C. Underwriters Laboratories, Inc.:

1. UL 1277 - Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

1.3 SYSTEM DESCRIPTION

A. Product Requirements: Provide products as follows:

1. Solid conductor for feeders and branch circuits 10 AWG and smaller.

2. Stranded conductors for control circuits.

3. Conductor not smaller than 12 AWG for power and lighting circuits.

4. Conductor not smaller than 14 AWG for control circuits.

5. Increase wire size in branch circuits to limit voltage drop to a maximum of 3 percent.

B. Wiring Methods: Provide the following wiring methods:

1. Concealed Dry Interior Locations: Use only building wire , Type THHN/THWN insulation, in raceway.

2. Exposed Dry Interior Locations: Use only building wire , Type THHN/THWN insulation, in raceway or metal clad cable.

3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN insulation, in raceway.

4. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.

5. Exterior Locations: Use only building wire, Type THHN/THWN XHHW insulation, in raceway.

6. Underground Locations: Use only building wire, Type THHN/THWN XHHW insulation, in raceway.

7. Cable Tray Locations: Use only Tray cable Type TC.

1.4 DESIGN REQUIREMENTS

A. Conductor sizes are based on copper.

1.5 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit for building wire and each cable assembly type.

C. Test Reports: Indicate procedures and values obtained.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for submittals.

B. Section 26 0500 - General Provisions: Project Record Documents: Record actual locations of components and circuits.

1.7 QUALITY ASSURANCE

A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.

B. Perform Work in accordance with [**[State] [Municipality] of <_____> [Highways] [Public Work's] standard.**]

C. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.9 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on Drawings.

1.10 COORDINATION

A. Section 01 3000 - Administrative Requirements: Requirements for coordination.

B. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

C. Wire and cable routing indicated is approximate unless dimensioned.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Product Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: [**90**] **[105]** degrees C.

E. Insulation Material: Thermoplastic.

2.2 TRAY CABLE

A. Product Description: Multiconductor power and control cable NFPA 70 Type TC.

B. Conductor: Copper.

C. Insulation: Flame-retardant cross-linked polyethylene.

D. Overall Jacket: Polyvinyl Chlorine (PVC) in accordance with UL 1277.

E. Insulation Voltage Rating: 600 volts.

F. Insulation Temperature Rating: 90 degrees C.

G. Listings: Finished cable UL listed as Type TC, and sunlight resistant.

2.3 WIRING CONNECTORS

A. Split Bolt Connectors:

B. Solderless Pressure Connectors:

C. Spring Wire Connectors:

D. Compression Connectors:

2.4 TERMINATIONS

A. Terminal Lugs for Wires 6 AWG and Smaller: Solderless, compression type copper.

B. Lugs for Wires 4 AWG and Larger: Color keyed, compression type copper, with insulating sealing collars.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 3000 - Administrative Requirements: Coordination and project conditions.

B. Verify interior of building has been protected from weather.

C. Verify mechanical work likely to damage wire and cable has been completed.

D. Verify raceway installation is complete and supported.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 EXISTING WORK

A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.

B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank cover for abandoned boxes not removed.

C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.

D. Extend existing circuits using materials and methods as specified.

E. Clean and repair existing wire and cable remaining or wire and cable to be reinstalled.

3.4 INSTALLATION

A. Route wire and cable to meet Project conditions.

B. Neatly train and lace wiring inside boxes, equipment, and panelboards.

C. Identify and color code wire and cable under provisions of Section 26 0553. Identify each conductor with its circuit number or other designation indicated.

D. Special Techniques--Building Wire in Raceway:

1. Pull conductors into raceway at same time.

2. Install building wire 4 AWG and larger with pulling equipment.

E. Special Techniques - Cable:

1. Protect exposed cable from damage.

2. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.

3. Use suitable cable fittings and connectors.

F. Special Techniques - Direct Burial Cable:

1. Trench and backfill for direct burial cable installation. Refer to Section 31 2323 and Section 31 2317. Install warning tape along entire length of direct burial cable, within 3 inches of grade.

2. Use suitable direct burial cable fittings and connectors.

G. Install stranded conductors for branch circuits 10 AWG and smaller. Install crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.

H. Install terminal lugs on ends of 600 volt wires unless lugs are furnished on connected device, such as circuit breakers.

I. Size lugs in accordance with manufacturer's recommendations terminating wire sizes. Install 2-hole type lugs to connect wires 4 AWG and larger to copper bus bars.

J. For terminal lugs fastened together such as on motors, transformers, and other apparatus, or when space between studs is small enough that lugs can turn and touch each other, insulate for dielectric strength of 2-1/2 times normal potential of circuit.

3.5 WIRE COLOR

A. General:

1. For wire sizes 8 AWG and smaller, install wire colors in accordance with the following:

a. Black and red for single phase circuits at 120/240 volts.

b. Black, red, and blue for circuits at 120/208 volts single or three phase.

c. Orange, brown, and yellow for circuits at 277/480 volts single or three phase.

2. For wire sizes 6 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:

a. Black and red for single phase circuits at 120/240 volts.

b. Black, red, and blue for circuits at 120/208 volts single or three phase.

c. Orange, brown, and yellow for circuits at 277/480 volts single or three phase.

B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.

C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.

D. Feeder Circuit Conductors: Uniquely color code each phase.

E. Ground Conductors:

1. For 6 AWG and smaller: Green.

2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

3.6 FIELD QUALITY CONTROL

A. Section 01 4000 - Quality Requirements 017000 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

END OF SECTION

SECTION 26 0533
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.

B. Related Sections:

1. Section 26 0503 - Equipment Wiring Connections.

2. Section 26 0526 - Grounding and Bonding for Electrical Systems.

3. Section 26 0529 - Hangers and Supports for Electrical Systems.

4. Section 26 0534 - Floor Boxes for Electrical Systems.

5. Section 26 0536 - Cable Trays for Electrical Systems.

6. Section 26 0539 - Underfloor Raceways for Electrical Systems.

7. Section 26 0553 - Identification for Electrical Systems.

8. Section 26 2716 - Electrical Cabinets and Enclosures.

9. Section 26 2723 - Indoor Service Poles.

10. Section 26 2726 - Wiring Devices.

11. Section 27 0533 - Conduits and Backboxes for Communications Systems.

12. Section 27 0536 - Cable Trays for Communications Systems.

13. Section 28 0528.33 - Conduits and Backboxes for Electronic Safety and Security.

14. Section 28 0528.36 - Cable Trays for Electronic Safety and Security.

15. Section 33 7119 - Electrical Underground Ducts and Manholes.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.

3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).

B. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.

5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.

7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

B. Underground More than 5 feet outside Foundation Wall: Provide rigid steel conduit, intermediate metal conduit, plastic coated rigid steel conduit, and thickwall nonmetallic conduit. Provide cast metal boxes or handhole.

C. Underground Within 5 feet from Foundation Wall: Provide precast concrete thickwall, plastic coated rigid steel conduit. Provide cast metal or precast concrete boxes.

D. In or Under Slab on Grade: Provide plastic coated conduit, thickwall nonmetallic conduit. Provide cast metal boxes.

E. Outdoor Locations, Above Grade: Provide rigid steel and aluminum conduit, intermediate metal conduit and electrical metallic tubing. Provide cast metal boxes.

F. In Slab Above Grade: Provide rigid steel conduit, intermediate metal conduit, electrical metallic tubing and thickwall nonmetallic conduit. Provide cast metal boxes.

G. Wet and Damp Locations: Provide rigid steel and aluminum conduit, intermediate metal conduit, electrical metallic tubing. Provide cast metal outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.

H. Concealed Dry Locations: Provide rigid steel and aluminum conduit, intermediate metal conduit, electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

I. Exposed Dry Locations: Provide rigid steel and aluminum conduit, intermediate metal conduit, electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

1.4 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 3/4 inch unless otherwise specified. 1/2" may be used for final connections to light fixtures.

1.5 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit for the following:

1. Flexible metal conduit.

2. Liquidtight flexible metal conduit.

3. Nonmetallic conduit.

4. Raceway fittings.

5. Conduit bodies.

6. Surface raceway.

7. Wireway.

8. Pull and junction boxes.

9. Handholes.

C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 7000 - Execution and Closeout Requirements: Closeout procedures.

B. Section 26 0500 - General Provisions: Project Record Documents:

1. Record actual routing of conduits larger than 2 inch.

2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Product Requirements: Product storage and handling requirements.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

1.8 COORDINATION

A. Section 01 3000 - Administrative Requirements: Coordination and project conditions.

B. Coordinate installation of outlet boxes for equipment connected under Section 26 0503.

C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

PART 2 - PRODUCTS

2.1 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. Intermediate Metal Conduit (IMC): Rigid steel.

D. Fittings and Conduit Bodies: NEMA FB 1; all steel fittings.

2.2 PVC COATED METAL CONDUIT

A. Product Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil thick.

B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.3 FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction.

B. Fittings: NEMA FB 1.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction with PVC jacket.

B. Fittings: NEMA FB 1.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: NEMA FB 1; steel, compression type.

2.6 NONMETALLIC CONDUIT

A. Product Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.7 SURFACE METAL RACEWAY

A. Manufacturers:

1. Wiremold.

2. Substitutions: Section 01 6000 - Product Requirements.

B. Product Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.

C. Size: [**<____>x<____> inch**].

D. Finish: Gray enamel.

E. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories; match finish on raceway.

2.8 WIREWAY

A. Product Description: General purpose type wireway.

B. Knockouts: Manufacturer's standard.

C. Size: [**4 x 4 inch**] [**6 x 6 inch**] [**8 x 8 inch**] [**12 x 12 inch**]; length as indicated on Drawings.

D. Cover: [**Hinged**] [**Screw**] cover.

E. Connector: Slip-in.

F. Fittings: Lay-in type with removable top, bottom, and side; captive screws.

G. Finish: Rust inhibiting primer coating with gray enamel finish.

2.9 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.

2. Concrete Ceiling Boxes: Concrete type.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.

C. Wall Plates for Finished Areas: As specified in Section 26 2726.

D. Wall Plates for Unfinished Areas: Furnish gasketed cover.

2.10 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Hinged Enclosures: As specified in Section 26 2716.

C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:

1. Material: Cast aluminum.

2. Cover: Furnish with neoprene gasket, and stainless steel cover screws.

D. Precast Concrete Handholes: Open bottom with extension rings:

1. Cover: Precast concrete bolt down.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 3000 - Administrative Requirements: Coordination and project conditions.

B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 EXISTING WORK

A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.

B. Remove concealed abandoned raceway to its source.

C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.

D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.

E. Extend existing raceway and box installations using materials and methods as specified.

F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 26 0526.

B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 0529.

C. Identify raceway and boxes in accordance with Section 26 0553.

D. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.4 INSTALLATION - RACEWAY

A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.

B. Arrange raceway supports to prevent misalignment during wiring installation.

C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 0529; provide space on each for 25 percent additional raceways.

E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports

F. Do not attach raceway to ceiling support wires or other piping systems.

G. Construct wireway supports from steel channel specified in Section 26 0529.

H. Route exposed raceway parallel and perpendicular to walls.

I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.

J. Route conduit in and under slab from point-to-point.

K. Maximum Size Conduit in Slab Above Grade: 3/4 inch. Do not cross conduits in slab larger than 1/2 inch.

L. Maintain clearance between raceway and piping for maintenance purposes.

M. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.

N. Cut conduit square using saw or pipe cutter; de-burr cut ends.

O. Bring conduit to shoulder of fittings; fasten securely.

P. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.

Q. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations.

R. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch size.

S. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.

T. Install fittings to accommodate expansion and deflection where raceway crosses seismic and expansion joints.

U. Install suitable pull string or cord in each empty raceway except sleeves and nipples.

V. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

W. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.

X. Close ends and unused openings in wireway.

3.5 INSTALLATION - BOXES

A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings.

B. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose.

C. Orient boxes to accommodate wiring devices oriented as specified in Section 26 2726.

D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

E. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in acoustic rated walls.

H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

I. Install stamped steel bridges to fasten flush mounting outlet box between studs.

J. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

K. Install adjustable steel channel fasteners for hung ceiling outlet box.

L. Do not fasten boxes to ceiling support wires or other piping systems.

M. Support boxes independently of conduit.

N. Install gang box where more than one device is mounted together. Do not use sectional box.

O. Install gang box with plaster ring for single device outlets.

3.6 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Section 07 8400.

B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation specified in Section.

C. Locate outlet boxes to allow luminaires positioned as indicated on reflected ceiling plan.

D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.7 ADJUSTING

A. Section 01 7000 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused openings in boxes.

3.8 CLEANING

A. Section 01 7000 - Execution and Closeout Requirements: Final cleaning.

B. Clean interior of boxes to remove dust, debris, and other material.

C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nameplates.

2. Labels.

3. Wire markers.

4. Conduit markers.

5. Stencils.

6. Underground Warning Tape.

B. Related Sections:

1. Section 09 9000 - Painting and Coating: Execution requirements for painting specified by this section.

1.2 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Submittal procedures.

B. Product Data:

1. Submit manufacturer's catalog literature for each product required.

2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

C. Samples:

1. Submit two tags, actual size.

2. Submit two labels, actual size.

D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.3 CLOSEOUT SUBMITTALS

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of tagged devices; include tag numbers.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept identification products on site in original containers. Inspect for damage.

C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Section 01 6000 - Product Requirements: Environmental conditions affecting products on site.

B. Install labels only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

1.6 EXTRA MATERIALS

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for extra materials.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved white letters on black background color.

B. Emergency system nameplates laminated three-layer plastic with engraved white letters on red background color.

C. Letter Size:

1. 1/8 inch high letters for identifying individual equipment and loads.

2. 1/4 inch high letters for identifying grouped equipment and loads.

D. Minimum nameplate thickness: 1/8 inch.

2.2 LABELS

A. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background.

2.3 WIRE MARKERS

A. Description: Cloth tape, split sleeve, or tubing type wire markers.

B. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawings.

2.4 CONDUIT AND RACEWAY MARKERS

A. Description: Stencils.

B. Color:

1. 480 Volt System: Black lettering on white background.

2. 208 Volt System: Black lettering on white background.

C. Legend:

1. 480 Volt System: 480 VOLTS.

2. 208 Volt System: 208 VOLTS.

2.5 UNDERGROUND WARNING TAPE

A. Description: 4 inch wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 9000 for stencil painting.

3.2 INSTALLATION

A. Install identifying devices after completion of painting.

B. Nameplate Installation:

1. Install nameplate parallel to equipment lines.

2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners.

3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners.

4. Secure nameplate to equipment front using screws or rivets.

5. Install nameplates for the following:

a. Switchboards.

b. Panelboards.

c. Transformers.

d. Service Disconnects.

e. Disconnect Switches.

f. Control Panels.

g. Inverters.

h. All similar items.

C. Label Installation:

1. Install label parallel to equipment lines.

2. Install label for identification of individual control device stations, and receptacle circuit identification.

3. Install labels for permanent adhesion and seal with clear lacquer.

D. Wire Marker Installation:

1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

2. Install labels at data outlets identifying patch panel and port designation.

E. Stencil Installation:

F. Underground Warning Tape Installation:

1. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit.

END OF SECTION

SECTION 26 0943
NETWORK LIGHTING CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Networked lighting control system and components.

B. Related Sections:

1. Section 23 0923 - Direct-Digital Control System for HVAC: Execution requirements for interfacing direct digital control systems with lighting control system specified in this Section.

2. Section 25 5000 - Integrated Automation Facility Controls: Execution requirements for interfacing with lighting control system specified in this Section.

3. Section 26 0503 - Equipment Wiring Connections: Execution requirements for electric connections specified by this Section.

4. Section 26 0533 - Raceway and Boxes for Electrical Systems: Product requirements for raceway and boxes for placement by this Section.

5. Section 26 0553 - Identification for Electrical Systems: Product requirements for electrical identification items for placement by this Section.

6. Section 26 2726 - Wiring Devices: Product requirements for wiring devices for placement by this Section.

1.2 REFERENCES

A. Federal Communications Commission:

1. Standard for Radio Frequency Equipment.

B. Government Electronics and Information Technology Association:

1. EIA 709.1 - Control Network Protocol Specification.

C. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

E. UL:

1. UL 50 - Enclosures for Electrical Equipment.

2. UL 67 - Panelboards.

3. UL 508 - Industrial Control Equipment.

4. UL 916 - Energy Management Equipment.

1.3 SYSTEM DESCRIPTION

A. Provide networked lighting control system consisting of components manufactured by single source.

B. Provide networked lighting control system consisting of:

1. Multiple relay panels linked over network wiring using open protocol for communications.

2. Relay panels and programmable switches connected together by networked wiring system extending from panel locations with single communications bus to allow switches to communicate with panels.

3. System connected to single time clock mounted [**in interior of relay panel**] [**at remote location**].

C. Networked lighting control system performs lighting control in following building areas:

1. Office Area #1: <_____>.

2. Office Area #2: <_____>.

3. <_____>.

4. <_____>.

1.4 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate dimensioned drawings of lighting control system components and accessories.

1. One Line Diagram: Indicating system configuration indicating panels, number and type of switches, data line, and network time clock.

2. Drawings for each panel showing hardware configuration and numbering.

3. Panel wiring schedules.

4. Include typical wiring diagrams for each component.

C. Product Data: Submit manufacturer's standard product data for each system component.

D. Manufacturer's Installation Instructions: Submit for each system component.

E. Manufacturer's Certificate: Certify <_____> <_____>. Submit in writing system has been installed, adjusted, and tested according to manufacturer's recommendations.

F. Manufacturer's Field Reports: Indicate acceptance of component and equipment installation, interconnecting wiring, and startup of system software.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record following information:

1. Wiring diagrams reflecting field installed conditions with identified and numbered system components and devices.

2. Drawings for each panel showing hardware configuration and numbering.

C. Operation and Maintenance Data:

1. Submit manufacturer's published installation instructions, operating instructions, programming instructions, and operator's guide.

2. System user's guide and programmer's guide.

3. Instruction books and manufacturer's printed materials.

4. Recommended renewal parts list.

1.6 QUALITY ASSURANCE

A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet when tested according to NFPA 262.

B. Comply with NFPA 70 as applicable to electrical wiring work.

C. Comply with NEMA 250 for type of electrical equipment enclosures.

D. Provide panelboards with UL listing according to UL 50, UL 67, and UL 916.

E. Provide equipment complying with FCC emissions' standards in part 15 subpart J for Class A application.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing lighting control system listed in this Section, with minimum five years' experience.

B. Installer: Company specializing in performing Work of this Section with minimum 5 years' experience.

1.8 PRE-INSTALLATION MEETINGS

A. Section 01 3000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept system components on Site in manufacturer's packaging. Inspect for damage.

C. Protect components by storing in manufacturer's containers indoors, protected from weather.

1.10 WARRANTY

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for warranties.

B. Furnish five-year manufacturer's warranty for each system component.

1.11 MAINTENANCE SERVICE

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for maintenance service.

B. Furnish service and maintenance of system for one year from date of Substantial Completion. Include maintenance items as shown in manufacturer's operating and maintenance data, including checkout and adjustments.

C. Furnish service during working hours on breakdowns and malfunctions for this maintenance period.

D. Maintain locally, near Place of Work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, with maximum four-hour response time.

E. Perform maintenance Work using competent and qualified personnel under supervision of manufacturer or original installer.

F. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of Owner.

1.12 EXTRA MATERIALS

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for extra materials.

B. Furnish 20 percent of total number of relays.

C. Furnish two of each switch type.

D. Furnish two of each occupancy sensor type.

E. Furnish two of each photocell type.

F. Furnish one replacement key for each lockingswitch and relay panel.

PART 2 - PRODUCTS

2.1 NETWORKED LIGHTING CONTROL SYSTEM

A. Manufacturers:

1. NLight.
2. LC&D.
3. GreenGate.
4. Watt-Stopper.
5. Lutron Electronics.
6. Substitutions: Section 01 6000 - Product Requirements.

B. Product Description: Networked lighting control system consisting of relay panels, network wiring, programmable network wired switches, programmable clock, software, and capability of integration into building automation system.

2.2 RELAY PANELS

A. UL listed, NEMA 250 Type 1 enclosure sized to accept up to [**8**] [**12**] [**16**] [**24**] [**32**] [**48**] relays.

B. Power Supply: Transformer assembly with two 40 VA transformers with separate secondaries. Transformers include internal overcurrent protection with automatic reset and metal oxide varistor protection against power line spikes.

C. Voltage: [**120**] [**240**] [**277**] V ac, [**60**] Hz, plus or minus 10 percent.

D. Mounting: [**Surface**] [**Flush**].

E. Cover: Hinged, locking configuration with wiring schedule directory card.

F. Interior: Bracket and intelligence board backplane with factory mounted and tested relays.

G. Furnish with integral DIN rail mounting bar to allow for installation of system components. Furnish terminals to accept network wiring for connection of switches to system, or to allow network wiring to be run between multiple panels for network communications between panels.

H. Furnish with individual on-off switches for both panel and network wiring power.

I. Furnish eight channels in each interior regardless of size, each with associated pushbutton to toggle channel on-off, and terminal block for separate dry contact input. Each relay in panel capable of being assigned to each channel, with overlapping allowed. Furnish each channel pushbutton with LED state indication.

J. Furnish each channel pushbutton with LED status indication.

K. Relays:

1. Type: Momentary-pulsed mechanically latching contactors rated at 20 A, 120 to 277 V ac attached to interior by plug-in type connector.

2. Locate next to each relay individual override button and LED to indicate state - relay on or relay off.

3. Furnish screw terminations for each wiring connection.

4. Furnish each channel button's dry control contact input terminal with capability of accepting two or three wires, maintained or momentary inputs and two-wire toggling input.

5. Furnish each channel with isolated contact for use with status feedback or pilot light control.

6. Relay panel records channel wiring assignments and current status of each relay, in nonvolatile memory to prevent data loss on power failure.

7. Furnish LED status indication of power supply status. Furnish access to 24 V ac and 24 V rectified power for accessory devices within panel.

8. Locate terminal blocks next to each relay to allow standard low voltage switching devices to control relay state. Devices can be either two- or three-wire, maintained or momentary inputs. Devices also accept two-wire toggling input.

2.3 NETWORK WIRING

A. Material: 18/4 twisted conductor with shield meeting Class 2P requirements. Data line can be run in loop, serial, or star configuration. Minimum one turn for every 3 inches; 50 picofarads/ft. maximum.

B. Maximum Length: 1,500 feet.

C. Maximum Number of Devices: 127.

2.4 PROGRAMMABLE NETWORK WIRED SWITCHES

A. Function: Allow individual overrides. Switches terminated to network wiring of each panel.

B. Configuration: [**Single,**] [**dual,**] [**quad,**] [**or**] [**octal**].

C. Switch module buttons capable of being individually programmed and assigned to each of following four functions:

1. Control each individual relay in single panel.

2. Control each group of relays in single panel.

3. Control each of eight channels in single panel.

4. Control similar channel letter in each chosen group of panels in system.

D. For applications requiring pattern switching, each button performs function using "on-off-not controlled" pattern of relays instead of normal "all on-all off."

E. Features:

1. Equipped with bicolor LED pilot light for individual buttons to indicate status of controlled relay or group of relays.

2. Equipped with locator light.

3. Furnish individual buttons with removable clear cover for labeling controlled loads.

4. Furnish [**single**] [**dual**] [**quad**] [**and**] [**octal**] switches with single master button capable of overriding every relay controlled by individual buttons to off position or capable of restoring them to their original state. Each switch unit master button function is capable of being configured to perform desired function.

5. Furnish dip switches on back of module to prevent switch from turning off lights accidentally.

6. Each module available in locking version. When key is inserted, individual buttons function for five minutes.

2.5 PROGRAMMABLE CLOCK

A. From each plug-in point on network wiring, time clock can be used to:

1. Schedule each eight-channel groups in relay panel network.

2. Program network wired switches.

B. Includes user selectable functions to handle standard lighting control functions for each channel independently. Selectable functions include:

1. Scheduled on and scheduled off.

2. Manual on and scheduled off.

3. Astronomical on and astronomical off with optional offset.

4. Astronomical on and scheduled off with optional offset.

C. Each channel capable of being assigned following:

1. Time delay from 1 to 256 minutes.

2. Automatic blinking of lights before turning off to allow occupants opportunity to enter override. Time interval configurable.

D. Features:

1. Furnish clock with display and user interface.

2. Capable of being adjusted for leap year, daylight savings dates, and holidays.

2.6 SOFTWARE

A. Furnish plug-in capability for use in system commissioning, programming, monitoring, and control. Software capable of functioning with EIA 709.1 compliant network tool.

B. After programming of system parameters is completed, system allows each user-definable feature such as schedules, relay groups, and switch assignments to be field modified without need for configuration software or system integration expertise.

2.7 BAS INTEGRATION

A. In addition to hardwired channel inputs, furnish system with capability for integration into [**direct digital control system**] without use of dry contact, gateways, or protocol converters. Integration accomplished via network connections of EIA 709.1 compliant devices.

B. Refer to Section [**255000**] [**230923**] <_____>.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount switches occupancy sensors and photocells as indicated on Drawings.

B. Label each low voltage wire clearly indicating connecting relay panel. Refer to Section 26 0553.

C. Use only properly color coded, stranded wire. Install wire sizes as indicated on Drawings.

D. Mount relay panels as indicated on Drawings. Wire numbered relays in panel to control power to each load.

E. Identify power wiring with circuit breaker number controlling load. When multiple circuit breaker panels are feeding into relay panel, label wires to clearly indicate originating panel's designation.

F. Terminate communication conductors and associated conduits external to factory supplied equipment.

G. Test relays and switches after installation to confirm proper operation.

H. Label each low voltage wire with relay number at each switch or sensor.

I. Install wiring schedule directory card affixed to rear of panel cover to identify circuits, relays, and loads controlled.

3.2 FIELD QUALITY CONTROL

A. Section 01 4000 - Quality Requirements 017000 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Test relays and switches after installation to confirm proper operation and confirm correct loads are recorded on directory card in each panel.

3.3 MANUFACTURER'S FIELD SERVICES

A. Section 01 4000 - Quality Requirements: Requirements for manufacturer's field services.

B. System Startup: Furnish manufacturer trained, factory authorized technician to confirm proper installation and operation of system components.

C. Furnish services of factory trained representative for minimum of one day for factory check, test, and startup supervision. Perform following services:

1. Check installation of panelboards.

2. Test operation of remote controlled devices.

3. Test operation of telephone override phone lines.

4. Test operation of network connections.

5. Test operation of central operator's station and associated printer.

6. Repair or replace defective components.

D. Programming: Furnish services of factory trained representative to perform programming of system. Assist Owner's personnel in developing control scenario for each application. Program Owner furnished control scenario.

1. Explain operation of control programs to Owner and conduct demonstration of project.

2. Provide programs on CD.

3. Maintain copy of programmed information at factory.

3.4 ADJUSTING

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for starting and adjusting.

B. Furnish factory trained technicians to functionally test each system component after installation to verify proper operation.

3.5 DEMONSTRATION

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate operation of following system components:

1. Index system to occupied cycle and unoccupied cycle.

2. Operation of switches. Demonstrate for all zones.

3. Operation of each type of occupancy sensors. Demonstrate for all zones.

4. Operation of each type of photocell. Demonstrate for all zones.

C. Furnish services of manufacturer's technical representative for eight hours to instruct Owner's personnel in operation and maintenance of system. Schedule training with Owner, provide at least seven days' notice to Architect/Engineer of training date.

END OF SECTION

SECTION 26 2416
PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution and branch circuit panelboards.

2. Electronic grade branch circuit panelboards.

B. Related Requirements:

1. Section 26 0526 - Grounding and Bonding for Electrical Systems.

2. Section 26 0553 - Identification for Electrical Systems.

3. Section 26 2813 - Fuses.

1.2 REFERENCE STANDARDS

A. Institute of Electrical and Electronics Engineers:

1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

B. National Electrical Manufacturers Association:

1. NEMA FU 1 - Low Voltage Cartridge Fuses.

2. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

3. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.

4. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

5. NEMA PB 1 - Panelboards.

6. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

C. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

E. UL:

1. UL 50 - Cabinets and Boxes

2. UL 67 - Safety for Panelboards.

3. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.

4. UL 1283 - Electromagnetic Interference Filters.

5. UL 1449 - Transient Voltage Surge Suppressors.

6. UL 1699 - Arc-Fault Circuit Interrupters.

1.3 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit catalog data showing specified features of standard products.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker, and fusible switch arrangement and sizes.

D. Source Quality control submittals: Indicate results of factory tests and inspections.

E. Field Quality Control Submittals: Indicate results of Contractor furnished tests and inspections.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.

C. Operation and Maintenance Data: Submit spare parts listing, source and current prices of replacement parts and supplies, and recommended maintenance procedures and intervals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for maintenance products.

B. Extra Stock Materials:

1. Furnish two of each panelboard key. Panelboards keyed alike [**to Owner's current keying system**] <_____>.

1.6 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

2. Manufacturer to be same as for switchboards.

3. Enclosure manufacturer to be the same as overcurrent devices.

PART 2 - PRODUCTS

2.1 DISTRIBUTION PANELBOARDS

A. Manufacturers:

1. Eaton.

2. Schneider Electric.

3. Siemens.

4. Substitutions: Not Permitted.

5. To be same manufacturer as switchboards.

B. Furnish materials according to [**State**] [**Municipality**] of <_____> [**Highways**] [**Public Work's**] standards.

C. Description: NEMA PB 1, [**circuit breaker type**] [**fusible switch type**] panelboard. Furnish combination controllers as indicated on Drawings.

D. Operation:

1. Service Conditions:

a. Temperature: <_____> degrees F.

b. Altitude: <_____> feet above sea level.

2. Minimum integrated short circuit rating: [**10,000**] [**22,000**] [**65,000**] [**100,000**] [**200,000**] <_____> A rms symmetrical for 240 [**208**] V panelboards; [**14,000**] [**65,000**] [**100,000**] [**200,000**] <_____> A rms symmetrical for 480 V panelboards[**, or as indicated on Drawings**].

E. Materials

1. Panelboard Bus: [**Copper,**] current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

2. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Furnish interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate NEMA FU 1, Class [**R**] [**J**] fuses.

3. Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

4. Molded Case Circuit Breakers with Current Limiters: UL 489, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.

5. Current Limiting Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical A, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.

6. Controllers: NEMA ICS 2, AC general-purpose Class A [**magnetic**] [**solid-state**] controller for induction motors rated in horsepower.

   a. Two-Speed Controllers: Include integral time delay transition between FAST and SLOW speeds.

   b. Full-Voltage Reversing Controllers: Include electrical interlock and integral time delay transition between FORWARD and REVERSE rotation.

   c. Control Voltage: [**120**] [**480**] <_____> volts, 60 Hertz.

   d. Overload Relay: NEMA ICS 2; melting alloy.

   e. Auxiliary Contacts: NEMA ICS 2, two each field convertible contacts in addition to seal-in contact.

   f. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty type.

   g. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.

   h. Pushbuttons: Shrouded Lockable type.

   i. Indicating Lights: , LED type.

   j. Selector Switches: Rotary type.

   k. Relays: NEMA ICS 2,.

   l. Control Power Transformers: 120 V secondary, 100 VA minimum, in each motor starter. Furnish fused secondary, and bond unfused leg of secondary to enclosure.

7. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated on Drawings. Provide each circuit breaker with padlockable lock-off device.

8. Enclosure: NEMA PB 1, Type [**1**] [**3R**] <_____>, <_____>inches deep, <_____> inches wide, cabinet box.

9. Cabinet Front: Surface type, fastened with screws hinged door with flush lock metal directory frame.

F. Finishes:

1. Manufacturer's standard gray enamel.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Manufacturers:

1. Eaton.

2. Schneider Electric.

3. Siemens.

4. Substitutions: Not Permitted.

5. To be same manufacturer as switchboards.

B. Furnish materials according to [**State**] [**Municipality**] of <_____> [**Highways**] [**Public Work's**] standards.

C. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

D. Materials:

1. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard; furnish insulated ground bus as indicated on Drawings.

2. For non-linear load applications subject to harmonics furnish 200 percent rated, plated copper, solid neutral.

3. Minimum Integrated Short Circuit Rating: [**10,000**] [**22,000**] [**65,000**] <_____> A rms symmetrical for 240 V panelboards; [**14,000**] [**65,000**] <_____> S rms symmetrical for 480 V panelboards[**, or as indicated on Drawings**].

4. Molded Case Circuit Breakers: UL 489, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Provide UL class 760 arc-fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.

5. Current Limiting Molded Case Circuit Breakers: UL 489, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical A, let-through current and energy level less than permitted for same size NEMA FU 1, Class RK-5 fuse.

6. Enclosure: NEMA PB 1, [**Type 1**] [**Type 3R**] <_____>.

7. Cabinet Box: 6 inches deep, [**20 inches**] [**<_____> inches**] wide [**for 240 V and less panelboards, 20 inches wide for 480 V panelboards**] [**for 240 V and less panelboards, <_____> inches wide for 480 V panelboards**].

E. Cabinet Front: [**Flush**] or [**Surface as indicated on Drawings**] cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finishes:

1. Finish in manufacturer's standard [**gray**] <_____> enamel.

2.3 ELECTRONIC GRADE PANELBOARD

A. Description:

1. Integral Surge Suppresser: Component recognized according to UL 1449 and UL 1283.

2. Panelboard: UL 67 listed and TVSS device UL 1449 Component Recognized. TVSS device meets UL 1449. Furnish panelboard markings with clamp voltage at TVSS terminals and clamp voltage at panelboard line terminals.

B. Performance:

1. Integral Surge Suppressers:

a. Maximum single impulse current rating not less than [**80 kA**] [**120 kA**] [**160 kA**] [**200 kA**] <_____> for each phase.

b. Pulse Lift Test: Capable of protecting against and surviving 5000 IEEE C62.41 Category C transients without failure or degradation.

c. Clamping Voltage:

1) 208Y/120 Configuration:

a) L-N: 500 V.

b) N-G: 500 V.

c) L-G: 500 V.

2) 480Y/277 Configuration:

a) L-N: 1,000 V.

b) N-G: 1,000 V.

c) L-G: 1,000 V.

C. Fabrication:

1. Integral Surge Suppresser:

a. Furnish copper bus bars for surge current path.

b. Construct using surge current modules (MOV based). Each module fused with user replaceable 200,000 AIR rated fuses. Status of each module monitored on front cover of panelboard enclosure and on module.

c. Furnish with audible alarm activated when one of surge current modules has failed. Furnish alarm on/off to silence alarm and alarm push-to-test switch to test alarm. Locate switches and alarm on front cover of panelboard enclosure.

d. Furnish response time no greater than five nanoseconds for individual protection modes.

e. Designed to withstand maximum continuous operating voltage (MCOV) of not less than 115 percent of nominal RMS voltage.

f. Furnish visible indication of proper suppresser connection and operation. Lights indicate operable phase and module.

g. Furnish minimum EFI/RFI filtering of 34 dB at 100 kHz with insertion loss ratio of 50:1 using Mil Std. 220A methodology.

2. Panelboards:

a. Top or bottom feed as indicated on Drawings. Furnish circuit directory inside door.

b. Construct box of galvanized steel. Box size as indicated on Drawings.

c. Main bus constructed of copper and rated for load current.

d. Furnish interior with branch circuit breakers. Furnish one [**60**] <_____> A [**circuit breaker**] [**circuit breakers**], with appropriate number of poles, as dedicated disconnect for TVSS.

e. Furnish [**standard rated**] [**200 percent rated**] neutral assembly with copper neutral bus.

f. Furnish with insulated ground bus and safety ground bus.

g. Furnish wiring gutters according to NEC.

h. Field connections to panelboard: [**main lug**] [**main breaker**] type.

i. Construct with [**flush**] [**surface**] mounted trim and NEMA Type [**1**] <_____> enclosure.

j. Furnish with branch breaker positions and nominal current rating as indicated on Drawings.

2.4 SOURCE QUALITY CONTROL

A. Section 01 4000 - Quality Requirements: Testing, inspection, and analysis requirements.

B. Independently test integral surge suppressers with category C3 high exposure waveform (20 kV-1.2/50us, 10kA-8/20 us) per IEEE C62.41.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Disconnect abandoned panelboards and load centers. Remove.

B. Maintain access to existing panelboard and load centers remaining active and requiring access. Modify installation or provide access panel.

3.2 INSTALLATION

A. Install panelboards according to NEMA PB 1.1.

B. Install panelboards plumb.

C. Install recessed panelboards flush with wall finishes.

D. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

E. Install filler plates for unused spaces in panelboards.

F. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes to balance phase loads. Identify each circuit as to its clear, evident and specific purpose of use.

G. Install engraved plastic nameplates according to Section 26 0553.

H. Install spare conduits out of each recessed panelboard to accessible location above ceiling [**below floor**]. Minimum spare conduits: five empty 1 inch. Identify each as spare.

I. Ground and bond panelboard enclosure according to Section 26 0526. Connect equipment ground bars of panels according to NFPA 70.

3.3 [**REPAIR**] [**RESTORATION**]

A. Repair existing panelboards and load centers to remain or to be reinstalled.

3.4 FIELD QUALITY CONTROL

A. Section 01 4000 - Quality Requirements: Requirements for inspecting and testing.

B. Inspect and test according to NETA ATS, except Section 4.

C. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.

D. Perform switch inspections and tests listed in NETA ATS, Section 7.5.

E. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

3.5 ADJUSTING

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for starting and adjusting.

B. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

3.6 CLEANING

A. Section 01 7000 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean existing panelboards and load centers to remain or to be reinstalled.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes wall switches; wall dimmers; receptacles; multioutlet assembly; and device plates and decorative box covers.

B. Related Sections:

1. Section 26 0521 - Undercarpet Cable.

2. Section 26 0533 - Raceway and Boxes for Electrical Systems: Outlet boxes for wiring devices.

3. Section 26 0534 - Floor Boxes for Electrical Systems: Service fittings for receptacles installed on floor boxes.

4. Section 26 0534 - Floor Boxes for Electrical Systems: Poke-through receptacles.

5. Section 26 0539 - Underfloor Raceways for Electrical Systems: Service fittings for receptacles installed in underfloor raceways.

1.2 REFERENCES

A. National Electrical Manufacturers Association:

1. NEMA WD 1 - General Requirements for Wiring Devices.

2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.3 SUBMITTALS

A. Section 01 3300 - Submittals.

B. Product Data: Submit manufacturer's catalog information showing dimensions, colors, and configurations.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.5 EXTRA MATERIALS

A. Section 01 7700 - Project Closeout.

B. Furnish two of each style, size, and finish wall plate.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

A. Manufacturers; Single Pole Switch:

1. Harvey Hubbell, Inc. Model 1221

2. Leviton Manufacturing Company Model 1221.

3. Pass and Seymour Model 20AC1.

4. Substitutions: Section 01 6100 - Product Requirements.

B. Manufacturers; Double Pole Switch:

1. Harvey Hubbell, Inc. Model 1222.

2. Leviton Manufacturing Company Model 1222.

3. Pass and Seymour Model 20AC2.

4. Substitutions: Per Division 01.

C. Manufacturers; Three-Way Switch:

1. Harvey Hubbell, Inc. Model 1222.

2. Leviton Manufacturing Company. Model 1223

3. Pass and Seymour Model 20AC3.

4. Substitutions: Section 01 6100 - Product Requirements.

D. Color: Red for switches connected to Life Safety Systems; Color as selected by Architect for all others.

E. Product Description: NEMA WD 1, Heavy-Duty, AC only general-use snap switch.

F. Ratings:

1. Voltage: 120-277 volts, AC.

2. Current: 20 amperes.

2.2 RECEPTACLES

A. Manufacturers; Single Convenience Receptacle:

1. Hubbell Model 5361.

2. Leviton Model 5361.

3. Pass and Seymour Model 5361.

4. Substitutions: Section 01 6000 - Product Requirements.

B. Manufacturers; Duplex Convenience Receptacle:

1. Hubbell Model 5362.

2. Leviton Model 5362.

3. Pass and Seymour 5362.

4. Substitutions: Section 01 6000 - Product Requirements.

C. Manufacturers; GFCI Receptacle:

1. Hubbell Model GF5362.

2. Leviton Model 6899.

3. Pass and Seymour Model 2097TR.

4. Substitutions: Section 01 6000 - Product Requirements.

D. Manufacturers: Arc-Fault Receptacle:

1. Hubbell Model AFR20.

2. Leviton Model AFTR2.

3. Pass and Seymour Model AF20TR.

4. Substitutions: Section 01 6000 - Product Requirements.

E. Manufacturers: Isolated Ground Receptacles:

1. Hubbell Model IG5252.

2. Leviton Model 5262IG.

3. Pass and Seymour Model IG5362.

4. Substitutions: Section 01 6000 - Product Requirements.

F. Manufacturers: Plug Load-Half Control Receptacles:

1. Hubbell Model BR20CI.

2. Leviton Model 5362SI.

3. Pass and Seymour Model 5262CH.

4. Substitutions: Section 01 6000 - Product Requirements.

G. Product Description: NEMA WD 1, Heavy-duty general use receptacle.

H. Device Body: Red body for receptacles connected to the Life Safety system; orange for isolated ground and color as selected by Architect for all others.

I. Configuration: NEMA WD 6, type as indicated on Drawings.

J. Convenience Receptacle: Type 5-20.

K. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

L. Receptacles in damp and wet locations shall be listed as weather resistant “WR”.

M. All receptacles to be tamper resistant.

2.3 WALL DIMMERS

A. Thin profile slide-to-off.

B. Lutron Nova-T.

2.4 OCCUPANCY SENSORS

A. Wall Switches and Ceiling sensors shall be Green Gate, Inc. as indicated on Drawings.

B. Switchpacks: Green Gate, Inc. as indicated on Drawings.

2.5 WALL PLATES

A. Manufacturers:

1. Red Dot.

2. Hubbell.

3. Leviton.

4. Pass and Seymour.

5. Substitutions: Section 01 6100 - Project Requirements.

B. Decorative Cover Plate: 302 stainless steel.

C. Jumbo Cover Plate: 302 stainless steel.

D. Weatherproof Cover: Aluminum or polycarbonate cover with hinged and gasketed device lid U.L. listed as weatherproof while “in use”.

2.6 MULTI-OUTLET ASSEMBLY

A. Manufacturers:

1. Wiremold.

2. Substitutions: Section 01 6100 - Product Requirements.

B. Multi-outlet Assembly: Aluminum channel with fitted cover, suitable for use as multi-outlet assembly.

C. Size: As indicated on Drawings.

D. Receptacles: Furnish covers and accessories to accept receptacles specified in this Section.

E. Receptacle Spacing: As indicated on Drawings.

F. Receptacle Color: Red body for devices connected to Life Safety system; as selected by Architect for all others.

G. Channel Finish: Brushed aluminum.

H. Fittings: Furnish manufacturer's standard couplings, elbows, outlet and device boxes, and connectors

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify outlet boxes are installed at proper height.

B. Verify wall openings are neatly cut and completely covered by wall plates.

C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

A. Clean debris from outlet boxes.

3.3 EXISTING WORK

A. Disconnect and remove abandoned wiring devices.

B. Modify installation to maintain access to existing wiring devices to remain active.

C. Clean and repair existing wiring devices to remain or to be reinstalled.

3.4 INSTALLATION

A. Install devices plumb and level.

B. Install switches with OFF position down.

C. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

D. Do not share neutral conductor on load side of dimmers.

E. Install receptacles with grounding pole on top.

F. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.

G. Install wall plates on flush mounted switches, receptacles, and blank outlets.

H. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

I. Connect wiring devices by wrapping solid conductor around screw terminal. Install stranded conductor for branch circuits 10 AWG and smaller. When stranded conductors are used in lieu of solid, use crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under device screws.

J. Use jumbo size plates for outlets installed in masonry walls.

K. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.5 FIELD QUALITY CONTROL

A. Section 01 7700 - Project Closeout.

B. Inspect each wiring device for defects.

C. Operate each wall switch with circuit energized and verify proper operation.

D. Verify each receptacle device is energized.

E. Test each receptacle device for proper polarity.

F. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

A. Section 01 7000 - Testing and Inspections.

B. Adjust devices and wall plates to be flush and level.

3.7 CLEANING

A. Section 01 7700 - Project Closeout.

B. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes interior luminaires, lamps, ballasts, and accessories.

B. Related Sections:

1. Section 09 5416 - Luminous Ceilings.

2. Section 09 5800 - Integrated Ceiling Assemblies.

3. Section 26 0526 - Grounding and Bonding for Electrical Systems.

4. Section 26 0533 - Raceway and Boxes for Electrical Systems.

5. Section 26 5200 - Emergency Lighting.

1.2 REFERENCES

A. American National Standards Institute:

1.3 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate dimensions and components for each luminaire not standard product of manufacturer.

C. Product Data: Submit dimensions, ratings, and performance data.

D. Samples: Submit two color chips 3 x 3 inch in size illustrating luminaire finish color where indicated in luminaire schedule.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.5 MOCK-UP

A. Section 01 4000 - Quality Requirements: Mock-up requirements.

B. Provide luminaires in ceiling assembly mock-up specified in Section <_____>.

C. Locate [**where directed by Architect/Engineer.**]

D. Incorporate accepted mockup as part of Work.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.7 MAINTENANCE MATERIALS

A. Section 01 7000 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish [**two**] <_____> of each plastic lens type.

C. Furnish [**one**] <_____> replacement lamps for each lamp installed.

D. Furnish [**two**] <_____> of each driver type.

E. Furnish <_____> of <_____>.

PART 2 - PRODUCTS

2.1 INTERIOR LUMINAIRES

A. Product Description: Complete interior luminaire assemblies, with features, options, and accessories as scheduled.

B. Refer to Section 01 6000 - Product Requirements for product options.

2.2 FLUORESCENT BALLASTS

A. Manufacturers:

1. Advance.

2. Magnetek.

3. Universal.

B. Product Description: [**Electronic ballast**] [**less than 10 percent THD**], suitable for lamps specified, with voltage to match luminaire voltage.

2.3 FLUORESCENT DIMMING BALLASTS AND CONTROLS

A. Manufacturers:

1. General Electric.

2. Lithonia Lighting.

3. Lutron Electronics.

4. Osram.

5. Phillips.

B. Product Description: Electrical assembly of control unit and ballast to furnish smooth dimming of fluorescent lamps.

C. Control Unit: [**Linear slide**] type, rated [**500**] [**1000**] [**1500**] <_____> watts at [**120**] [**277**] volts.

D. Ballast: Selected by dimming system manufacturer as suitable for operation with control unit and suitable for lamp type and quantity specified for luminaire.

2.4 FLUORESCENT LAMPS

A. Manufacturers:

1. General Electric.

2. Phillips.

PART 3 - EXECUTION

3.1 EXISTING WORK

A. Disconnect and remove abandoned luminaires, lamps, and accessories.

B. Extend existing interior luminaire installations using materials and methods as specified.

C. Clean and repair existing interior luminaires to remain or to be reinstalled.

3.2 INSTALLATION

A. Install suspended luminaires using pendants supported from swivel hangers. Install pendant length required to suspend luminaire at indicated height.

B. Support luminaires larger than 2 x 4 foot size independent of ceiling framing.

C. Locate recessed ceiling luminaires [**as indicated on reflected ceiling plan**].

D. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.

E. Exposed Grid Ceilings: [**Support surface-mounted luminaires on grid ceiling directly from building structure**].

F. Install recessed luminaires to permit removal from below.

G. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Install clips to secure recessed grid-supported luminaires in place.

I. Install wall-mounted luminaires at height [**as indicated on Drawings**].

J. Install accessories furnished with each luminaire.

K. Connect luminaires to branch circuit outlets provided under Section 26 0533 [**using flexible conduit**].

L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

M. Install specified lamps in each luminaire.

N. Ground and bond interior luminaires in accordance with Section 26 0526.

3.3 FIELD QUALITY CONTROL

A. Section [**014000 - Quality Requirements**] [**017000 - Execution and Closeout Requirements**]: Field inspecting, testing, adjusting, and balancing.

B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.4 ADJUSTING

A. Section 01 7000 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Aim and adjust luminaires.

3.5 CLEANING

A. Section 01 7000 - Execution and Closeout Requirements: Final cleaning.

B. Remove dirt and debris from enclosures.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

3.6 PROTECTION OF FINISHED WORK

A. Section 01 7000 - Execution and Closeout Requirements: Protecting finished work.

B. Relamp luminaires [**having failed lamps**] at Substantial Completion.

END OF SECTION

SECTION 27 1000
COMMUNICATIONS STRUCTURED CABLING

PART 1 - GENERAL

1.1 GENERAL INTRODUCTION

A. The work shall consist of the design, provision, termination, testing and documentation of a complete and fully functional structured high-performance copper and optical fiber communications cabling system. The instructions in this section are specific to communications installations and should be read in conjunction with other contract documents as applicable.

1.2 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Antelope Valley Community College District, Facilities Building and/or project site, prior to conduit placement in slab or below grade, and prior to layout of BDF conduits and rack systems.

1.3 QUALIFICATIONS

A. The telephone and data cabling system installation work detailed in this section shall be carried out by a specialist installer company. The installer shall be certified by CommScope in the installation and testing of the cabling system and certified by Corning for the installation and testing of the Corning LANscape Fiber Optic systems.

B. The installer shall have a proven track record in the field of telephone and data (high performance copper and optical fiber) cabling system installation. The installer shall have completed at least three previous installations of comparable size, complexity and manpower within the last three years. Each installation shall utilize components, installation practices and testing procedure equivalent to those specified in this document.

C. The Installer shall hold a valid State Contractors License for the duration of the project. The Installer shall be responsible for obtaining permits and other requirements for performing work on this project. All costs associated with obtaining permits and other documentation shall be included in the bid sum for the project.

1.4 DEFINITIONS

A. Throughout this specification, the following definitions will apply:

1. Provide: Supply, furnish, deliver, install, pull, fix, dress, terminate, label, test, ground and document the components as per these specifications.

2. Telecommunications Closets are floor-serving spaces that provide a connection point between backbone and horizontal distribution pathways.

3. Backbone Cables: Cables interconnecting the Equipment Room (ER) and Telecommunications Rooms (TRs).

4. Link Cables: Cables interconnecting Telecommunications Rooms (TRs).

5. Horizontal Cables: Cables interconnecting the Telecommunications Rooms (TRs) to each workstation outlet.

6. External Cables: Cables that interconnecting the building to external connection point(s) and/or other building(s). These cables are Outside Plant (OSP) or Indoor / Outdoor rated.

7. Station Cables: Cables linking workstation outlet to active equipment.

8. Owner: shall refer to the Antelope Valley Community College District, or their designated representative.

9. Architect: shall refer to Huitt-Zollars.

10. Construction Project Manager (CPM): Refer to the designated Construction Project Manager.

11. Construction Contractor (Contractor): shall refer to the General Contractor and any of its sub-contractors.

12. Consultant: Vantage Technology Consulting Group.

13. Bidder: A company invited to bid for the works.

14. Installer/Contractor: The Company installing the equipment as defined in this specification.

1.5 MANUFACTURER'S COMPLETE SYSTEMS

A. The cabling system specified in this document shall be an end to end solution that is sourced from, and manufactured by CommScope, for an end-to-end UNIPRISE system and qualify for the CommScope 25-year extended product warranty and Application Assurance.

B. Unless explicitly noted within these specifications, this shall include patch panels, connectors, cables, patch cords, faceplates and other associated components.

C. Where it is specified that a system be provided by "manufacturer xxx or equal", a substitution of another manufacturer's products will only be considered for a complete end to end solution of equal quality, as determined by the Construction Project Manager. All substitutions shall conform to the substitution requirements detailed in the specifications. In instances where these specifications do not include the statement "or equal" for a particular component or system, substitutions will not be entertained.

1.6 PERSONNEL

A. The personnel who will be employed on the contract shall be suitably trained in the management of a project of this nature and/or in the installation and maintenance of products of the type being provided to be able to carry out all work in a competent manner.

B. The Installer shall provide a site manager responsible for all site-related issues. This individual shall be the single point of contact for the project team and shall carry a mobile phone so they can be contacted during the working hours of the project.

C. The Installer shall be certified by the component manufacturer(s) in the installation and testing of the cabling system and shall be able to provide a manufacturers' extended performance warranty for the 'end to end' cabling system.

1.7 LABELING AND NUMBERING SCHEME

A. Labeling of the cabling system shall be in accordance with EIA/TIA 606-B for the Administration of the Telecommunications Infrastructure for Commercial Buildings. All components shall be labeled with required identifiers to conform to this standard. Refer to Antelope Valley College Campus Design Handbook, Section 27 0553.

1.8 WARRANTY

A. Installer to provide a warranty for one year from Notice of Completion on all materials and workmanship installed or supplied as part of the cabling system.

B. The Installer shall also supply an extended performance warranty, as offered by the components' manufacturer(s): CommScope Uniprise Systems and Corning LANscape Systems.

C. System Warranty Requirements - The System Warranty applies only to Products that are: (i) installed by an Authorized Partner, at the location listed on the System Warranty Certificate; (ii) installed in compliance with CommScope's written design, engineering and installation procedures, and the specifications for the Application; (iii) designed, installed, and maintained in compliance with the applicable ANSI/TIA-568, ANSI/TIA-569 or ISO/ IEC 11801, as may be amended, in effect at the date of Certification Date; (iv) not subject to conditions that exceed the individual Product Performance Specification(s); (v) used at the original site of installation; (vi) tested pursuant to industry standards and applicable CommScope testing requirements and satisfactorily pass such tests; and (vii) not otherwise expressly excluded or invalidated under the System Warranty Terms and Conditions.

1.9 QUALITY

A. The Contractor shall be responsible for the complete provision and installation of all components as specified herein. The Contractor shall provide all tools, equipment, fixtures, appliances, ancillary piece parts and hardware as necessary to complete the assembly and installation as required. The Construction Project Manager may conduct scheduled or unscheduled inspections of the Contractor's work at any time during construction. All work included in the scope assigned to the contractor that is associated with this project shall be accomplished in a workmanlike manner, installed and assembled plumb, level and square. The product shall be delivered to the Antelope Valley Community College District finished, complete, and ready to operate according to the manufacturer's specifications.

B. All installation work shall be completed to the standard of the samples approved by the Construction Project Manager during the submittal process. Any products not installed to the quality detailed in these specifications and approved in the submittal process shall be reworked by the Installer to the satisfaction of the Construction Project Manager at no additional cost to the Antelope Valley Community College District.

1.10 STANDARDS

A. All products, services and documentation provided by the Installer shall meet the requirements of the following where applicable:

1. National Electric Code (NEC), 2014 Edition.

2. Relevant State Electric and Fire Codes.

3. ANSI/EIA/TIA 568-C.3 Commercial Building Telecommunications Wiring Standard.

4. ANSI/EIA/TIA 569B Commercial Building Standard for Telecommunications Pathways and Spaces.

5. ANSI/EIA/TIA 606 B Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

6. ANSI/EIA/TIA 607C Commercial Building Grounding and Bonding Requirements for Telecommunications - 2016.

7. BICSI publications:

   a. Telecommunications Distribution Methods Manual, 13th Edition.

   b. Information Technology Systems Installation Methods Manual (ITSIMM), 7th Edition.

   c. Customer Owned Outside Plant Design Manual, 5th Edition.

   d. ANSI/BICSI 001-2017, Information and Communication Technology Systems Design and Implementation Best Practices for Educational Institutions and Facilities.

8. Manufacturer's recommendations and installation guidelines.

9. Antelope Valley College Campus Design Handbook dated June 7, 2017, and all addendums.

B. All publications referred to in this document shall be the latest edition.

1.11 SUBMITTALS

A. Cabling Diagram: Submit, for approval, a complete cabling diagram. The diagram shall be based on the single line drawing included in the Construction Documents. It shall be updated to show quantities and part numbers for all components including patch panels, cable, conduit, cabinets and equipment racks, splices, splice cases and all other associated components.

B. Test Equipment: Submit, for approval, details of each item of test equipment to be used to test the optical fiber and copper components. Include patch cords and other specialized components. Testing shall not commence until equipment and methods are approved by the consultant.

C. Product Literature/Data Sheets: Submit for approval manufacturer's product data sheets for each component of the telephone and data cabling systems. Certify that the data sheets depict the components to be provided by the Installer to make up the complete system as described in this specification. The actual part numbers to be used must be highlighted or noted on each submittal. A catalogue showing only general product categories will not be accepted.

D. Component Samples and Mock-ups:

1. Provide one full size installation sample mock-up of each of the following components for approval. All samples are to be fully labeled as per these specifications. Samples are to be delivered to the Construction Manager's office on site prior to installation.

2. Outlet Samples:

a. Provide a mock-up of each communications outlet, as listed below. The sample is intended to represent a typical communications outlet and shall include all associated parts to make a complete sample. Provide bushings and strain relief for the horizontal cable jacket, demonstrating how the cable shall be secured. Label the outlet and each connector as detailed in this specification.

b. Provide samples of the following outlet configurations:

1) Wall-mounted outlet (Quad) - provide the communications outlet and all terminations, and a 36" length of the relevant cable(s).

2) Wall-mounted instructor station (12-port) containing (6) Cat 6 data cables, (2) Cat 6 Shielded cables w/ Yellow jacks or icons, and (4) blanks. Include a sample of the labeling schema for approval.

E. As-Built Documentation:

1. Following completion of the installation, submit the following record drawings, documentation and testing for approval.

2. As-Built Drawings: As built drawings shall show all locations and pathways for Technology Outlets Technology Equipment Locations, Telecommunication Grounding Busbars (TGB), Telecommunications Bonding Backbones (TBB), and identification.

3. Final Test Results:

a. Test results for each cable indicating tests performed, results obtained and values measured.

b. Provide complete test results and graphs for each cable. Summary PASS / FAIL tests will not be accepted on their own.

4. All documentation and drawings shall be provided in an electronic format (AutoCAD for drawings, MS Excel for schedule, etc.) and supplied on CD-ROM or DVD-ROM.

PART 2 - PRODUCTS

2.1 HORIZONTAL COPPER CABLES

A. Workstation voice and data cable: CommScope Uniprise 7504 Category 6 cables with a blue jacket.

B. Workstation voice and data cable for LASD network: CommScope Uniprise 7504 Category 6 cables with a teal jacket.

C. Workstation analog voice cable for EOC outlets: CommScope Uniprise 7504 Category 6 cables with a gray jacket.

D. AV Instructor to monitor data cable: CommScope Uniprise 65S4 Shielded Category 6 F/UTP cables with a yellow jacket.

E. Security Camera Data cable: CommScope Uniprise 7504 cables with an orange jacket.

F. Wireless Access Point data cable: CommScope Uniprise 10G4 Category 6A cables with a white jacket.

2.2 OPTICAL FIBER CABLES

A. 50/125 Micron Multimode (OM4) Cable Elements shall conform to the following specification:

1. 50/125 micron multimode optical fiber cable with glass core and cladding (tolerances 50+/-3 micron, 125 +/-2 micron).

2. Graded refractive index profile.

3. Attenuation coefficient at 850 nm of 3.5 dB/km or less.

4. Attenuation coefficient at 1300 nm of 1.5 dB/km or less.

5. Bandwidth distance product at 850 nm of 2000 MHz.km or more (laser) and 1500 MHz.km (overfilled launch).

6. Bandwidth distance product at 1300 nm of 500 MHz.km or more.

7. Individual glass elements proof tested at 100 kpsi (100,000 lbs. per square inch).

8. Number of elements as indicated on the Drawings.

B. Singlemode (OS2) Cable Elements shall conform to the following specification:

1. 8.3 micron core diameter, 125 micron cladding diameter (+/- 1 micron).

2. Mode field diameter of between 8.7 and 9.3 (with +/- 0.5-micron tolerance) at 1310 nm.

3. Attenuation coefficient at 1310 nm of 1.0 db/km or less.

4. Attenuation coefficient at 1550 nm of 1.0 db/km or less.

5. Cladding non-circularity of +/- 1%.

6. Core to cladding concentricity error of no more than 0.8 micron.

7. Maximum dispersion rate of 2.80 ps/nm-km at 1300 nm.

8. Maximum dispersion rate of 17.00 ps/nm-km at 1550 nm.

9. Individual glass elements proof tested at 100 kpsi (100,000 lbs. per square inch).

10. Number of elements as indicated on the Drawings.

C. External Cable: OSP fiber cable for connection to the campus network is not part of this scope.

2.3 WORK AREA CONNECTORS

A. CommScope Uniprise eight position modular Cat 6 and Cat 6A RJ45 jacks.

2.4 PATCH PANELS

A. Category 6: CommScope Uniprise Cat 6 UNP-U-610-2U-48 RJ-45 patch panels.

B. Category 6A: CommScope Uniprise UNP-U-10G-2U-48 patch.

C. Rack Mounted Optical Fiber Patch Panel:

1. Corning CCH-02U optical fiber patch panel:

a. OM4 Cassette numbers CCH-CP12-E4.

b. OS2 Cassette numbers CCH-CP12-A9.

2.5 OPTICAL FIBER CONNECTORS

A. Multimode Optical Fiber Connectors: Provide LC multimode optical fiber connectors, conforming to TIA-568-C.3 Optical Fiber Cabling Components standards.

B. Singlemode Optical Fiber Connectors: Provide singlemode LC optical fiber connectors, conforming to TIA-568-C.3 Optical Fiber Cabling Components standards.

2.6 PATCH CORDS

A. Provide two high performance copper patch cords per telecommunications outlet. These shall be sourced from the same manufacturer as the connectors provided as a part of this project. Each cord shall meet or exceed the performance specifications in this document when installed as part of the end-to-end cabling system described in this specification.

1. 20% of the patch cords shall be 3 feet in length and blue in color.

2. 60% of the patch cords shall be 7 feet in length and blue in color.

3. 20 % of the patch cords shall be 11 feet in length and blue in color.

B. Optical Fiber: Provide one optical fiber patch cord per optical fiber pair installed. These shall be sourced from the same manufacturer as the optical fiber connectors provided as a part of this project. Each cord shall meet or exceed the optical fiber performance specifications in this document.

1. 20% of the patch cords shall be 3 feet in length and orange/aqua/yellow in color.

2. 60% of the patch cords shall be 7 feet in length and orange/aqua/yellow in color.

3. 20% of the patch cords shall be 11 feet in length and orange/aqua/yellow in color.

C. The patch cords are to be passed to the client on completion of the project. Each cord is to have a manufacturer’s certificate of conformance and shall be in its original, unopened packaging.

2.7 WORK AREA FACEPLATES

A. Wall-mounted Faceplate: Provide CommScope Uniprise wall-mounted flush modular faceplate to house work area jacks, capable of housing a minimum of six jacks. The faceplate shall fit over a deep 5-Square telecommunications box by Steel City (T&B 82181T-1) or Randl (T-55017) electrical outlet box fitted with a single gang plaster ring and shall match the electrical trim in color.

B. Blanking Inserts: Provide blanking inserts, matching faceplates, in sufficient quantities to cover all unused openings in every faceplate.

C. Stainless Steel Wallphone Faceplate: Provide a stainless steel wall mounted flush modular faceplate to house a single work area jack. The faceplate shall fit over a standard NEMA electrical 2-gangoutlet box fitted with a single gang plaster ring cover. The faceplate shall be capable of having a wall-mounted telephone fitted directly over it.

2.8 EQUIPMENT CABINETS AND RACKS

A. Provide Chatsworth Equipment Cabinets as shown on the Drawings and table below:

TR	DESCRIPTION	MFG	PART NUMBER	QUANTITY
BDF	SEISMIC EQUIPMENT CABINET	CPI	Z4-22N-113C-C12	1
BDF	SEISMIC 19” TWO POST RACK	CPI	46353-703	4
BDF	6” VERTICAL CABLE MANAGER	CPI	13704-703	3
BDF	CABLE MANAGER FINGER KIT	CPI	13696-001	3
BDF	VCS OFFSET MOUNTING BRACKET	CPI	13699-701	3
BDF	TOP MOUNT CABLE WATERFALL TRAY	CPI	15275-701	2

B. Each cabinet or rack shall conform to the following specification:

1. Provide cable supports, to each side, at rear to loom fixed cable terminations.

2. Provide (1) 2U front-side horizontal patch management in the top and the bottom of each cabinet and top and bottom of each patch panel. Each cabinet shall be equipped with at least one vertical cable manager designed for the selected system.

3. All other parts needed to make the cabinet into a usable system shall be provided. These parts include appropriate bolts, installation kits, and mounting equipment for items specified.

2.9 COMMUNICATIONS BACKBOARD

A. Provide AC- grade or better plywood, 8 ft. high with a minimum thickness of 0.75 in. on the equipment rack locations. Plywood shall be either fire- rated or treated on all sides with at least

two coats of fire- resistant paint. The bottom of the plywood shall be mounted 6” above finished floor.

PART 3 - EXECUTION

3.1 HORIZONTAL CABLING AND COMPONENTS

A. Horizontal Cabling: Provide one four-pair high performance horizontal cable running from each work area connector to the patch panels located in the Telecommunications Room serving that outlet. Terminate all four pairs of each end of each cable with an RJ45 communications connector using the EIA/TIA 568B termination scheme.

B. Work Area Outlets:

1. Standard Work Area Outlet: Each standard work area outlet will be a wall-mounted flush modular faceplate configured with (4) RJ45 connectors, unless otherwise noted. The faceplate shall fit over a deep 5-Square telecommunications box by Steel City (T&B 82181T-1) or Randl (T-55017) electrical outlet box fitted with a single gang plaster ring cover and shall match the electrical faceplate color. Any unused faceplate opening shall contain a matching blanking insert.

2. Wall-phone Faceplate: Each wall-phone outlet will be a wall mounted flush modular faceplate to house a single (1) RJ45 connector. The faceplate shall fit over a deep NEMA electrical outlet box fitted with a single gang plaster ring cover and be capable of having a wall-mounted telephone fitted directly over it.

3. Furniture / Raceway Faceplate: Each Furniture outlet will be a flush mounted modular faceplate to house RJ45 work area jacks as shown on the drawings. The faceplate shall fit over a modular raceway.

4. TV Outlet: Each TV outlet will be a wall-mounted flush modular faceplate configured with (2) RJ45 connector network cables, unless otherwise noted. The faceplate shall fit over a deep 5-Square telecommunications box by Steel City (T&B 82181T-1) or Randl (T-55017) electrical outlet box fitted with a single gang plaster ring cover and shall match the electrical faceplate color, U.O.N. Refer to AV drawings. Any unused faceplate opening shall contain a matching blanking insert.

3.2 BACKBONE CABLING AND COMPONENTS

A. Copper Backbone Cabling (Not applicable for this project).

B. Optical Fiber Backbone Cable (Not applicable for this project).

3.3 TECHNOLOGY INFRASTRUCTURE

A. Data system equipment cabinets and racks:

1. Provide equipment cabinets and racks, as shown on the Drawings and in Table A, Section 2.8 of this document.

2. Securely fix the cabinets/racks in place.

3. Whenever cables are to enter the cabinets from above, provide a 12”x6” grommeted opening on the top of the cabinet.

4. Attach the power strip to the cabinet/rack. Ensure that the power strips are connecting to the cabinets/racks in such a way that the structural integrity of the cabinets/racks is not compromised. Connect the cabinet power strip to an appropriate power receptacle.

5. Fix each cabinet and rack to the floor and supporting walls to provide stability and prevent movement of the cabinet or rack. Fix adjacent racks and cabinets together.

6. Install the appropriate seismic transverse and longitudinal bracing per any local codes and the current NUSIG (National Uniform Seismic Installation Guidelines).

3.4 INSTALLATION PRACTICE

A. Provide bushings, grommets and strain relief for cables terminating at wall mounted outlets and patch panels to ensure durable and robust connections. The bushings and grommets are intended to protect the cables from any sharp edges that present a risk to the cables. Ensure that all sharp edges are covered to protect the cables from damage.

B. No cable is to be pulled through a conduit “L-bend” (condulets). In existing routes with L-bends, the cables are to be pulled to the L-Bend. The cable is then to be carefully pulled through the remainder of the conduit run.

C. Install all cables in complete runs from outlet or patch panel to patch panel. In line joints, splices, distribution points or other intermediate connections are not permitted unless specifically called out by this specification.

D. At no point shall the communications cables be tied to power cables or other building services or their supports, or run in the same ducts, raceways, conduits or connection boxes as power cabling.

E. Use plenum-rated tie wraps in plenum spaces.

F. Reinstate all pull-wires in conduits and ducts after use to facilitate future addition of cables.

G. Cables shall not be held so tightly with cable ties that the cable jackets are indented by the cable ties.

H. Individually and properly ground all equipment cabinets, racks and ladder rack. Ground all metallic sheath communications cables entering the building per manufacturer specifications and NEC 770-33, 800-33 and 800-40.

I. Replace all moisture and fire barrier material in ducts, conduits and other penetrations disturbed during installation of communications cabling. Install barrier material in all fire-rated penetrations that have cabling running through them. The barrier material shall be installed so the final penetration has the same fire rating as the original wall/floor.

J. Provide expansion plugs in all ducts/conduits entering the building. Seal all unused ducts/conduits with plugs that allow the pull-string to be tied off on the inside.

K. Provide J-hooks and cable hangers as necessary to support cables running in the ceiling void. J-hooks shall be appropriately sized to allow a minimum of 50 percent spare capacity for future cable installation. J-hooks shall be at least 1” wide, and fitted at no more than 48” centers.

L. Conduit fill ratios shall not exceed the current requirements of the NEC.

M. Provide Velcro hook and loop ties to secure cabling running in the Telecom Closets. Provide straps at 3' intervals. On completion of installation, neatly run and re-tie all cable bundles in the Closet.

N. All cable bundles exiting floor or wall penetrations and running into furniture or casework shall be wrapped in spiral wrap or split-loom tubing to protect the cabling and provide a neat installation.

O. Labels shall be machine generated, not hand written, and placed within 12 inches of each end of each cable.

3.5 UNUSED COMPONENTS

A. Any components purchased in accordance with these specifications and unused shall be documented and passed to the Antelope Valley Community College District on completion of the Project.

3.6 TESTING

A. General Instructions:

1. The testing is to show beyond reasonable doubt that there are no errors, damaged or incorrectly installed components, that the installation is correctly labeled and that all the installed components meet or exceed the criteria detailed in these specifications and applicable standards. Any test that does not show that a component is satisfactorily installed, as per these specifications, shall be repeated. If a test procedure needs to be modified to satisfactorily test some components, the modification shall be submitted for approval of the Construction Project Manager, prior to the tests being conducted.

2. Following optical fiber and data cable installation, including labeling and termination at both ends, undertake and record tests to ensure that the cabling system will perform satisfactorily in service. In addition to the tests detailed in this specification, the Installer shall carry out any additional tests that the Installer deems necessary to ensure the satisfactory operation of the telephone and data systems. The costs of these additional tests shall be borne by the Installer.

3. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to testing. Any testing performed on incomplete systems shall be redone on completion of the work.

4. Provide the Construction Project Manager with the opportunity to witness all testing. On reasonable request, the installer shall demonstrate that the test procedure competently identifies the fault conditions being tested for.

5. Complete and record all of the tests identified in these specifications.

6. Notify the Construction Project Manager ten working days before the date of commencement of the cable tests. Provide details in writing, on that advance date, of proposed tests, the test schedule, equipment to be used, its certification and calibration and the names and qualifications of test personnel.

7. Personnel shall be competent in and qualified by experience or training for comprehensive TDR and OTDR operation and troubleshooting, for both copper and optical fiber testing.

8. Ensure that all test equipment is in calibration before delivery to site and throughout the testing period. The Installer shall be responsible for ensuring that any necessary tests and rework to maintain equipment's calibration status is carried out. Any tests performed on uncalibrated test equipment shall be repeated at the Installer's cost.

9. The test documentation shall be available for inspection by the Construction Project Manager during the installation period and copies shall be passed to the Construction Project Manager within five working days of completion of tests on cables in each area. The Installer shall retain a copy to aid preparation of as-built information.

10. Failures detected during the testing shall be noted on the test results schedule, rectified and re-tested. On the fault being rectified, this shall also be noted. These notes shall not be deleted or obliterated.

11. Rectification of all damaged cables shall include replacing damaged cables with new cables in complete runs, replacing damaged connectors or remaking poor terminations. In-line cable joints, splices or distribution points will not be acceptable except where specified in this document. All damaged cables shall be removed from site.

12. If on submittal of the As-Built documentation there are any missing test results or incorrectly named files, the test shall be repeated at the Installer's expense.

B. Category 6A and Category 6 Cabling:

1. Test each Category 6A and Category 6 Cable and its associated connectors. Carry out the following tests on every pair of every cable:

   a. Wire Map.

   b. Length.

   c. Insertion Loss.

   d. NEXT Loss.

   e. ELFEXT.

   f. Propagation Delay and Delay Skew.

   g. Return Loss.

   h. Power Sum Near-End Crosstalk (PSNEXT) Loss.

   i. Power Sum Equal Level Far-End Crosstalk (PSELFEXT).

2. The tester shall have the following parameters:

   a. Level IV field tester shall be used to test every twisted-pair cabling.

   b. Tester shall be configured to match the manufacturer used for the installation.

   c. Tester shall be configured to test permanent link.

C. Work Area Faceplates and Blanking Plates:

1. Carry out a visual inspection of the faceplates and blanking plates. Replace all damaged components.

2. Ensure that all faceplate labels are installed correctly.

D. Optical Fiber Cabling:

1. Test each Optical Fiber Cable and its associated connectors. Carry out the following tests on every element of every optical fiber cable:

   a. Length.

   b. End-to-End Attenuation.

   c. Connector Loss.

   d. Splice Loss.

   e. Power Loss.

2. Test each optical fiber cable element and its associated connectors. Carry out the following test on every element of every optical fiber cable:

   a. Visually check optical connectors using microscope (minimal magnification x200) to ensure that no physical damage has occurred during the installation process. There are to be no scratches on the core of the fiber or pits on the core or cladding. If any defect cannot be rectified with polishing, the connector is to be replaced.

   b. Record the length and loss of each mated connector pair on the test results schedule for all elements.

   c. Verify the labeling of the cable and connectors is correct.

   d. If a element has an excessive attenuation coefficient, a sudden step in attenuation coefficient (greater than 0.2 dB) or back scatter, losses due to micro bending or macro bending or has any other fault then the fault on that element shall be rectified.

   e. The attenuation of each multimode connector shall be measured in one direction (outward). The attenuation of each singlemode connector shall be measured in both directions.

   f. Each fusion splice shall be tested in both directions for both multimode and singlemode elements. The measurements for each direction shall be averaged for the final attenuation figure for each fusion splice.

   g. The return loss must be measured in both directions for single mode connectors. The return loss shall be greater or equal to the value shown in the table above.

E. Any failures shall be recorded (including value of excessively lossy terminations) and the results obtained after rectification of the fault shall be recorded.

END OF SECTION

SECTION 27 4150
AUDIOVISUAL SYSTEM EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The work covered in this Section consists of furnishing all labor, material and services to install a complete audiovisual system as indicated on the project drawings and in these Specifications.

B. Delivery of the work described in this Specification shall include, but not be limited to, the following Basic Services:

1. Engineering and Design: The Audiovisual Integrator shall provide all system engineering and design necessary to develop the complete systems described herein. Engineering and Design shall include preparation of all necessary electronic schematics, hardware drawings, systems diagrams, schedules and lists. Additionally, final system design and configuration with the Owner, as well as on site audiovisual coordination and infrastructure installation review with the General Contractor is required.

2. Assembly: The Audiovisual Integrator shall procure and assemble all hardware and equipment and any additional materials as required to deliver completely functioning Audiovisual Systems.

3. Software Programming: The Audiovisual Integrator shall perform all required software setup, configuration, and programming required to develop a complete operating system in accordance with this Specification, including all control logic and push button component faceplate or interface programming.

4. Installation: The Audiovisual Integrator shall install all equipment, cable, wiring, connectors, plates and other material at the Project site per the Integrator’s approved designs. The Audiovisual Integrator shall install any owner furnished equipment identified in this document and calibrate it to work with the integrated systems.

5. Testing and Adjustment: The Audiovisual Integrator shall perform all tests and adjustments, furnish all test equipment necessary and perform all work required to properly configure the systems and to verify their performance in accordance with the information in this Specification and the Integrator’s approved engineered designs.

6. Acceptance Testing: Prior to Owner acceptance and hand-over of the completed Audiovisual Systems, the Audiovisual Integrator shall demonstrate the operation of the complete systems, including all individual devices and specified control functions. Both subjective and objective tests may be required by the Owner to determine compliance with the information in this Specification and the Integrator’s approved designs.

7. Training: The Audiovisual Integrator shall provide technical training of Owner's staff, instructing them on Audiovisual Systems operation, maintenance and troubleshooting.

8. Warranty: The Audiovisual Integrator shall warranty the Audiovisual Systems in accordance with the terms of this Specification.

1.2 DEFINITION OF TERMS

A. Definitions of the terminology used in this Specification are as follows:

1. Owner or Client: Shall refer to Antelope Valley College (AVC), or their designated representative.

2. Architect: Shall refer to Huitt-Zollars, Inc.

3. Construction Manager (CM): Shall refer to selected services supplier.

4. General Contractor (GC): Shall refer to selected services supplier.

5. Audiovisual Consultant (Consultant): Shall refer to Vantage Technology Consulting Group.

6. Audiovisual Integrator (Integrator): Shall refer to the Integrator contracted to provide the services and material delineated herein under the GC or sub-contracted under another Construction Contractor.

7. Construction Contractor: Shall refer to a designated sub-contractor to the General Contractor.

8. Audiovisual Specification (Specification): Shall refer to the complete set of designs, performance and delivery requirements delineated within this document and all referenced documents

9. Audiovisual System (AV System): Shall refer to the complete compliment of equipment, software and other material that upon completion of assembly, installation and configuration provides the full functionality and technical performance delineated in this Specification

10. Audiovisual Equipment (AV Equipment): Shall refer to any and all individual equipment items installed as a part of the Audiovisual System.

11. Work: Design and provision the Audiovisual Systems and associated equipment, software and services for the Project

12. Construction Documents: Shall include all documentation associated with the design and general construction of the Project, including this Specification

13. Provide: Supply, deliver, install, test, configure, label, and commission.

14. Manufacturer: Shall refer to the original manufacturer of any equipment provided as part of the Work.

15. Commissioning Date: Shall refer to the date at which a system is formally accepted by the Owner,

16. By Others: Shall refer to work or equipment provided outside the scope of work of this Section.

1.3 PROJECT IDENTIFICATION

A. Project Information: Project location for Audiovisual services will be within the FA4 & APL swing spaces. Space will comprise of labs, classrooms, conference spaces and additional specialty areas and elements (signage/wayfinding, etc.) on the basement, first and second levels of the existing building.

B. Project Location: Antelope Valley College, Lancaster, CA.

1.4 PRELIMINARY SCHEDULE

A. See current project construction schedule and coordinate with CM for actual dates and critical milestones.

1.5 REGULATORY REQUIREMENTS

A. The Audiovisual Integrator shall obtain any permits and shall pay all fees required by public agencies having jurisdiction over the Work.

B. All products and materials provided shall be listed by Underwriters Laboratory (UL) and shall bear the UL label intended for the purpose specified and indicated. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels.

C. All equipment and installations under this Specification shall conform to the following:

1. ANSI/NFPA 70, National Electrical Code.

2. ANSI/IEEE C2, National Electrical Safety Code TIA/EIA Standards 568 A (including TSB 67), 569 and 607.

3. IEEE/ANSI 142 1982, Recommended Practice for Grounding of Industrial and Commercial Power Systems.

D. The Audiovisual Integrator and their employees shall perform all work in compliance with current Occupational Safety and Health Administration (OSHA) guidelines and regulations and other safety and health requirements as may be mandated by the Owner, the General Contractor or other authorities.

E. The Audiovisual Integrator shall have a thorough knowledge of governing codes and standards in effect and having jurisdiction over the Project. Lack of awareness of any of the relevant codes and standards will not be accepted as a reason for non-compliance.

F. The Audiovisual Integrator shall be responsible for providing cable and materials that comply with applicable codes and requirements of regulating bodies. The cost for these materials shall be included in the Bid price, as the Owner shall not accept change orders for changes in materials.

1.6 COORDINATION OF RELATED WORK BY OTHERS

A. The Audiovisual Integrator shall coordinate with the General Contractor and other construction trades to ensure proper integration and operation of the Audiovisual Systems with the complete Project designs, building systems and all other elements of the Project. The Audiovisual Integrator should request from the General Contractor complete project Construction

Documents to help facilitate effective coordination of the Audiovisual Integrator's work with the work of others.

B. Some components of the complete Audiovisual Systems will be provided by or impacted by others. It shall be the responsibility of the Audiovisual Integrator to coordinate with all parties whose work impacts the Audiovisual Integrator's work to ensure the complete coordination and successful implementation of the Audiovisual Systems. Related work by others shall include, but may not be limited to, the following:

1. Millwork and Cabinetry: All millwork and cabinetry modifications required to accommodate the installation of Audiovisual Systems, equipment and related cabling and connections, except as may be individually identified in the Specification, shall be provided by others.

2. Owner Furnished Equipment (OFE): Some equipment that will become a part of or connect to the Audiovisual Systems may be provided by the Owner and shall be designated as Owner Furnished Equipment (OFE). Owner Furnished Equipment shall be provided by the Owner and supplied to the Audiovisual Integrator for connection, installation and/or integration into the Audiovisual Systems as delineated in the Audiovisual System designs and these Specifications. This may include new or existing equipment. The Audiovisual Integrator shall be responsible for coordinating with the Owner to ensure that all Owner Furnished Equipment is fully operational and compatible with other Audiovisual Equipment and that it is made available to the Audiovisual Integrator in a timeframe that does not delay the Audiovisual Integrator's work.

3. Information Technology Systems: Unless otherwise specified, all data networking cabling and active electronics shall be provided by others. The Audiovisual Integrator shall be responsible for coordinating with the Owner or the Owner's designated representative regarding connections between the Audiovisual Systems and the Owner's data network, including all client/server computing and peripherals, Internet, digital video storage and other data/media distribution systems. Configuration of all network IP addresses and settings for Audiovisual equipment covered within this scope is to be provided by the AV Integrator.

C. Electrical (AC) Power Service and Connections:

1. Technical Power Service: All electrical panels, power receptacles, lighting fixtures, dimmers, lighting controls, and interconnecting wiring shall be supplied by others.

2. The Audiovisual Integrator shall verify power connection is proper before connecting any AV system equipment.

D. Low Voltage Cable Containment:

1. Low voltage cable containment, including raceways, conduits and junction boxes, required to support Audiovisual System devices and interconnecting cabling shall be as specified in the Construction Documents and shall be provided by others.

2. Upon commencement of work on the Project the Audiovisual Integrator shall review the Construction Documents to confirm that the infrastructure provided is sufficient to accommodate the Audiovisual Systems to be installed. Any conflicts or issues must immediately be brought to the attention of the Audiovisual Consultant.

3. The Audiovisual Integrator shall provide blank cover plates or panels for all floor, wall and ceiling boxes that are dedicated to the Audiovisual Systems but do not have devices and/or connectors at the time of Audiovisual System commissioning. Colors and types shall be coordinated with the Architect. Devices and plates for other trades (HV power, voice/data, and security) within the AV floor boxes are by others.

E. Low Voltage Cabling and Termination:

1. All audio, video, control and other low voltage cabling associated with the Audiovisual System shall be provided, installed and terminated by the Audiovisual Integrator utilizing the cable containment infrastructure (e.g. conduit, raceways, junction boxes, etc.) provided by others as noted on the Construction Documents.

2. The Audiovisual Integrator shall provide all patch cords and other cable assemblies required to connect Audiovisual Equipment to voice/data outlets and any other required system or network inputs or outputs.

3. Where cable installation is required, this will include wall and/or floor jacks, plates and terminations at all room devices, and service loops at patch bay locations shall be provided by the Audiovisual Integrator.

F. Equipment Mounting and Support:

1. Structural support for ceiling mounted video projectors, wall mounted monitors and other Audiovisual Equipment shall be provided. The Audiovisual Integrator shall coordinate with Construction other trades as necessary to ensure compatibility of the structural supports provided by others with the Audiovisual Equipment provided by the Audiovisual Integrator.

2. The Audiovisual Integrator shall install all Audiovisual Equipment, including projector mounts, as indicated in this Specification and the Construction Documents. Exceptions will be the Audiovisual Integrator furnished display wall mounts as those will be provided and installed by the Audiovisual Integrator (refer to Paragraph 1.6-B-8). The Audiovisual Integrator shall verify location and structural suitability before attaching equipment and mounts. Any variations from the drawings and specifications or any question of structural integrity shall be brought to the attention of the Architect and Audiovisual Consultant before installing the equipment.

G. Audiovisual System Connections to Building Systems and Controls:

1. The Audiovisual Integrator shall coordinate with the General Contractor to verify that all devices and controls to be interconnected to the Audiovisual System are functioning properly prior to commencing interconnection to the Audiovisual Equipment.

2. The Audiovisual Integrator shall investigate all hardware and software control conflicts between the building systems and the Audiovisual Equipment before interconnecting the building systems. Report any conflicts, potential or existing, to the Audiovisual Integrator, in writing, before interconnecting the systems. Damage caused to any base building systems due to the improper connection of Audiovisual Equipment shall be the sole responsibility of the Audiovisual Integrator.

3. Where indicated, the Audiovisual Integrator shall select and install the appropriate cable type to facilitate device communication from the Audiovisual Equipment to interconnected building systems.

4. The Audiovisual Integrator shall coordinate with the General Contractor to verify proper operation of the connected Audiovisual Equipment and the building systems after interconnecting the systems.

1.7 REFERENCES

A. The following documents provide information regarding audiovisual industry “best practices,” including commonly accepted standards for design, installation, and performance of integrated

audiovisual systems. The technical quality of the Audiovisual Integrator's work and the resulting performance of the Audiovisual Systems installed in the Project will generally be measured against the standards and practices delineated in these References.

B. Audiovisual Best Practices: The Design and Integration Process for the AV and Construction Industry, Timothy Cape and Jim Smith; Fairfax, VA; International Communications Industries Association, 2005.

C. ASTM Task Group E33.04C, Acoustical Environment in the Open-Plan Office, Atlas-Soundolier, Addendum, May 1994.

D. Dashboard for Controls Design Reference, InfoComm International, http://www.infocomm.org.

E. Dashboard for Controls Integrators Guide, InfoComm International, http://www.infocomm.org.

1.8 PROJECT / SITE CONDITIONS

A. Refer to Division 1 of the Construction Documents for coordination with other trades on this project.

B. Coordinate all access to the site at all times with the General Contractor.

C. Adhere to the safety standards established by the General Contractor while performing work on site.

D. All employees of the Audiovisual Integrator shall wear identification clearly indicating the Audiovisual Integrator's company name while on site.

E. All employees of the Audiovisual Integrator shall comply with rules and policies established by the General Contractor.

F. All vehicles of the Audiovisual Integrator or employees shall be parked in areas designated by the General Contractor.

G. The Audiovisual Integrator will store equipment in a manner that will not interfere with the work of others. Coordinate secured storage at the site with the General Contractor.

H. Do not install equipment in dusty conditions or allow dust to accumulate in or on installed Audiovisual Equipment.

I. Protect all work and equipment from damage by others.

J. Protect all existing work in place by others from damage by the Audiovisual Integrator, the Audiovisual Integrator's agents and/or sub contractors, or any employees or vendors. The Audiovisual Integrator will be solely responsible for any/all damage to work in place by others.

K. Keep areas around and inside of each piece of equipment and each rack free from dust, dirt and debris throughout the project. Equipment that is not properly maintained during installation shall be replaced at no cost to the Owner before final payment is made to the Audiovisual Integrator.

L. All equipment and materials stored at the Audiovisual Integrator's facility(s) or stored and/or installed at the Project site will remain the property of the Audiovisual Integrator unless ownership is legally transferred and accepted in writing by the Owner. The Audiovisual Integrator shall be solely responsible for the protection of all equipment from damage, theft or vandalism regardless of cause, until the work described herein is accepted by the Owner at the time of Final Checkout.

1.9 QUALITY ASSURANCE

A. The Audiovisual Integrator shall obtain any permits and shall pay all fees required by public agencies having jurisdiction over the Work.

B. All products and materials provided shall be listed by Underwriters Laboratory (UL) and shall bear the UL label intended for the purpose specified and indicated. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels.

C. All equipment and installations under this Specification shall conform to the following:

1. ANSI/NFPA 70, National Electrical Code.

2. ANSI/IEEE C2, National Electrical Safety Code TIA/EIA Standards 568 A (including TSB 67), 569 and 607.

3. IEEE/ANSI 142 1982 Recommended Practice for Grounding of Industrial and Commercial Power Systems.

D. The Audiovisual Integrator and their employees shall perform all work in compliance with current Occupational Safety and Health Administration (OSHA) guidelines and regulations and other safety and health requirements as may be mandated by the Owner, the General Contractor or other authorities.

E. The Audiovisual Integrator shall have a thorough knowledge of governing codes and standards in effect and having jurisdiction over the Project. Lack of awareness of any of the relevant codes and standards will not be accepted as a reason for non-compliance.

F. The Audiovisual Integrator shall be responsible for providing cable and materials that comply with applicable codes and requirements of regulating bodies. The cost for these materials shall be included in the Bid price, as the Owner shall not accept change orders for changes in materials.

1.10 INTEGRATOR QUALIFICATIONS

A. The successful Integrator shall be contracted to perform the Work based on their bid's attention to the following criteria:

1. Integrator shall have a minimum of three (3) years of experience with the design, engineering, assembly, installation and support of Audiovisual Systems of similar or greater complexity to those identified in this Specification and shall have been operating under the same business name for a minimum of three (3) years.

2. The Integrator shall be able to provide the necessary professional design, engineering, fabrication, installation, and project management personnel to execute the Work and to guarantee a complete, functional system in compliance with the intent of this Specification.

3. The Integrator shall be licensed with all agencies having jurisdiction over the Work.

4. The Integrator shall maintain permanent fabrication, service and support facilities within 150 miles of the Project site.

5. The Integrator shall be bondable at 100% of contract value.

6. As a minimum requirement for this Bid, the Lead Engineer or Project Manager from the Integrator shall have a CTS (Certified Technology Specialist) certificate from ICIA.

7. The Integrator will have held for longer than a period of one year current manufacturer certifications for the major equipment for the project as appropriate.

1.11 SUBMITTALS

A. General submittal requirements:

1. A submittal package consists of all items (forms, lists, drawings, etc.) specified for that submittal.

2. All specified items for each submittal shall be provided at the same time. Partial or incomplete submittals will be rejected.

3. Unless directed otherwise in writing by the Audiovisual Consultant, the Audiovisual Integrator is not authorized to proceed with the acquisition, assembly or installation of any systems or components until all required submittals have been approved by the Audiovisual Consultant. Any acquisition, assembly or installation of any systems or components without Audiovisual Consultant's approval will be subject to removal at the Audiovisual Integrator's expense.

4. The Audiovisual Integrator shall coordinate with Audiovisual Consultant prior to the delivery of each submittal to obtain the proper quantities of submittals to each recipient.

5. Product cut sheets shall be submitted electronically on one compact disc with a separate "table of contents" listing all of the cut sheets included.

6. Product cut sheets shall accompany all requests for product substitutions.

7. Audiovisual Consultant will notify the Audiovisual Integrator if any sample products are required for fit or finish coordination. Samples shall be provided by the Audiovisual Integrator upon request and at no additional cost to the Owner.

8. Use the architectural audiovisual infrastructure constructions plans and specifications for reference (obtainable through the General Contractor).

9. All submitted bill-of-materials equipment listings shall include referenced information listed within this document and will be cross-referenced with the drawings. List will include an itemized breakdown by room (or similar room type) along with model numbers, quantities, etc. Final submittal will include product serial number information for major equipment as appropriate.

B. Project Commencement Submittals:

1. Immediately upon award of contract and authorization to proceed with the Work, the Audiovisual Integrator shall commence initial planning and coordination. Project Commencement Submittals required upon commencement of the Work shall include, but not be limited to, the following:

a. Project Plan:

1) Listing of Long Lead Time Equipment.

2) The Audiovisual Integrator shall submit a list of long-lead items. These are items that may be necessary to order ahead of the submittal and approval

sequence in order to avoid adversely impacting the project schedule. Do not include equipment that will be ordered within the scheduled submittal and approval process.

3) The Audiovisual Integrator shall use reasonable judgment in determining which products are legitimate long lead items. Failure to include an item that may require long procurement lead time shall not relieve the Audiovisual Integrator of responsibility for furnishing the item to meet the agreed Schedule.

C. Engineering Submittals:

1. The Audiovisual Integrator shall present documentation delineating the complete requirements for Audiovisual System engineering, fabrication, assembly, installation, commissioning and testing. Engineering Submittals shall be presented to the Audiovisual Consultant for review, comment and approval prior to commencing further work. Engineering Submittals shall include, but not limited to, the following:

a. Equipment List (to be submitted in the form of Appendix B)

b. Audiovisual System Shop Drawings:

1) At a minimum, Shop Drawings shall include the following:

a) Single-line system design diagrams clearly diagramed with cabling type and numbers and equipment tags.

b) Rack elevations.

c) Equipment location diagram.

d) Equipment plate layout.

e) Control panel layout and labeling.

2) All sheets shall be the same size, oriented the same direction, and shall be bound, not folded.

D. Control System Software Submittals:

1. Control System Software consists of the following three primary components:

a. Control System Button Panel Layout.

b. Control System Processor Software.

c. Initial IP allocation table and request form for all networked AV devices.

2. In order to develop Control System Software that is functional and understandable by the intended users it will be necessary for the Audiovisual Integrator to provide “working” copies of software for review and comment by the Owner and the Project team as it is being developed.

3. Include initial IP request table in editable spreadsheet format (obtainable though Owner IT Department or sample form can be requested from Consultant) to coordinate any static IP addresses for networked equipment provided within this scope. Table shall include fields for (but not limited to):

a. Device IP number (address, subnet, gateway).

b. Device name.

c. Device location (room number and placement).

d. Device manufacturer and model number.

e. Device MAC address.

f. Assigned port number (physical port or what port switch is associated with).

E. Substantial Completion Submittals:

1. Substantial Completion of the Audiovisual System installation shall be the point at which all Audiovisual Equipment has been installed, programmed, configured and initially tested to confirm proper operation. The point of Substantial Completion shall be as mutually agreed between the Audiovisual Integrator and the Audiovisual Consultant following discussion and observation. At the point of agreed Substantial Completion, the Audiovisual Integrator shall submit the following:

a. Testing Report:

1) Perform electrical and electronic tests and present documented results. Provide results to Audiovisual Consultant before scheduling the Preliminary Checkout.

2) Submit test results in a table format stating test description, acceptable result value and measured value (result). Clearly show all values not in acceptable value ranges.

b. Preliminary Project Record Documents Submittal:

1) Upon Substantial Completion the Audiovisual Integrator shall submit Preliminary Project Record Documents to the Audiovisual Consultant. Preliminary Project Record documents shall be submitted prior to the Preliminary Checkout.

2) Preliminary Project Record Documents shall include:

a) Corrected/updated shop drawings.

b) Updated Equipment List in the form of Appendix A.

c) Half size drawings modified to reflect the actual installation conditions.

d) CD-ROM with manufacturers' operation manuals arranged alphabetically and current drawings in .DWG format.

3) Consultant's Preliminary Checkout will be scheduled after the Preliminary Project Record Documents and Test Reports have been approved.

F. Final Acceptance Submittals:

1. Prior to Final Acceptance the Audiovisual Integrator shall submit the following:

a. Hardcopy Project Record Documents:

1) Warranty documentation including warranty start and end dates for each individual piece of equipment provided.

2) Explanation of procedures for obtaining telephone support and on-site service during Audiovisual Integrator's warranty period.

3) Recommended dates for the preventive maintenance service calls.

4) Final Equipment List with itemized listing by room/system, including serial number for each item.

5) Final IP address allocation table.

6) Electrical and electronic test results.

7) Key schedule with three copies of each key required for operation of the systems, equipment racks, etc.

8) One (1) half-size set of all Audiovisual System design drawings revised to reflect "as-built" conditions.

9) One (1) full size set of all Audiovisual System design drawings revised to reflect "as-built" conditions.

b. Electronic documentation on DVD/CD ROM(s) to include:

1) Product Information which shall consist of electronic versions for all product literature, manuals, software and other material provided by equipment manufacturers with the Audiovisual Equipment. Material shall be assembled in the binders with section dividers and a table of contents.

2) Back-up of Audiovisual Control System software code (e.g. user interface software and control processor program). Un-compiled source code shall be submitted in both soft copy and printed out in hard copy documentation. Copies (hard and soft) of the software are to be included in the systems manuals.

3) Copies of all custom or purpose created software, including original source code.

4) All software shall be written with remark statements to document function of sub routines, macro's and program requirements.

5) All control, DSP and specific device application software.

6) All final software configuration and final set-up settings.

7) Final equipment list with warranty and serial number information.

8) Record Drawings in PDF format.

9) Record Drawings in .DWG format.

1.12 WARRANTY AND MAINTENANCE SUPPORT

A. Basic Warranty:

1. Basic Warranty provided by the Audiovisual Integrator shall include repair or replacement for one year from Final Acceptance on all Audiovisual Equipment provided (including products having a manufacturer's warranty of less than one year) and all Audiovisual Integrator workmanship. Basic Warranty shall be provided at no additional cost, except in case of obvious abuse. Consumable items such as lamps, batteries, tapes, etc. are not covered by Basic Warranty.

2. During the Basic Warranty period the Audiovisual Integrator shall:

a. Provide telephone support within 4 hours of a call requesting service.

b. Provide on site support within 24 hours of a call requesting service not corrected by telephone support.

c. Repair or replace faulty items within 72 hours of on-site service or within manufacturers' specific repair program whichever is quicker.

3. Audiovisual Integrator shall not involve the Owner with removing, re installing equipment, shipping or receiving equipment being repaired under Basic Warranty, nor shall the Owner be responsible for any shipping or freight charges associated with any item under warranty.

4. Audiovisual Consultant and the Owner shall be copied with all paperwork related to any and all warranty work during the Basic Warranty period.

5. The Basic Warranty period will commence no sooner than the date of first beneficial use by the Owner and no later than the date of contract closeout.

PART 2 - PRODUCTS

2.1 GENERAL

A. The information provided in this section describes the basic functional capabilities and operational requirements of the Audiovisual System(s) installed in the Project as well as specific product information. Descriptions are provided by individual area where applicable.

2.2 DESCRIPTION OF TYPICAL CLASSROOMS:

A. Typical Classrooms within the scope of the project are noted on the AV drawing key-plans.

B. Functional Requirements: System is intended to be Instructor and student-operated, with no Operator action required during a class.

C. Sources:

1. Wireless microphone system: Lavaliere/lapel microphone for Instructor.

2. Computer for Internet access/web-based content and local content.

3. Cable cubby for connecting portable source equipment, such as laptop computers to the system.

4. Wireless mirroring/presentation appliance.

5. Document Camera and Kensington-style lock.

6. Blu-ray / DVD player.

D. Processing:

1. Audio digital signal processing (DSP), including:

a. Leveling or AGC for microphone inputs.

b. Auto mixing.

c. Equalization.

d. Feedback elimination.

e. Compression/limiting.

f. Output gain.

2. DSP to receive the following inputs:

a. Wireless microphones.

b. Digital presentation switcher.

3. DSP to receive the following outputs:

a. Ceiling loudspeaker system.

b. Mono audio output plate for connecting portable Assistive Listening System.

4. Digital presentation switcher for routing of all content. Outputs to include:

a. 1080p feed for main display.

5. Main Displays: Front projection system with high-brightness video projector and manual projection screen.

a. Ceiling loudspeaker system consisting of full-range loudspeakers.

6. Main Displays: Front projection system with high-brightness video projector and manual projection screen.

E. Loudspeaker System: Ceiling loudspeaker system consisting of full-range loudspeakers.

F. Assistive Listening/Interpretation System: Provide RF-based ALS equipment with inductive neck loop and over-ear receiver attachments.

G. Control:

1. Wired table top touch panel located at Instructor’s Desk.

2. Wired table top button control panel located at Student Group Desk.

3. Integrated controller for touch panel and network interface.

4. At a minimum, remote control functions include:

   a. System on/off/reset.

   b. Input/output switching (including):

      1) PC (rack).

      2) Doc Cam.

      3) Laptop.

      4) Blu-ray Player.

      5) Wireless Mirroring/Presentation Appliance.

      6) Display Mute.

5. Equipment Locations: All AV equipment will be housed within each classroom, with majority of source and processing equipment housed within Instructor's Desk.

H. Equipment:

1. Source Equipment:

   a. 3 Input Transmitter: OFCI Extron DTP T USW 233.

   b. Cable Cubby: OFCI Extron Cable Cubby 1400 (with OFCI TLP Pro 720T control panel) with connection cables, Left/Right Cable Pass-Through and Blank AAPs as required.

   c. Wireless Mirroring/Presentation Appliance: OFCI Extron Sharelink 250. Connect to data network and configure settings in conjunction with AVC IT Dept.

   d. Document Camera: OFCI AVerVision F17HD with HDMI digital input. Include Kensington-style lock for securing to instructor desk.

   e. Wireless Microphone System: OFCI Shure LX 14/85.

2. Mixing, Routing, Processing, and Distribution:

   a. Digital Presentation OFCI Switcher: Extron IN1608 IPCP MA 70.

   b. HDMI TP Receiver: OFCI Extron DTP HDMI 230Rx.

3. Loudspeaker / Amplification:

   a. Ceiling Loudspeaker: OFCI Extron full range 2x2 tile flat-field ceiling speaker.

   b. Amplifier: OFCI Extron XPA 2001-70V power audio amplifier.

4. Display:

   a. Video Projector: OFCI Epson Pro-Lite 1980W 4,400 ANSI lumens WUXGA resolution projector (coordinate standard lensing with ceiling elements) with BMS LOC-IV security enclosure and OFCI Peerless AV PRGS-455 (white) ceiling mount. Provide with wireless networking module for wireless presentation connection. Include spare projector lamp. Projector to be white model where available.

   b. Coordinate projector throw with projection screen image per Section 11 5213.

5. Control System:

   a. Control System: Extron IN1608 IPCP MA 70 connected to AVC data network.

   b. Touch Panel: OFCI Extron TLP Pro 720T Black (with table well). Provide with XTP PI 100 Power-over-Ethernet injector as required.

   c. Control for projection screen to include up/down upon system startup and shut down. Control to include manual override for up/down during system on operation.

   d. Control to include separate microphone and program audio mute and level controls.

6. Assistive Listening System: Listen Technology 4-Person Installed RF System (216 MHz) LS-55-072.

7. Instructor Station: OFCI Computer Comforts Sit-To-Stand table with 14RU equipment rack and power distribution unit.

2.3 ROOM MANAGEMENT

A. AV Remote Management System: Connect to existing Extron GlobalViewer Enterprise 2.0 server application for all new endpoints. Coordinate with Owner for server and network needs, as required to support the software.

2.4 SUBSTITUTIONS

A. The acceptability of a proposed substitution to a specified Audiovisual Equipment item shall be considered under the following terms:

   1. The term "No Substitutions" shall denote that only the listed product(s) are acceptable and no substitutions will be considered or approved.

   2. The term “Or Equal as Approved" shall denote that equivalent products will be considered as alternatives to the specified products pending approval from Audiovisual Consultant.

   3. The term "Or Equal" shall denote that functionally equivalent products shall be acceptable without written approval by Audiovisual Consultant.

B. Where a specified item has been discontinued by the manufacturer and/or replaced by a new model, the Audiovisual Integrator shall supply the current model at no additional cost to the project. Audiovisual Consultant may require submission of the new model for evaluation prior to acceptance as a substitute.

C. Where a manufacturer is listed as “comparable” but a specific model number is not indicated, the comparable products must meet all the listed specifications as a minimum, and the primary specified product (manufacturer and model number) shall be used as the basis of design.

D. Unless otherwise noted, product substitution is allowed only by expressed written consent of Audiovisual Consultant.

E. The Audiovisual Integrator shall be fully responsible for making a substitute product match the requirements, description and functionality of the originally specified product regarding all options, accessories and external interface requirements.

2.5 SOFTWARE

A. General:

1. All source code becomes the exclusive property of the Owner.

2. All source code changes must be fully documented. Updated programming (compiled and un-compiled hard and soft copy versions of code) must be updated and located at all equipment rack locations and for all equipment manuals.

3. Source code changes and/or additional programming will be warranted by the vendor for a period of one year with the Audiovisual Integrator responsible for any required diagnosis and repair.

4. All manufacturer’s software operating system updates, bug fixes, patches, etc., shall be installed as part of the periodic system maintenance of the system during the warranty period.

5. An acceptance test will be performed at commissioning during which the software and any additional code changes or upgrades must perform accurately and be error free.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before commencing the Audiovisual Integrator shall verify proper completion of the following work by others:

1. All low voltage cable containment and other infrastructure, including, but not limited to, the following:

a. Junction boxes and conduit installed per drawings and specifications.

b. Conduit stub-outs finished appropriately to prevent cable abrasion.

c. Pull boxes installed per N.E.C. based on total number of turns and angles and on linear feet of conduit.

d. Pull strings installed in all conduits.

e. Cable tray installed and accessible as specified.

2. All line voltage (120VAC) electrical power services, including verification of service levels, circuiting, grounding and other critical criteria.

3. Fixed millwork and furniture systems.

B. Confirm with the General Contractor and the Owner that all work performed by others that impacts the work of the Audiovisual Integrator and the Audiovisual System installation has been completed satisfactorily. Also confirm that any remaining work to be completed will not adversely affect the work of the Audiovisual Integrator of the Audiovisual System installation and/or performance.

C. Provide written notification of any problems impacting the Audiovisual Integrator's work to Audiovisual Consultant. Failure of the Audiovisual Integrator to notify the Architect and/or Audiovisual Consultant in a timely manner of incomplete, inadequate, unfinished or otherwise unacceptable pre requisite work by other trades in the base building infrastructure will not relieve the Audiovisual Integrator of the responsibility to complete the work under this contract.

3.2 INSTALLATION

A. General:

1. All equipment and enclosures described in this Specification shall be installed plumb and square unless specifically detailed otherwise.

2. All Audiovisual Equipment, except that designated as movable, portable or loose equipment, shall be secured and permanently attached to racks or other appropriate rigid surface in a manner which will require the use of a tool (e.g.: screw driver, nut driver, etc.) for removal.

3. All Audiovisual Equipment installed in a manner or location that may visually impact the finished appearance or functionality of any part of the facility shall be coordinated and approved by the Architect and/or the Audiovisual Consultant prior to installation.

4. All Audiovisual Equipment supports shall meet or exceed the load requirements of the intended application with a minimum safety factor of five times the actual load.

5. Provide support structure and hardware with a SAE Grade 8 load rating (min.).

B. Conduit and Raceways:

1. Where cabling transitions from the building distribution infrastructure into equipment racks, provide strain relief and insulation as necessary to protect the cables.

2. Segregate cabling within conduits by signal and cable types.

3. Do not exceed 40 percent fill in conduits.

C. Cable Dressing:

1. Cable dressing shall be considered from a maintenance standpoint. Suitable service loops shall be provided to allow removal of equipment, or to extend equipment that is mounted in the rack on rack slides. Where there is no rear access to the rack mounted equipment, this requirement shall be carefully addressed, and cabling shall be of sufficient length to enable the removal and replacement of any individual piece of equipment with all others in place.

2. It is expected that the Audiovisual Integrator will fabricate some portions of the systems off site. Pre wiring is acceptable provided that the pre wired assembly can easily be transported to its final location without complication, and without risk of cable or

equipment damage. Use of intermediate connections for inter rack cables is not acceptable.

3. Equipment specified as "Future" shall be accommodated with cables installed and routed normally, with the un-terminated end being labeled, sealed in a plastic bag, and tagged appropriately.

4. The Audiovisual Integrator shall be responsible for determining the proper length of all cables whether manufactured on or off the job site.

5. The Audiovisual Integrator shall determine the desired method of securing cables. All of the following requirements must be met by the system:

    a. Plastic cable ties are the preferred method of cable lacing. Lay in systems are not acceptable except as applied to a horizontal cable tray.

    b. Wires and cable shall be installed in a neat and orderly fashion, with like cable types following similar paths. Groups of cables shall be neatly combed and harnessed. Harnessed groups of cables shall be anchored at suitable intervals to reduce and relieve wire strain, especially strain on connections. Adequate service loops shall be provided at all cable endpoints.

6. Some rack-mounted equipment utilizes slide assemblies for front extension while in operation. For this type of mounting, additional, carefully dressed service loops on all cables shall be provided and installed with spring operated cable retractor assemblies to gather and recoil the service loop.

7. For all schemes of cable routing, no point in the path shall be subjected to a bend radius of less than eight (8) times the cable diameter, or minimum cable bend radius specified by the manufacturer.

8. Captive cables shall not be laced in such a manner as to prevent removal of the equipment to which they are captive.

9. Wires and cables shall be segregated according to signal type. In addition, audio cable shall be subdivided into three (3) classes: microphone level circuits, line level circuits, and speaker level circuits.

10. Microphone level audio circuits shall be kept at least three inches (3") from any other type of parallel signal circuits and at least six inches (6") from any parallel AC power circuits.

11. Speaker level audio circuits shall be kept a minimum of three inches (3") from line level audio and AC power circuits. All other signal circuits shall be kept at least three inches (3") away from any parallel AC power circuits.

12. Where circuits of different types must cross, they shall do so at right angles and then return to the above required separations in as short a distance as possible.

13. Conductors, wires, and cables shall be continuous between termination points. Splices are not acceptable.

14. Cable tie and lacing installation shall be accomplished using hand tools specifically designed to apply proper tension to the cable tie, and to cut the end off flush with no protruding sharp edges. The Audiovisual Integrator's field supervisor shall spot check assemblies using cable ties both visually and by touch, thereby detecting any sharp edges of improperly cut cable ties. Install cable ties on all cable runs of two or more cables that are not supported by raceway, cable tray, or other means. Place cable ties

approximately six inches (6") apart. Do not use more cable ties than are necessary for a neat installation. Cable ties shall not be applied with excessive force that may damage or deform sensitive and fragile cables.

15. Rack mounting rails shall not be used for cable lacing. Lacing bars and/or tie mount bases mounted to cabinets or console shall be provided where appropriate.

D. Labeling:

1. Provide permanent, self adhesive, engraved labels on the following (use 1/8 inch letters with contrasting core):

a. Front panel of rack mounted equipment to indicate system designation and/or functionality (e.g. Automixer 3, Press Feed, ADA, Speech Amp-Zone A, etc.).

b. Terminals (all types) to indicate system designation and/or functionality.

2. Provide permanent, self adhesive labels on the back of rack mounted equipment to indicate system designation and/or functionality. Text shall be identical to equipment front panels noted above; however, labels for equipment back panels do not need to be rigid, engraved labels.

3. Identification “Vanity Panels” may be used and located at the top most panel location of each equipment rack to identify the Audiovisual Integrator as well as the Audiovisual Consultant.

4. Provide engraved text or graphics directly on the following (use 1/8 inch letters with contrasting paint fill):

a. Receptacle plates and panels.

b. Rack panels.

5. Provide heat shrink labels on both ends of all installed cabling. Use self adhesive wire numbers under clear heat shrink, direct printed heat shrink or direct printed self adhesive wrap around.

6. Provide printed tags 6 inches from the male connector end on all portable cables.

7. Do not indicate the Audiovisual Integrator’s name on movable, portable or loose equipment, control panels or wall plates.

8. Text, graphics and colors used on labels visible on finished surfaces visible to Audiovisual System end-users must be approved by Audiovisual Consultant before fabrication of labeling, plates or other labeled items.

E. Wiring:

1. Do not make any in line wire splices unless specifically approved and noted.

2. Use only wire pulling lubricants specified by the wire manufacturer.

3. Provide grommets or chase nipples at cable entry where conduit is not installed.

4. Provide cable anchors for any cable or cable bundle • 1 inch diameter. Do not use self sticking adhesive cable anchors.

5. Provide a service loop for each cable that connects to equipment in racks or AV furniture.

6. All cables to or from a movable lectern, cart, or desk or lectern shall be highly flexible cable, specifically designed by the manufacturer to be flexed repeatedly. Permanent installation type of cable is not acceptable for this application.

7. Do not install HD-SDI cable or Category type cables with plastic wire ties. Use soft Velcro based cable ties located at random distances apart.

F. Service and segregation of installed cables: Refer to AV Drawing package for standard wiring termination and labeling details, standard cable segregation requirements and any special condition wiring details.

G. Terminations:

1. Use crimping tools recommended by the termination manufacturer. Use ratcheting crimp tools for spade lugs and Molex connector pins.

2. Provide insulated spade lugs for screw terminals, two lugs per terminal maximum.

3. Conductors in phoenix type connectors shall not be tinned.

4. Use properly sized spade lugs for cable gauge and screw size.

5. Terminate conductors with proper mating connectors.

6. Audio shield/drain wires shall not be connected to the connector body at any time.

7. Only one cable or set of wires should be installed into any single connector; do not loop cable in and out of a connector. Provide a terminal block to parallel any audio signal wiring.

3.3 QUALITY CONTROL

A. Using the necessary test equipment, record and report to Audiovisual Consultant the results of all tests called for under this heading and as noted elsewhere.

B. Correct or replace at no expense to the Owner any component that does not meet the manufacturer's specifications or indicated performance during any test.

3.4 SUBSTANTIAL COMPLETION INSPECTION

A. Prior to the Substantial Completion Inspection, the Audiovisual Integrator must verify that he is prepared for the checkout session by filling out a checklist for each room based on field verification. This completed checklist must be faxed or emailed to Audiovisual Consultant before checkout.

B. During Substantial Completion Inspection the Audiovisual Integrator will verify quality of workmanship, labeling, proper power/signal grounding and overall equipment performance. Audiovisual Consultant will also verify audio setup and equalization and projector adjustments and will test all basic AV system operations. Audiovisual Consultant will prepare a punch list of items the Audiovisual Integrator must address before Final Checkout.

C. Substantial Completion Inspection will be scheduled after the documentation provided is approved.

D. The Audiovisual Integrator's Project Manager or a senior technician who is familiar with the system and the control system programmer shall assist Audiovisual Consultant during the Substantial Completion Inspection. The tests will consist of a thorough test, set up, adjustments and evaluation of all system performance and functionality. Include 16 hours on site for these tests.

E. Following the Substantial Completion Inspection, Audiovisual Consultant will create a punch list of deficiencies that must be corrected by the Audiovisual Integrator within 7 calendar days. The Audiovisual Integrator must provide documentation indicating that the punch list deficiencies have been corrected no later than 7 calendar days after Substantial Completion Inspection.

3.5 FINAL ACCEPTANCE

A. Prior to the Final Acceptance inspection, the Audiovisual Integrator must verify that he is prepared for the checkout session by again filling out the following checklist verifying that all systems are operational, as well as all punch list items from the Preliminary Checkout Session have been addressed and corrected. This completed checklist, one for each room, must be faxed or emailed to Audiovisual Consultant before checkout.

3.6 SYSTEM TESTING AND OWNER ACCEPTANCE PROCEDURES

A. Installation Testing and Adjustment:

1. The Audiovisual Integrator shall perform all tests and adjustments, shall furnish all test equipment necessary and perform all work required to verify performance of the system in accordance with these Specifications. When these initial tests and adjustments are completed, the Audiovisual Integrator shall notify the Owner that the systems are in compliance with the Specifications and are ready and complete for Acceptance Tests. The scope of this work includes, but is not limited to the following:

2. The acceptance testing process shall reference this Specification for specific system requirements. There are two distinct procedures in the overall acceptance testing process outlined in this section, the Substantial Completion and the Final Acceptance. Often times, punch lists and incomplete elements will preclude considering the first review of the systems to be the final acceptance of the systems. Typically, final acceptance occurs only after all punch lists are completed and the owner has had some time to work the systems (after the systems are substantially complete), final documentation is given to the owner, and all training is performed.

3. Additionally, the Owner shall retain the right to hire a consultant to test the technology systems. Delays to this consultant caused by incomplete work, improper wiring or inoperative equipment may result in consultant's time being billed to the Audiovisual Integrator at current consulting rates. In the event further adjustments are required, or defective equipment is to be repaired or replaced, tests shall be suspended or continued at the option of the Owner.

4. AV system acceptance testing will consist of verifying overall system functionality, internal rack functions and wiring, external device functions and terminations, device operation, and completion of the Audiovisual Integrators testing procedures. The owner and Audiovisual Consultant will spot check the systems installed by the Audiovisual Integrator in accordance with the standards and practices delineated in the Specification documentation. The following requirements will be considered the basis for establishing substantial completion of the AV Systems.

5. Provide as-built equipment list.

6. Provide redlined design drawings, rack layouts, spreadsheets, and any other relevant and current documentation.

7. Integrator's Punch list: Provide an internally constructed punch list of known devices, cables, or systems that are incomplete. Audiovisual Consultant and the owner will construct another punch list after the substantial completion acceptance testing is performed that is based on the inspection and the Audiovisual Integrator's internally constructed list.

8. Test, adjust, balance, equalize and calibrate all equipment (including OFE) as required for optimum quality. Establish and tabulate normal settings for all level controls. These settings shall be recorded in the maintenance manual for reference.

9. Signal and Cable Testing and Documentation: Provide documentation on the point to point testing of all Fiber, CAT6, Audio, Video Inter-Room and Cabling, provided by the Audiovisual Integrator. The following will be tested for each of the respective category of cable and/or signal types:

    a. Audio: continuity, polarity, sound check.

    b. Speaker: Impedance, polarity, proper zoning, buzz & rattle (frequency sweep), sound check, signal quality.

    c. Video: signal continuity, proper routing.

    d. Control: Continuity and confirmation of control capability between designated control locations and control processors.

    e. Data/Cat6: Bandwidth testing.

10. Quality of Installation: The areas around the AV installation should be free of debris and excess wires. Racks, consoles, and equipment should be free from dirt and grease.

11. Labeling and Terminations: All devices, including floor boxes, racks, termination panels, components, closets, panels, and cables should be terminated and labeled according to the Integrator's engineered plans. Visual spot-checking of wire dressing and terminations will be performed during the Acceptance Testing procedure.

12. The Owner's technical staff shall be involved in recommending hardware and software system settings. The Integrator shall be responsible for providing the test equipment for the tests.

13. System Functional Completion Requirements:

    a. The Owner is encouraged to bring in specific testing and operation scenarios that the Integrator may run through.

    b. The individual areas of the building and the corresponding audiovisual shall be tested for compliance with system functional descriptions described in the Technology Systems Performance Specification.

14. System Technical Performance Completion:

    a. Individual sub-system components of the integrated AV Systems shall meet or exceed the technical performance defined in the Technology Systems Specification. Testing of the performance of these systems is the responsibility of the Integrator and shall include:

b. During the Acceptance Testing procedure, each system will be spot checked to verify systems integration and inter-system operability. For instance, a laptop and/or microphone should be able to be plugged into an interface, and the audio routed to a desired speaker zone.

c. The Audiovisual Integrator shall supply any necessary testing equipment for Acceptance Testing including a continuity checker, laptop computers with software, patch cables, and video test equipment. Also, video signal must be able to be routed, patched, and scaled or scan converted.

3.7 TRAINING

A. The Audiovisual Integrator shall provide sufficient training for the Owner's designated staff to become proficient in the general operation, routine maintenance, troubleshooting, and other basic system support functions. This training shall include one session of training of up to 2 hours by the Audiovisual Integrator or the equipment manufacturer. This training shall include a session or sessions that are focused on the Owner's designated technical staff and also a session or sessions that focus on the administrative and/or instructional staff. Training of end users will be provided by the Owner's technical staff.

B. Times of day for training must be coordinated with Client availability including evening hours if requested for least disruption to Client day time operations.

3.8 CONTRACT CLOSE-OUT

A. Contract Closeout will be based on completion of Final Checkout, acceptance of Project Record Documents and Completion of Using Agency Training.

END OF SECTION

SECTION 27 5126
ASSISTIVE LISTENING SYSTEMS EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. The work covered in this Section consists of furnishing all labor, material and services to install a complete audiovisual system as indicated on the Project Drawings and in these Specifications.

B. The work of the Assistive Listening Systems is integral to the work of the, but not limited to the, Audiovisual Systems, Equipment, Consultant and Integrator.

C. Delivery of the work described in this Specification shall include, but not be limited to, the following Basic Services:

1. Engineering and Design: The Audiovisual Integrator shall provide all system engineering and design necessary to develop the complete systems described herein. Engineering and Design shall include preparation of all necessary electronic schematics, hardware drawings, systems diagrams, schedules and lists. Additionally, final system design and configuration with the District, as well as on site audiovisual coordination and infrastructure installation review with the General Contractor is required.

2. Assembly: The Audiovisual Integrator shall procure and assemble all hardware and equipment and any additional materials as required to deliver completely functioning Audiovisual Systems.

3. Software Programming: The Audiovisual Integrator shall perform all required software setup, configuration, and programming required to develop a complete operating system in accordance with this Specification, including all control logic and push button component faceplate or interface programming.

4. Installation: The Audiovisual Integrator shall install all equipment, cable, wiring, connectors, plates and other material at the Project site per the Integrator’s approved designs. The Audiovisual Integrator shall install any District furnished equipment identified in this document and calibrate it to work with the integrated systems.

5. Testing and Adjustment: The Audiovisual Integrator shall perform all tests and adjustments, furnish all test equipment necessary and perform all work required to properly configure the systems and to verify their performance in accordance with the information in this Specification and the Integrator’s approved engineered designs.

6. Acceptance Testing: Prior to District acceptance and hand-over of the completed Audiovisual Systems, the Audiovisual Integrator shall demonstrate the operation of the complete systems, including all individual devices and specified control functions. Both subjective and objective tests may be required by the District to determine compliance with the information in this Specification and the Integrator’s approved designs.

7. Training: The Audiovisual Integrator shall provide technical training of District's staff, instructing them on Audiovisual Systems operation, maintenance and troubleshooting.

8. Warranty: The Audiovisual Integrator shall warranty the Audiovisual Systems in accordance with the terms of this Specification.

1.2 DEFINITION OF TERMS

A. Definitions of the terminology used in this Specification are as follows:

1. District or Client: Shall refer to Antelope Valley College (AVC), or their designated representative.

2. Architect: Shall refer to Huitt-Zollars, Inc.

3. Construction Manager (CM): Shall refer to selected services supplier.

4. General Contractor (GC): Shall refer to selected services supplier.

5. Audiovisual Consultant (Consultant): Shall refer to Vantage Technology Consulting Group

6. Audiovisual Integrator (Integrator): Shall refer to the Integrator contracted to provide the services and material delineated herein under the GC or sub-contracted under another Construction Contractor

7. Construction Contractor: Shall refer to a designated sub-contractor to the General Contractor.

8. Audiovisual Specification (Specification): Shall refer to the complete set of designs, performance and delivery requirements delineated within this document and all referenced documents.

9. Audiovisual System (AV System): Shall refer to the complete compliment of equipment, software and other material that upon completion of assembly, installation and configuration provides the full functionality and technical performance delineated in this Specification.

10. Audiovisual Equipment (AV Equipment): Shall refer to any and all individual equipment items installed as a part of the Audiovisual System.

11. Work: Design and provision the Audiovisual Systems and associated equipment, software and services for the Project.

12. Construction Documents: Shall include all documentation associated with the design and general construction of the Project, including this Specification

13. Provide: Supply, deliver, install, test, configure, label, and commission.

14. Manufacturer: Shall refer to the original manufacturer of any equipment provided as part of the Work

15. Commissioning Date: Shall refer to the date at which a system is formally accepted by the District

16. By Others: Shall refer to work or equipment provided outside the scope of work of this section.

1.3 PROJECT IDENTIFICATION

A. Project Information:

1. Project location for Audiovisual services will be within the FA4 & APL swing spaces. Space will comprise of labs, classrooms, conference spaces and additional specialty areas and elements (signage/wayfinding, etc.) on the basement, first and second levels of the existing building.

a. Project Location:

1) Antelope Valley College.

2) Lancaster, CA.

1.4 PRELIMINARY SCHEDULE

A. See current project construction schedule and coordinate with CM for actual dates and critical milestones.

1.5 REGULATORY REQUIREMENTS

A. The Audiovisual Integrator shall obtain any permits and shall pay all fees required by public agencies having jurisdiction over the Work.

B. All products and materials provided shall be listed by Underwriters Laboratory (UL) and shall bear the UL label intended for the purpose specified and indicated. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels.

C. All equipment and installations under this Specification shall conform to the following:

1. ANSI/NFPA 70, National Electrical Code.

2. ANSI/IEEE C2, National Electrical Safety Code TIA/EIA Standards 568 A (including TSB 67), 569 and 607.

3. IEEE/ANSI 142 1982, Recommended Practice for Grounding of Industrial and Commercial Power Systems.

D. The Audiovisual Integrator and their employees shall perform all work in compliance with current Occupational Safety and Health Administration (OSHA) guidelines and regulations and other safety and health requirements as may be mandated by the District, the General Contractor or other authorities.

E. The Audiovisual Integrator shall have a thorough knowledge of governing codes and standards in effect and having jurisdiction over the Project. Lack of awareness of any of the relevant codes and standards will not be accepted as a reason for non-compliance.

F. The Audiovisual Integrator shall be responsible for providing cable and materials that comply with applicable codes and requirements of regulating bodies. The cost for these materials shall be included in the Bid price, as the District shall not accept change orders for changes in materials.

1.6 COORDINATION OF RELATED WORK BY OTHERS

A. The Audiovisual Integrator shall coordinate with the General Contractor and other construction trades to ensure proper integration and operation of the Audiovisual Systems with the complete Project designs, building systems and all other elements of the Project. The Audiovisual Integrator should request from the General Contractor complete project Construction Documents to help facilitate effective coordination of the Audiovisual Integrator's work with the work of others.

B. Some components of the complete Audiovisual Systems will be provided by or impacted by others. It shall be the responsibility of the Audiovisual Integrator to coordinate with all parties whose work impacts the Audiovisual Integrator's work to ensure the complete coordination and successful implementation of the Audiovisual Systems. Related work by others shall include, but may not be limited to, the following:

1. Millwork and Cabinetry: All millwork and cabinetry modifications required to accommodate the installation of Audiovisual Systems, equipment and related cabling and connections, except as may be individually identified in the Specification, shall be provided by others.

2. District Furnished Equipment (OFE): Some equipment that will become a part of or connect to the Audiovisual Systems may be provided by the District and shall be designated as District Furnished Equipment (OFE). District Furnished Equipment shall be provided by the District and supplied to the Audiovisual Integrator for connection, installation and/or integration into the Audiovisual Systems as delineated in the Audiovisual System designs and these Specifications. This may include new or existing equipment. The Audiovisual Integrator shall be responsible for coordinating with the District to ensure that all District Furnished Equipment is fully operational and compatible with other Audiovisual Equipment and that it is made available to the Audiovisual Integrator in a timeframe that does not delay the Audiovisual Integrator's work.

3. Information Technology Systems: Unless otherwise specified, all data networking cabling and active electronics shall be provided by others. The Audiovisual Integrator shall be responsible for coordinating with the District or the District's designated representative regarding connections between the Audiovisual Systems and the District's data network, including all client/server computing and peripherals, Internet, digital video storage and other data/media distribution systems. Configuration of all network IP addresses and settings for Audiovisual equipment covered within this scope is to be provided by the AV Integrator.

C. Electrical (AC) Power Service and Connections:

1. Technical Power Service: All electrical panels, power receptacles, lighting fixtures, dimmers, lighting controls, and interconnecting wiring shall be supplied by others.

2. The Audiovisual Integrator shall verify power connection is proper before connecting any AV system equipment.

D. Low Voltage Cable Containment:

1. Low voltage cable containment, including raceways, conduits and junction boxes, required to support Audiovisual System devices and interconnecting cabling shall be as specified in the Construction Documents and shall be provided by others.

2. Upon commencement of work on the Project the Audiovisual Integrator shall review the Construction Documents to confirm that the infrastructure provided is sufficient to

accommodate the Audiovisual Systems to be installed. Any conflicts or issues must immediately be brought to the attention of the Audiovisual Consultant.

3. The Audiovisual Integrator shall provide blank cover plates or panels for all floor, wall and ceiling boxes that are dedicated to the Audiovisual Systems but do not have devices and/or connectors at the time of Audiovisual System commissioning. Colors and types shall be coordinated with the Architect. Devices and plates for other trades (HV power, voice/data, and security) within the AV floor boxes are by others.

E. Low Voltage Cabling and Termination:

1. All audio, video, control and other low voltage cabling associated with the Audiovisual System shall be provided, installed and terminated by the Audiovisual Integrator utilizing the cable containment infrastructure (e.g. conduit, raceways, junction boxes, etc.) provided by others as noted on the Construction Documents.

2. The Audiovisual Integrator shall provide all patch cords and other cable assemblies required to connect Audiovisual Equipment to voice/data outlets and any other required system or network inputs or outputs.

3. Where cable installation is required, this will include wall and/or floor jacks, plates and terminations at all room devices, and service loops at patch bay locations shall be provided by the Audiovisual Integrator.

F. Equipment Mounting and Support:

1. Structural support for ceiling mounted video projectors, wall mounted monitors and other Audiovisual Equipment shall be provided. The Audiovisual Integrator shall coordinate with Construction other trades as necessary to ensure compatibility of the structural supports provided by others with the Audiovisual Equipment provided by the Audiovisual Integrator.

2. The Audiovisual Integrator shall install all Audiovisual Equipment, including projector mounts, as indicated in this Specification and the Construction Documents. Exceptions will be the Audiovisual Integrator furnished display wall mounts as those will be provided and installed by the Audiovisual Integrator (refer to Paragraph 1.6-B-8). The Audiovisual Integrator shall verify location and structural suitability before attaching equipment and mounts. Any variations from the drawings and specifications or any question of structural integrity shall be brought to the attention of the Architect and Audiovisual Consultant before installing the equipment.

G. Audiovisual System Connections to Building Systems and Controls:

1. The Audiovisual Integrator shall coordinate with the General Contractor to verify that all devices and controls to be interconnected to the Audiovisual System are functioning properly prior to commencing interconnection to the Audiovisual Equipment.

2. The Audiovisual Integrator shall investigate all hardware and software control conflicts between the building systems and the Audiovisual Equipment before interconnecting the building systems. Report any conflicts, potential or existing, to the Audiovisual Integrator, in writing, before interconnecting the systems. Damage caused to any base building systems due to the improper connection of Audiovisual Equipment shall be the sole responsibility of the Audiovisual Integrator.

3. Where indicated, the Audiovisual Integrator shall select and install the appropriate cable type to facilitate device communication from the Audiovisual Equipment to interconnected building systems.

4. The Audiovisual Integrator shall coordinate with the General Contractor to verify proper operation of the connected Audiovisual Equipment and the building systems after interconnecting the systems.

1.7 REFERENCES

A. The following documents provide information regarding audiovisual industry “best practices,” including commonly accepted standards for design, installation, and performance of integrated audiovisual systems. The technical quality of the Audiovisual Integrator’s work and the resulting performance of the Audiovisual Systems installed in the Project will generally be measured against the standards and practices delineated in these References.

B. Audiovisual Best Practices: The Design and Integration Process for the AV and Construction Industry, Timothy Cape and Jim Smith; Fairfax, VA; International Communications Industries Association, 2005.

C. ASTM Task Group E33.04C, Acoustical Environment in the Open-Plan Office, Atlas-Soundolier, Addendum, May 1994.

D. Dashboard for Controls Design Reference, InfoComm International http://www.infocomm.org.

E. Dashboard for Controls Integrators Guide, InfoComm International http://www.infocomm.org.

1.8 PROJECT / SITE CONDITIONS

A. Refer to Division 1 of the Construction Documents for coordination with other trades on this project.

B. Coordinate all access to the site at all times with the Contractor.

C. Adhere to the safety standards established by the Contractor while performing work on site.

D. All employees of the Audiovisual Integrator shall wear identification clearly indicating the Audiovisual Integrator’s company name while on site.

E. All employees of the Audiovisual Integrator shall comply with rules and policies established by the Contractor.

F. All vehicles of the Audiovisual Integrator or employees shall be parked in areas designated by the Contractor.

G. The Audiovisual Integrator will store equipment in a manner that will not interfere with the work of others. Coordinate secured storage at the site with the Contractor.

H. Do not install equipment in dusty conditions or allow dust to accumulate in or on installed Audiovisual Equipment.

I. Protect all work and equipment from damage by others.

J. Protect all existing work in place by others from damage by the Audiovisual Integrator, the Audiovisual Integrator’s agents and/or sub contractors, or any employees or vendors. The Audiovisual Integrator will be solely responsible for any/all damage to work in place by others.

K. Keep areas around and inside of each piece of equipment and each rack free from dust, dirt and debris throughout the project. Equipment that is not properly maintained during installation

shall be replaced at no cost to the District before final payment is made to the Audiovisual Integrator.

L. All equipment and materials stored at the Audiovisual Integrator's facility(s) or stored and/or installed at the Project site will remain the property of the Audiovisual Integrator unless Districtship is legally transferred and accepted in writing by the District. The Audiovisual Integrator shall be solely responsible for the protection of all equipment from damage, theft or vandalism regardless of cause, until the work described herein is accepted by the District at the time of Final Checkout.

1.9 QUALITY ASSURANCE

A. The Audiovisual Integrator shall obtain any permits and shall pay all fees required by public agencies having jurisdiction over the Work.

B. All products and materials provided shall be listed by Underwriters Laboratory (UL) and shall bear the UL label intended for the purpose specified and indicated. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels.

C. All equipment and installations under this Specification shall conform to the following:

1. ANSI/NFPA 70, National Electrical Code.

2. ANSI/IEEE C2, National Electrical Safety Code TIA/EIA Standards 568 A (including TSB 67), 569 and 607.

3. IEEE/ANSI 142 1982, Recommended Practice for Grounding of Industrial and Commercial Power Systems.

D. The Audiovisual Integrator and their employees shall perform all work in compliance with current Occupational Safety and Health Administration (OSHA) guidelines and regulations and other safety and health requirements as may be mandated by the District, the Contractor or other authorities.

E. The Audiovisual Integrator shall have a thorough knowledge of governing codes and standards in effect and having jurisdiction over the Project. Lack of awareness of any of the relevant codes and standards will not be accepted as a reason for non-compliance.

F. The Audiovisual Integrator shall be responsible for providing cable and materials that comply with applicable codes and requirements of regulating bodies. The cost for these materials shall be included in the Bid price, as the District shall not accept change orders for changes in materials.

1.10 INTEGRATOR QUALIFICATIONS

A. The successful Integrator shall be contracted to perform the Work based on their bid's attention to the following criteria:

1. Integrator shall have a minimum of 3 years of experience with the design, engineering, assembly, installation and support of Audiovisual Systems of similar or greater complexity to those identified in this Specification and shall have been operating under the same business name for a minimum of 3 years.

2. The Integrator shall be able to provide the necessary professional design, engineering, fabrication, installation, and project management personnel to execute the Work and to guarantee a complete, functional system in compliance with the intent of this Specification.

3. The Integrator shall be licensed with all agencies having jurisdiction over the Work.

4. The Integrator shall maintain permanent fabrication, service and support facilities within 150 miles of the Project site.

5. The Integrator shall be bondable at 100 percent of contract value.

6. As a minimum requirement for this Bid, the Lead Engineer or Project Manager from the Integrator shall have a CTS (Certified Technology Specialist) certificate from ICIA.

7. The Integrator will have held for longer than a period of one year current manufacturer certifications for the major equipment for the project as appropriate.

1.11 SUBMITTALS

A. General Submittal Requirements

1. A submittal package consists of all items (forms, lists, drawings, etc.) specified for that submittal.

2. All specified items for each submittal shall be provided at the same time. Partial or incomplete submittals will be rejected.

3. Unless directed otherwise in writing by the Audiovisual Consultant, the Audiovisual Integrator is not authorized to proceed with the acquisition, assembly or installation of any systems or components until all required submittals have been approved by the Audiovisual Consultant. Any acquisition, assembly or installation of any systems or components without Audiovisual Consultant's approval will be subject to removal at the Audiovisual Integrator's expense.

4. The Audiovisual Integrator shall coordinate with Audiovisual Consultant prior to the delivery of each submittal to obtain the proper quantities of submittals to each recipient.

5. Product cut sheets shall be submitted electronically on one compact disc with a separate "table of contents" listing all of the cut sheets included.

6. Product cut sheets shall accompany all requests for product substitutions.

7. Audiovisual Consultant will notify the Audiovisual Integrator if any sample products are required for fit or finish coordination. Samples shall be provided by the Audiovisual Integrator upon request and at no additional cost to the District.

8. Use the architectural audiovisual infrastructure constructions plans and specifications for reference (obtainable through the Contractor).

9. All submitted bill-of-materials equipment listings shall include referenced information listed within this document and will be cross-referenced with the drawings. List will include an itemized breakdown by room (or similar room type) along with model numbers, quantities, etc. Final submittal will include product serial number information for major equipment as appropriate.

B. Project Commencement Submittals:

1. Immediately upon award of contract and authorization to proceed with the Work, the Audiovisual Integrator shall commence initial planning and coordination. Project Commencement Submittals required upon commencement of the Work shall include, but not be limited to, the following:

a. Project Plan:

1) Listing of Long Lead Time Equipment.

2) The Audiovisual Integrator shall submit a list of long-lead items. These are items that may be necessary to order ahead of the submittal and approval sequence in order to avoid adversely impacting the project schedule. Do not include equipment that will be ordered within the scheduled submittal and approval process.

3) The Audiovisual Integrator shall use reasonable judgment in determining which products are legitimate long lead items. Failure to include an item that may require long procurement lead time shall not relieve the Audiovisual Integrator of responsibility for furnishing the item to meet the agreed Schedule.

C. Engineering Submittals:

1. The Audiovisual Integrator shall present documentation delineating the complete requirements for Audiovisual System engineering, fabrication, assembly, installation, commissioning and testing. Engineering Submittals shall be presented to the Audiovisual Consultant for review, comment and approval prior to commencing further work. Engineering Submittals shall include, but not limited to, the following:

a. Equipment List (to be submitted in the form of Appendix B).

b. Audiovisual System Shop Drawings.

D. Substantial Completion Submittals:

1. Substantial Completion of the Audiovisual System installation shall be the point at which all Audiovisual Equipment has been installed, programmed, configured and initially tested to confirm proper operation. The point of Substantial Completion shall be as mutually agreed between the Audiovisual Integrator and the Audiovisual Consultant following discussion and observation. At the point of agreed Substantial Completion, the Audiovisual Integrator shall submit the following:

a. Testing Report:

1) Perform electrical and electronic tests and present documented results. Provide results to Audiovisual Consultant before scheduling the Preliminary Checkout.

2) Submit test results in a table format stating test description, acceptable result value and measured value (result). Clearly show all values not in acceptable value ranges.

b. Preliminary Project Record Documents Submittal:

1) Upon Substantial Completion the Audiovisual Integrator shall submit Preliminary Project Record Documents to the Audiovisual Consultant. Preliminary Project Record documents shall be submitted prior to the Preliminary Checkout.

2) Preliminary Project Record Documents shall include:

a) Corrected/updated shop drawings.

b) Updated Equipment List in the form of Appendix A.

c) Half size drawings modified to reflect the actual installation conditions.

d) CD-ROM with manufacturers' operation manuals arranged alphabetically and current drawings in .DWG format.

3) Consultant's Preliminary Checkout will be scheduled after the Preliminary Project Record Documents and Test Reports have been approved.

E. Final Acceptance Submittals:

1. Prior to Final Acceptance the Audiovisual Integrator shall submit the following:

2. Hardcopy Project Record Documents:

a. Warranty documentation including warranty start and end dates for each individual piece of equipment provided.

b. Explanation of procedures for obtaining telephone support and on-site service during Audiovisual Integrator's warranty period.

c. Recommended dates for the preventive maintenance service calls.

d. Final Equipment List with itemized listing by room/system, including serial number for each item.

e. Final IP address allocation table.

f. Electrical and electronic test results.

g. Key schedule with three copies of each key required for operation of the systems, equipment racks, etc.

h. One (1) half-size set of all Audiovisual System design drawings revised to reflect "as-built" conditions.

i. One (1) full size set of all Audiovisual System design drawings revised to reflect "as-built" conditions.

3. Electronic documentation on DVD/CD ROM(s) to include:

   a. Product Information which shall consist of electronic versions for all product literature, manuals, software and other material provided by equipment manufacturers with the Audiovisual Equipment. Material shall be assembled in the binders with section dividers and a table of contents.

   b. Back-up of Audiovisual Control System software code (e.g. user interface software and control processor program). Un-compiled source code shall be submitted in both soft copy and printed out in hard copy documentation. Copies (hard and soft) of the software are to be included in the systems manuals.

   c. Copies of all custom or purpose created software, including original source code.

   d. All software shall be written with remark statements to document function of sub routines, macro's and program requirements.

   e. All control, DSP and specific device application software.

   f. All final software configuration and final set-up settings.

   g. Final equipment list with warranty and serial number information.

   h. Record Drawings in PDF format.

   i. Record Drawings in .DWG format.

1.12 WARRANTY AND MAINTENANCE SUPPORT

A. Basic Warranty:

1. Basic Warranty provided by the Audiovisual Integrator shall include repair or replacement for one year from Final Acceptance on all Audiovisual Equipment provided (including products having a manufacturer's warranty of less than one year) and all Audiovisual Integrator workmanship. Basic Warranty shall be provided at no additional cost, except in case of obvious abuse. Consumable items such as lamps, batteries, tapes, etc. are not covered by Basic Warranty.

2. During the Basic Warranty period the Audiovisual Integrator shall:

   a. Provide telephone support within 4 hours of a call requesting service.

   b. Provide on site support within 24 hours of a call requesting service not corrected by telephone support.

   c. Repair or replace faulty items within 72 hours of on-site service or within manufacturers' specific repair program whichever is quicker.

3. Audiovisual Integrator shall not involve the District with removing, re installing equipment, shipping or receiving equipment being repaired under Basic Warranty, nor shall the District be responsible for any shipping or freight charges associated with any item under warranty.

4. Audiovisual Consultant and the District shall be copied with all paperwork related to any and all warranty work during the Basic Warranty period.

5. The Basic Warranty period will commence no sooner than the date of first beneficial use by the District and no later than the date of contract closeout.

PART 2 - PRODUCTS

2.1 ASSISTIVE LISTENING SYSTEM

A. Assistive Listening Systems (ALS) shall be utilized in all classrooms:

1. Connection for portable ALS shall be provided for use in classrooms less than a capacity of 50 persons.

2. A fixed ALS shall be provided for use in classrooms greater than a capacity of 50 persons.

3. Beltpack and earphones shall be centrally located, stored and charged.

B. The stationary RF transmitter shall be capable of broadcasting on 57 channels. The transmitter shall have an SNR of 80 dB or greater. The output power shall be adjustable to quarter, half or full. Channel tuning shall be capable of being locked. The device shall have an audio frequency response of 50 Hz to 15k Hz, ±3 dB at 72 MHz. It shall have 2 mixing audio inputs and a mixed signal output. The device shall have the following audio controls: input level, mix level and an adjustable low pass filter (contour). The device shall have an audio processor that is capable of automatic gain control and limiting.

C. Shall be capable of receiving on 57 wide and narrow band channels. The device shall tune to a single channel and user shall not be able to change the channel. The receiver shall have an audio frequency response of 50 Hz - 15 kHz (±3 dB). The device shall have the option of worn on a lanyard or belt clip and the lanyard shall have the option of an integrated DSP driven neck loop that automatically senses and sends optimized audio signals directly to telecoils. The ALS system shall have 80dB SNR or greater, end-to-end.

D. Furnish and install an RF wireless assistive listening systems:

1. Classrooms with capacity of less than 50 persons:

a. Listen Technologies LT-800-072 Base Transmitter (Qty: 1 ea.).

b. Listen Technologies LA-122 Universal antenna. (Qty: 1 ea.).

c. Listen Technologies LR-5200-072-P1 Multi-Channel Advanced Intelligent DSP RF.

d. Package, 72MHz (Qty: 2 for each classroom) Package includes: LR-5200-072 iDSP receivers, LA-401 Universal Ear Speaker, LA-430 Intelligent Neck Loop Lanyard, and LA-365 Rechargeable Li-ion Battery.

e. Listen Technologies LA-304 ADA Access/Compliance signage kit. (Qty: 1 ea. Per classroom).

2. Classrooms with capacity of greater than 50 persons:

a. Listen Technologies LT-800-072 Base Transmitter (Qty: 1 ea.).

b. Technologies LA-326 Rack mount kit (Qty: 1 ea.).

c. Listen Technologies LA-122 Universal antenna. (Qty: 1 ea.).

d. Listen Technologies LR-5200-072-P1 Multi-Channel Advanced Intelligent DSP RF Package, 72MHz (Qty: 3 for each classroom). Package Includes: LR-5200-072 iDSP receivers, LA-401 Universal Ear Speaker, LA-430 Intelligent Neck Loop Lanyard, and LA-365 Rechargeable Li-ion Battery.

e. Listen Technologies LA-304 ADA Access/Compliance signage kit. (Qty: 1 ea. Per classroom).

3. Listen Technologies LA-381-01 Intelligent 12-Unit Charging Tray (Qty: 2) for Applied Arts Building and (Qty: 1) for Fine Arts 4 Building.

2.2 SUBSTITUTIONS

A. The acceptability of a proposed substitution to a specified Audiovisual Equipment item shall be considered under the following terms:

1. The term "No Substitutions" shall denote that only the listed product(s) are acceptable and no substitutions will be considered or approved.

2. The term “Or Equal as Approved" shall denote that equivalent products will be considered as alternatives to the specified products pending approval from Audiovisual Consultant.

3. The term "Or Equal" shall denote that functionally equivalent products shall be acceptable without written approval by Audiovisual Consultant.

B. Where a specified item has been discontinued by the manufacturer and/or replaced by a new model, the Audiovisual Integrator shall supply the current model at no additional cost to the project. Audiovisual Consultant may require submission of the new model for evaluation prior to acceptance as a substitute.

C. Where a manufacturer is listed as “comparable” but a specific model number is not indicated, the comparable products must meet all the listed specifications as a minimum, and the primary specified product (manufacturer and model number) shall be used as the basis of design.

D. Unless otherwise noted, product substitution is allowed only by expressed written consent of Audiovisual Consultant.

E. The Audiovisual Integrator shall be fully responsible for making a substitute product match the requirements, description and functionality of the originally specified product regarding all options, accessories and external interface requirements.

2.3 SOFTWARE

A. General:

1. All source code becomes the exclusive property of the District.

2. All source code changes must be fully documented. Updated programming (compiled and un-compiled hard and soft copy versions of code) must be updated and located at all equipment rack locations and for all equipment manuals.

3. Source code changes and/or additional programming will be warranted by the vendor for a period of 1 year with the Audiovisual Integrator responsible for any required diagnosis and repair.

4. All manufacturer's software operating system updates, bug fixes, patches, etc., shall be installed as part of the periodic system maintenance of the system during the warranty period.

5. An acceptance test will be performed at commissioning during which the software and any additional code changes or upgrades must perform accurately and be error free.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before commencing the Audiovisual Integrator shall verify proper completion of the following work by others:

1. All low voltage cable containment and other infrastructure, including, but not limited to, the following:

a. Junction boxes and conduit installed per Drawings and Specifications.

b. Conduit stub-outs finished appropriately to prevent cable abrasion.

c. Pull boxes installed per N.E.C. based on total number of turns and angles and on linear feet of conduit.

d. Pull strings installed in all conduits.

e. Cable tray installed and accessible as specified.

2. All line voltage (120VAC) electrical power services, including verification of service levels, circuiting, grounding and other critical criteria.

3. Fixed millwork and furniture systems.

B. Confirm with the Contractor and the District that all work performed by others that impacts the work of the Audiovisual Integrator and the Audiovisual System installation has been completed satisfactorily. Also confirm that any remaining work to be completed will not adversely affect the work of the Audiovisual Integrator of the Audiovisual System installation and/or performance.

C. Provide written notification of any problems impacting the Audiovisual Integrator's work to Audiovisual Consultant. Failure of the Audiovisual Integrator to notify the Architect and/or Audiovisual Consultant in a timely manner of incomplete, inadequate, unfinished or otherwise unacceptable pre requisite work by other trades in the base building infrastructure will not relieve the Audiovisual Integrator of the responsibility to complete the work under this Contract.

3.2 INSTALLATION

A. General:

1. All equipment and enclosures described in this Specification shall be installed plumb and square unless specifically detailed otherwise.

2. All Audiovisual Equipment, except that designated as movable, portable or loose equipment, shall be secured and permanently attached to racks or other appropriate rigid surface in a manner which will require the use of a tool (e.g.: screw driver, nut driver, etc.) for removal.

3. All Audiovisual Equipment installed in a manner or location that may visually impact the finished appearance or functionality of any part of the facility shall be coordinated and approved by the Architect and/or the Audiovisual Consultant prior to installation.

4. All Audiovisual Equipment supports shall meet or exceed the load requirements of the intended application with a minimum safety factor of five times the actual load.

5. Provide support structure and hardware with a SAE Grade 8 load rating (min.).

B. Conduit and raceways:

1. Where cabling transitions from the building distribution infrastructure into equipment racks, provide strain relief and insulation as necessary to protect the cables.

2. Segregate cabling within conduits by signal and cable types.

3. Do not exceed 40% fill in conduits.

C. Cable Dressing:

1. Cable dressing shall be considered from a maintenance standpoint. Suitable service loops shall be provided to allow removal of equipment, or to extend equipment that is mounted in the rack on rack slides. Where there is no rear access to the rack mounted equipment, this requirement shall be carefully addressed, and cabling shall be of sufficient length to enable the removal and replacement of any individual piece of equipment with all others in place.

2. It is expected that the Audiovisual Integrator will fabricate some portions of the systems off site. Pre-wiring is acceptable provided that the pre-wired assembly can easily be transported to its final location without complication, and without risk of cable or equipment damage. Use of intermediate connections for inter rack cables is not acceptable.

3. Equipment specified as "Future" shall be accommodated with cables installed and routed normally, with the un-terminated end being labeled, sealed in a plastic bag, and tagged appropriately.

4. The Audiovisual Integrator shall be responsible for determining the proper length of all cables whether manufactured on or off the job site.

5. The Audiovisual Integrator shall determine the desired method of securing cables. All of the following requirements must be met by the system:

6. Plastic cable ties are the preferred method of cable lacing. Lay in systems are not acceptable except as applied to a horizontal cable tray.

7. Wires and cable shall be installed in a neat and orderly fashion, with like cable types following similar paths. Groups of cables shall be neatly combed and harnessed. Harnessed groups of cables shall be anchored at suitable intervals to reduce and relieve wire strain, especially strain on connections. Adequate service loops shall be provided at all cable endpoints.

8. Some rack-mounted equipment utilizes slide assemblies for front extension while in operation. For this type of mounting, additional, carefully dressed service loops on all cables shall be provided and installed with spring operated cable retractor assemblies to gather and recoil the service loop.

9. For all schemes of cable routing, no point in the path shall be subjected to a bend radius of less than 8 times the cable diameter, or minimum cable bend radius specified by the manufacturer.

10. Captive cables shall not be laced in such a manner as to prevent removal of the equipment to which they are captive.

11. Wires and cables shall be segregated according to signal type. In addition, audio cable shall be subdivided into 3 classes: microphone level circuits, line level circuits, and speaker level circuits.

12. Microphone level audio circuits shall be kept at least three inches (3") from any other type of parallel signal circuits and at least 6 inches from any parallel AC power circuits.

13. Speaker level audio circuits shall be kept a minimum of 3 inches from line level audio and AC power circuits. All other signal circuits shall be kept at least 3 inches away from any parallel AC power circuits.

14. Where circuits of different types must cross, they shall do so at right angles and then return to the above required separations in as short a distance as possible.

15. Conductors, wires, and cables shall be continuous between termination points. Splices are not acceptable.

16. Cable tie and lacing installation shall be accomplished using hand tools specifically designed to apply proper tension to the cable tie, and to cut the end off flush with no protruding sharp edges. The Audiovisual Integrator's field supervisor shall spot check assemblies using cable ties both visually and by touch, thereby detecting any sharp edges of improperly cut cable ties. Install cable ties on all cable runs of two or more cables that are not supported by raceway, cable tray, or other means. Place cable ties approximately 6 inches apart. Do not use more cable ties than are necessary for a neat installation. Cable ties shall not be applied with excessive force that may damage or deform sensitive and fragile cables.

17. Rack mounting rails shall not be used for cable lacing. Lacing bars and/or tie mount bases mounted to cabinets or console shall be provided where appropriate.

D. Labeling

1. Provide permanent, self adhesive, engraved labels on the following (use 1/8 inch letters with contrasting core):

   a. Front panel of rack mounted equipment to indicate system designation and/or functionality (e.g. Automixer 3, Press Feed, ADA, Speech Amp-Zone A, etc.).

   b. Terminals (all types) to indicate system designation and/or functionality.

2. Provide permanent, self adhesive labels on the back of rack mounted equipment to indicate system designation and/or functionality. Text shall be identical to equipment front panels noted above; however, labels for equipment back panels do not need to be rigid, engraved labels.

3. Identification “Vanity Panels” may be used and located at the top most panel location of each equipment rack to identify the Audiovisual Integrator as well as the Audiovisual Consultant.

4. Provide engraved text or graphics directly on the following (use 1/8 inch letters with contrasting paint fill):

   a. Receptacle plates and panels.

   b. Rack panels.

5. Provide heat shrink labels on both ends of all installed cabling. Use self adhesive wire numbers under clear heat shrink, direct printed heat shrink or direct printed self adhesive wrap around.

6. Provide printed tags 6 inches from the male connector end on all portable cables.

7. Do not indicate the Audiovisual Integrator’s name on movable, portable or loose equipment, control panels or wall plates.

8. Text, graphics and colors used on labels visible on finished surfaces visible to Audiovisual System end-users must be approved by Audiovisual Consultant before fabrication of labeling, plates or other labeled items.

E. Wiring:

1. Do not make any in line wire splices unless specifically approved and noted.

2. Use only wire pulling lubricants specified by the wire manufacturer.

3. Provide grommets or chase nipples at cable entry where conduit is not installed.

4. Provide cable anchors for any cable or cable bundle • 1 inch diameter. Do not use self sticking adhesive cable anchors.

5. Provide a service loop for each cable that connects to equipment in racks or AV furniture.

6. All cables to or from a movable lectern, cart, or desk or lectern shall be highly flexible cable, specifically designed by the manufacturer to be flexed repeatedly. Permanent installation type of cable is not acceptable for this application.

7. Do not install HD-SDI cable or Category type cables with plastic wire ties. Use soft Velcro based cable ties located at random distances apart.

F. Service and segregation of installed cables: Refer to AV Drawing package for standard wiring termination and labeling details, standard cable segregation requirements and any special condition wiring details.

G. Terminations:

1. Use crimping tools recommended by the termination manufacturer. Use ratcheting crimp tools for spade lugs and Molex connector pins.

2. Provide insulated spade lugs for screw terminals, two lugs per terminal maximum.

3. Conductors in phoenix type connectors shall not be tinned.

4. Use properly sized spade lugs for cable gauge and screw size.

5. Terminate conductors with proper mating connectors.

6. Audio shield/drain wires shall not be connected to the connector body at any time.

7. Only one cable or set of wires should be installed into any single connector; do not loop cable in and out of a connector. Provide a terminal block to parallel any audio signal wiring.

3.3 QUALITY CONTROL

A. Using the necessary test equipment, record and report to Audiovisual Consultant the results of all tests called for under this heading and as noted elsewhere.

B. Correct or replace at no expense to the District any component that does not meet the manufacturer's specifications or indicated performance during any test.

3.4 SUBSTANTIAL COMPLETION INSPECTION

A. Prior to the Substantial Completion Inspection, the Audiovisual Integrator must verify that he is prepared for the checkout session by filling out a checklist for each room based on field verification. This completed checklist must be faxed or emailed to Audiovisual Consultant before checkout.

B. During Substantial Completion Inspection the Audiovisual Integrator will verify quality of workmanship, labeling, proper power/signal grounding and overall equipment performance. Audiovisual Consultant will also verify audio setup and equalization and projector adjustments and will test all basic AV system operations. Audiovisual Consultant will prepare a punch list of items the Audiovisual Integrator must address before Final Checkout.

C. Substantial Completion Inspection will be scheduled after the documentation provided is approved.

D. The Audiovisual Integrator's Project Manager or a senior technician who is familiar with the system and the control system programmer shall assist Audiovisual Consultant during the Substantial Completion Inspection. The tests will consist of a thorough test, set up, adjustments and evaluation of all system performance and functionality. Include 16 hours on site for these tests.

E. Following the Substantial Completion Inspection, Audiovisual Consultant will create a punch list of deficiencies that must be corrected by the Audiovisual Integrator within 7 calendar days. The Audiovisual Integrator must provide documentation indicating that the punch list deficiencies have been corrected no later than 7 calendar days after Substantial Completion Inspection.

3.5 FINAL ACCEPTANCE

A. Prior to the Final Acceptance inspection, the Audiovisual Integrator must verify that he is prepared for the checkout session by again filling out the following checklist verifying that all systems are operational, as well as all punch list items from the Preliminary Checkout Session have been addressed and corrected. This completed checklist, one for each room, must be faxed or emailed to Audiovisual Consultant before checkout.

3.6 SYSTEM TESTING & DISTRICT ACCEPTANCE PROCEDURES

A. Installation Testing and Adjustment:

1. The Audiovisual Integrator shall perform all tests and adjustments, shall furnish all test equipment necessary and perform all work required to verify performance of the system in accordance with these Specifications. When these initial tests and adjustments are completed, the Audiovisual Integrator shall notify the District that the systems are in compliance with the Specifications and are ready and complete for Acceptance Tests. The scope of this work includes, but is not limited to the following:

   a. The acceptance testing process shall reference this Specification for specific system requirements. There are two distinct procedures in the overall acceptance testing process outlined in this section, the Substantial Completion and the Final Acceptance. Often times, punch lists and incomplete elements will preclude considering the first review of the systems to be the final acceptance of the systems. Typically, final acceptance occurs only after all punch lists are completed and the District has had some time to work the systems (after the systems are substantially complete), final documentation is given to the District, and all training is performed.

2. Additionally, the District shall retain the right to hire a consultant to test the technology systems. Delays to this consultant caused by incomplete work, improper wiring or inoperative equipment may result in consultant's time being billed to the Audiovisual Integrator at current consulting rates. In the event further adjustments are required, or defective equipment is to be repaired or replaced, tests shall be suspended or continued at the option of the District.

3. AV system acceptance testing will consist of verifying overall system functionality, internal rack functions and wiring, external device functions and terminations, device operation, and completion of the Audiovisual Integrators testing procedures . The District and Audiovisual Consultant will spot check the systems installed by the Audiovisual Integrator in accordance with the standards and practices delineated in the Specification documentation. The following requirements will be considered the basis for establishing substantial completion of the AV Systems.

4. Provide as-built equipment list.

5. Provide redlined design drawings, rack layouts, spreadsheets, and any other relevant and current documentation.

6. Integrator’s Punch list: Provide an internally constructed punch list of known devices, cables, or systems that are incomplete. Audiovisual Consultant and the District will construct another punch list after the substantial completion acceptance testing is performed that is based on the inspection and the Audiovisual Integrator’s internally constructed list.

7. Test, adjust, balance, equalize and calibrate all equipment (including OFE) as required for optimum quality. Establish and tabulate normal settings for all level controls. These settings shall be recorded in the maintenance manual for reference.

8. Signal and Cable Testing and Documentation: Provide documentation on the point to point testing of all Fiber, CAT6, Audio, Video Inter-Room and Cabling, provided by the Audiovisual Integrator. The following will be tested for each of the respective category of cable and/or signal types:

a. Audio: Continuity, polarity, sound check.

b. Speaker: Impedance, polarity, proper zoning, buzz and rattle (frequency sweep), sound check, signal quality.

c. Video: Signal continuity, proper routing.

d. Control: Continuity and confirmation of control capability between designated control locations and control processors.

e. Data/Cat6: Bandwidth testing.

9. Quality of Installation: The areas around the AV installation should be free of debris and excess wires. Racks, consoles, and equipment should be free from dirt and grease.

10. Labeling and Terminations: All devices, including floor boxes, racks, termination panels, components, closets, panels, and cables should be terminated and labeled according to the Integrator's engineered plans. Visual spot-checking of wire dressing and terminations will be performed during the Acceptance Testing procedure.

11. The District's technical staff shall be involved in recommending hardware and software system settings. The Integrator shall be responsible for providing the test equipment for the tests.

12. System Functional Completion Requirements:

a. The District is encouraged to bring in specific testing and operation scenarios that the Integrator may run through.

b. The individual areas of the building and the corresponding audiovisual shall be tested for compliance with system functional descriptions described in the Technology Systems Performance Specification.

13. System Technical Performance Completion:

a. Individual sub-system components of the integrated AV Systems shall meet or exceed the technical performance defined in the Technology Systems Specification. Testing of the performance of these systems is the responsibility of the Integrator and shall include:

1) During the Acceptance Testing procedure, each system will be spot checked to verify systems integration and inter-system operability. For instance, a laptop and/or microphone should be able to be plugged into an interface, and the audio routed to a desired speaker zone.

b. The Audiovisual Integrator shall supply any necessary testing equipment for Acceptance Testing including a continuity checker, laptop computers with software, patch cables, and video test equipment. Also, video signal must be able to be routed, patched, and scaled or scan converted.

3.7 TRAINING

A. The Audiovisual Integrator shall provide sufficient training for the District's designated staff to become proficient in the general operation, routine maintenance, troubleshooting, and other basic system support functions. This training shall include one session of training of up to 2 hours by the Audiovisual Integrator or the equipment manufacturer. This training shall include a

session or sessions that are focused on the District's designated technical staff and also a session or sessions that focus on the administrative and/or instructional staff. Training of end users will be provided by the District's technical staff.

B. Times of day for training must be coordinated with Client availability including evening hours if requested for least disruption to Client day time operations.

3.8 CONTRACT CLOSE-OUT

A. Contract Closeout will be based on completion of Final Checkout, acceptance of Project Record Documents and Completion of Using Agency Training.

END OF SECTION

SECTION 32 1713
PARKING BUMPERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Precast concrete wheel stops.

B. Related work:

1. Division 32 for pavement markings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wheel stops: Standard precast concrete units, formed of 3,000 psi (minimum) concrete reinforced with 2 No. 3 deformed concrete reinforcing bars, with 2 holes for anchors. Exposed surfaces shall be dense and smooth, free of honeycombs.

B. Anchors: 3/4-inch ID galvanized pipe or No. 5 concrete reinforcing bar by 18-inch long.

PART 3 - EXECUTION

3.1 INSPECTION\PREPARATION

A. Verify conditions and measurements affecting the work of this Section at site. Make sure that detrimental conditions are corrected before proceeding with installation.

3.2 INSTALLATION

A. Install in the locations shown, in even alignment. Anchor to subgrade by driving 2 anchors flush with the top of the bumper. Use caution not to damage the bumper.

END OF SECTION

SECTION 32 1723
PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Pavement markings on concrete curbs and AC paving.

B. Related work:

1. Division 9 for all other field painting.

1.2 SUBMITTALS

A. Data: Submit manufacturer data for paint.

B. Samples: Submit 8-1/2- by 11-inch samples of paint color selected.

1.3 HANDLING

A. Storage: Off the ground, protected from weather, in original packaging, and protected from damage. Properly vent protective covering.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint: One of the following, or equal, of the color(s) selected by the Architect.

1. Frazee Paint: Traffic Line Paint 506.

2. Dunn Edwards Corp.: Vin-L-Stripe W-801.

3. Sherwin-Williams: Pro-Park Traffic Marking Paint B97 Series.

B. Paint color:

1. Accessibility markings: Match No. 15090 in Federal Standard 595A as specified in Section 2-1720 of CCR Title 24 Accessibility Regulations.

2. No Parking Zone Markings: Yellow.

3. No Parking Curbs: Red.

4. All other loactions: White.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct detrimental conditions before proceeding with installation.

3.2 PREPARATION

A. Remove dust, debris, curing and sealing compounds, and other foreign substances detrimental to epoxy adhesive and paint bond. Use a commercial degreasing solution to remove grease and oil.

B. Take field measurements and make layouts required.

3.3 PAVEMENT MARKINGS

A. Mix and apply paint in compliance with the paint manufacturer's instructions and to the layout indicated.

B. Paint accessibility marking at each accessible parking space. Apply 700 square-inch International Accessibility Symbol on pavement in accordance with CBC Title 24 Section 2. Paint white symbol on blue square background.

C. Make lines uniform and 3-inch wide, unless otherwise indicated.

D. Provide hairpin stripe hatching between accessibility parking stalls as required by Code.

E. Make work straight or curved as indicated, of uniform color and texture with edges parallel, clean, sharply defined and accurate, without overspray.

F. Thickness of cured paint film shall be 15 mils minimum, but not less than required for complete opacity.

G. Spread and embed glass traffic beds evenly in final coat while still wet at the rate of 5 pounds per gallon of paint.

H. Erect temporary barriers and signs, and leave them in place until the paint has thoroughly dried.

3.4 CORRECTIVE WORK

A. Touchup defective markings by painting over the errors with paint of the same color as the pavement. Correct deviations in the edge of striping that are greater than 1/2-inch in 20-foot and re-apply striping correctly.

B. The Architect may, at his option, require sandblasting of the striping if the errors are significant.

C. Replace damaged units.

END OF SECTION

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A

APPENDIX A – CUT SHEETS

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	

FEATURES & SPECIFICATIONS

INTENDED USE —The BLT Best-in-Value Low Profile LED luminaire features a popular center basket design that offers a clean, versatile style and volumetric distribution. High efficacy LED light engines deliver energy savings and low maintenance compared to traditional sources. An extensive selection of configurations and options make the BLT the perfect choice for many lighting applications including schools, offices and other commercial spaces, retail, hospitals and healthcare facilities. The low profile BLT design (2-3/8") also makes it an excellent choice for renovation projects.

CONSTRUCTION — BLT enclosure components are die-formed for dimensional consistency and painted after fabrication with a polyester powder paint for improved performance and protection.

The reflector is finished with a high reflective matte white powder paint for improved aesthetics and increased light diffusion.

End plates contain easy-to-position integral T-bar clips for securely attaching the luminaire to the T-grid. For additional T-grid security, optional screw on T-bar clips are available.

Diffusers are extruded from impact modified acrylic for increased durability.

LED boards and drivers are accessible from the plenum.

OPTICS — Volumetric illumination is achieved by creating an optimal mix of light to walls, partitions and vertical and horizontal work surfaces – rendering the interior space, objects and occupants in a more balanced, complimentary luminous environment. High performance extruded acrylic diffusers conceal LEDs and efficiently deliver light in a volumetric distribution. Four diffuser choices available - curved and square designs with linear prisms or a smooth frosted finish.

ELECTRICAL — Long-life LEDs, coupled with high-efficiency drivers, provide superior quantity and quality of illumination for extended service life. 80% LED lumen maintenance at 60,000 hours (L80/60,000).

Non-Configurable BLT: Generic 0-10 volt dimming driver. Dims to 10%

Configurable BLT: available in High Efficiency (HE) versions for applications where a lower wattage (over the standard product) is required. The High Efficiency versions deliver >130 LPW and can be specified via the Lumen Package designations in the Ordering Information below.

eldoLED driver options deliver choice of dimming range, and choices for control, while assuring flicker-free, low-current inrush, 89% efficiency and low EMI.

Optional integrated nLight®controls make each luminaire addressable - allowing it to digitally communicate with other nLight enabled controls such as dimmers, switches, occupancy sensors and photocontrols. Connection to nLight is simple. It can be accomplished with integrated nLight AIR wireless or through standard Cat-5 cabling. nLight offers unique plug-and-play convenience as devices and luminaires automatically discover each other and self-commission, while nLight AIR is commissioned easily through an intutitive mobile app.

Lumen Management: Unique lumen management system (option N80) provides on board intelligence that actively manages the LED light source so that constant lumen output is maintained over the system life, preventing the energy waste created by the traditional practice of over-lighting.

Step-level dimming option allows system to be switched to 50% power for compliance with common energy codes while maintaining fixture appearance.

Driver disconnect provided where required to comply with US and Canadian codes.

SENSOR— Integrated sensor (individual control): Sensor Switch MSD7ADCX ((Passive infrared (PIR)) or MSDPDT7ADCX ((PIR/Microphonics Dual Tech (PDT)) integrated occupancy sensor/automatic dimming photocell allows the luminaire to power off when the space is unoccupied or enough ambient light is entering the space. See page 4 for more details on the integrated sensor.

Integrated Sensor (nLight Wired Networking): This sensor is nLight-enabled, meaning it has the ability to communicate over an nLight network. When wired, using CAT-5 cabling, with other nLight-enabled sensors, power packs, or WallPods, an nLight control zone is created. Once linked to a Gateway, directly or via a Bridge, the zone becomes capable of remote status monitoring and control via SensorView software. See page 4 for the nLight sensor options.

Integrated Smart Sensor (nLight Air Wireless Platform): The rES7 sensor is nLight AIR enabled, meaning it has the ability to communicate over the wireless nLight control platform. It is both a digital PIR occupancy sensor/automatic dimming photocell. It pairs to other luminairs and wall switches through our mobile app, CL*AIR*ITY, which allows for simple sensor adjustment. See page 4 for more details on the Integrated Smart Sensor.

INSTALLATION — The BLT's low profile design of only 2-3/8" provides increased installation flexibility especially in restrictive plenum applications. The BLT fits into standard 15/16" and narrow 9/16" T-grid ceiling systems.

Suitable for damp location.

For recessed mounting in hard ceiling applications, Drywall Grid Adapters (DGA) are available as an accessory. See Accessories section.

LISTINGS — CSA Certified to meet U.S. and Canadian standards. IC rated.
DesignLights Consortium® (DLC) Premium qualified product. Not all versions of this product may be DLC Premium qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

WARRANTY — 5-year limited warranty. Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

NOTE: Actual performance may differ as a result of end-user environment and application.

All values are design or typical values, measured under laboratory conditions at 25 °C.

Specifications subject to change without notice.

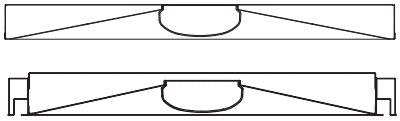
BLT Series LED

2BLT

2' x 4'
LED

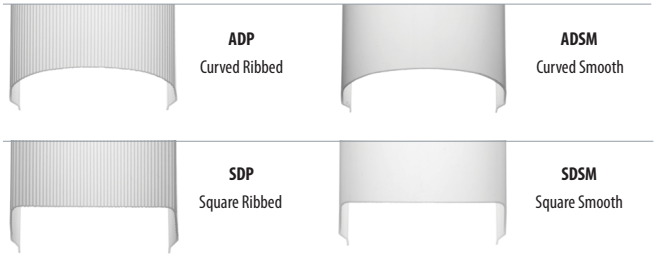
Specifications

Length: 47-3/4 (121.2)
Width: 23-3/4 (60.3)
Depth: 2-3/8 (6.0)
Depth with Air supply/return: 2-3/4 (6.9)



All dimensions are inches (centimeters) unless otherwise specified.

Multiple Diffuser Options



A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and out-of-the-box control compatibility with simple commissioning.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is part of an A+ Certified solution for nLight® control networks when ordered with drivers marked by a shaded background*
- This luminaire is part of an A+ Certified solution for nLight control networks, providing advanced control functionality at the luminaire level, when selection includes driver and control options marked by a shaded background*

To learn more about A+, visit www.acuitybrands.com/aplus.

*See ordering tree for details

2BLT Volumetric Recessed Lighting 2'x4'

A+ Capable options indicated by this color background.

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative.

Example: 2BLT4 40L ADP EZ1 LP840

2BLT4

Series	Air function	Lumens[2]		Diffuser	Voltage	Driver	Color temperature
2BLT4 2x4 BLT	(blank) Static A Air supply/ return[1]	**Standard efficiency (>100 LPW)** 30L 3000 40L 4000 48L 4800 60L 6000 72L 7200	**High efficiency[3,4] (>130 LPW)** 40LHE 4000 48LHE 4800 60LHE 6000 72LHE 7200 85LHE 8500	ADP Curved, linear prisms ADSM Curved, smooth SDP Square, linear prisms SDSM Square, smooth **Includes trim rings to match sensored version** ADPT Curved, linear prisms ADSMT Curved, smooth SDPT Square, linear prisms SDSMT Square, smooth	(blank) MVOLT 120 120V 277 277V 347 347V[5]	EZ1 eldoLED dims to 1% (0-10 volt dimming) SLD Step-level dimming[6] LE1 Lutron Ecosystem driver dims to 1%[6,7]	LP830 82CRI, 3000 K LP835 82CRI, 3500 K LP840 82CRI, 4000 K LP850 82CRI, 5000 K LP930 90CRI, 3000K LP935 90CRI, 3500K LP940 90CRI, 4000K LP950 90CRI, 5000K

Controls

(blank)	No nLight®
N80	nLight® with 80% lumen management
N80EMG	nLight® with 80% lumen management For use with generator supply EM power[8]
N100	nLight® without lumen management
N100EMG	nLight® without lumen management For use with generator supply EM power[8]
NLTAIR	nLight AIR enabled[9]

Occupancy control[10]

(blank)	No sensor control
nLight Wired Networking	
NES7	nLight™ nES 7 PIR integral occupancy sensor[11]
NESPDT7	nLight™ nES PDT 7 dual technology integral occupancy control[11]
NES7ADCX	nLight™ nES 7 ADCX PIR integral occupancy sensor with automatic dimming photocell[11]
NESPDT7ADCX	nLight™ nES PDT 7 dual technology integral occupancy sensor with automatic dimming photocell[11]
nLight Wireless Networking	
RES7N	nLight AIR PIR integral occupancy sensor with automatic dimming photocell for Networking Capabilities

Individual Control

MSD7ADCX	PIR integral occupancy sensor with automatic dimming control photocell[6,12]
MSDPDT7ADCX	PDT integral occupancy sensor with automatic dimming control photocell[6,12]
nLight Wireless Zone	
RES7Z	nLight Air PIR integral occupancy sensor with automatic dimming photocell for zone control

Options

EL7L	700 lumen battery pack[13]
EL14L	1400 lumen battery pack[13]
EL14LSD	1400 lumen battery pack with self-diagnostic testing feature[13,14]
CP	Chicago plenum[15]
BGTD	Bodine Generator Transfer Device[16]
PWS1836	6' pre-wire, 3/8" diameter, 18 gauge, 1 circuit
PWS1846	6' pre-wire, 3/8" diameter, 18 gauge, 2 circuit
PWS1846 PWSLV	Two cables: one 6' pre-wire, 3/8" diameter, 18 gauge, 2 circuits; one 6' pre-wire, 3/8" diameter, 18 gauge, purple and gray[17]
PWS1856LV	6' pre-wire, 3/8" diameter, 18 gauge, 1 circuit w/low voltage purple and grey wires[17]
GLR	Fast-blowing fuse[18]
GMF	Slow-blowing fuse[18]
NPLT	Narrow pallet
RRL_	RELOC®-ready luminaire[19]
LATC	Earthquake clip
DWAM	Anti-Microbial paint
JP16	Job packaging
IP5X	Gasketed diffuser compartment to meet IP5X rating[20]

Accessories next page

Notes

1 Consult factory for airflow data.
2 Approximate lumen output.
3 All versions may not achieve 130+ LPW. Refer to photometry on www.acuitybrands.com.
4 Air supply/return option, 90 CRI, and versions with integral sensor trim rings may not achieve 130 LPW.
5 Not available with SLD EL7L, or EL14L options.
6 Not available with N80, N80EMG, N100, N100EMG, NLTAIR, or occupancy control.
7 Not available with controls, occupancy controls, or PWS options. Consult factory for Hi-Lume dimming.
8 nLight EMG option requires a connection to existing nLight network. Power is provided from a separate N80 or N100 enabled fixture.
9 Must order with RES7N or RES7Z sensor. Only available with EZ1 driver. Not available with 72L, 72LHE, or 85LHE options.
10 Must specify diffuser with trim rings. See sensor options on page 4.
11 Requires N80, N80EMG, N100, or N100EMG.
12 Only available with EZ1 driver option. 0-10v dimming wires not accessible via access plate.
13 When using pre-wire option, use PWS1846 or PWS1846 PWSLV.
14 For more information, please see the PSSD2 specification sheet.
15 Not available with N80, N80EMG, N100, or N100EMG.
16 Must specify voltage. Requires BSE labeling, voltage specific. Consult factory for options.
17 Not available with nLight wired/wireless network or individual controls.
18 Must specify voltage, 120 or 277, with GLR and GFM fusing.
19 For ordering logic consult RRL_2013.
20 Not available with air supply/return or Wired Networking (NES_) and Individual Control (MSD_) sensors.

LED: One Lithonia Way Conyers, GA 30012 Phone: 800-858-7763 www.lithonia.com Rev. 03/13/17

2BLT Volumetric Recessed Lighting 2'x4'

Non-Configurable BLT								
Stock/MTO	**Catalog Description ***	**UPC**	**Lumens**	**Wattage**	**LPW**	**Color Temperature**	**Voltage**	**Pallet Qty**
Stock	2BLT4 40L ADP LP835	00190887470789	3945	34	116	3500K/82 CRI	120-277	26
	2BLT4 40L ADP LP840	00190887470765	4032	34	118	4000K/82CRI	120-277	26
	2BLT4 46L ADP LP835	00190887468656	4520	38.34	118	3500K/82 CRI	120-277	26
	2BLT4 46L ADP LP840	00190887468649	4620	38.34	120	4000K/82CRI	120-277	26
	2BLT4 40L ADP EL14L LP835	00190887470925	3945	34	116	3500K/82 CRI	120-277	26
	2BLT4 40L ADP EL14L LP840	00190887470918	4032	34	118	4000K/82 CRI	120-277	26
	2BLT4 46L ADP EL14L LP835	00190887468670	4520	38.34	118	3500K/82 CRI	120-277	26
	2BLT4 46L ADP EL14L LP840	00190887468663	4620	38.34	120	4000K/82 CRI	120-277	26
MTO	2BLT4 40L ADP 347 LP835		3945	34	116	3500K/82 CRI	347	26
	2BLT4 40L ADP 347 LP840		4032	34	118	4000K/82CRI	347	26
	2BLT4 46L ADP 347 LP835		4520	38.34	118	3500K/82 CRI	347	26
	2BLT4 46L ADP 347 LP840		4620	38.34	120	4000K/82CRI	347	26

*Generic 0-10V Dimming to 10%.

Accessories: *Order as separate catalog number.*

DGA24	Drywall grid adapter for 2x4 recessed fixture

nLight® Wired Control Accessories:
Order as separate catalog number. Visit www.acuitybrands.com/products/controls/nlight.

WallPod stations	**Model number**	**Occupancy sensors**	**Model number**
On/Off	nPODM [color]	Small motion 360°, ceiling (PIR / dual tech)	nCM 9 RJB / nCM PDT 9 RJB
On/Off & raise/lower	nPODM DX [color]	Large motion 360°, ceiling (PIR / dual tech)	nCM10 RJB / nCM PDT 10 RJB
Graphic touchscreen	nPOD GFX [color]	Wall switch with raise/lower	nWSX PDT LV DX [color]
Photocell controls	**Model number**	**Cat-5 cable (plenum rated)**	**Model number**
Full range dimming	nCM ADCX RJB	10' cable	CAT5 10FT J1
		30' cable	CAT5 30FT J1

nLight® AIR Control Accessories:
Order as separate catalog number. Visit www.acuitybrands.com/products/controls/nlightair.

Wall switches	**Model number**
On/Off single pole	rPODB [color]
On/Off two pole	rPODB 2P [color]
On/Off & raise/lower single pole	rPODB DX [color]
On/Off & raise/lower two pole	rPODB 2P DX [color]
On/Off & raise/lower single pole	rPODBZ DX WH[1]

Notes
1 Can only be ordered with the RES7Z zone control sensor version.

Replacement Parts: *Order as separate catalog number.*

*249P2N	2DBLT48 ADP LENS ASSEMBLY	4 ft. replacement lens
*249P2T	2DBLT48 SDP LENS ASSEMBLY	4 ft. replacement lens
*249P30	2DBLT48 ADSM LENS ASSEMBLY	4 ft. replacement lens
*249P33	2DBLT48 SDSM LENS ASSEMBLY	4 ft. replacement lens
*237LT2	2DBLT48 ADPT LENS ASSEMBLY	4 ft. replacement lens
*237LT4	2DBLT48 SDPT LENS ASSEMBLY	4 ft. replacement lens
*237LT6	2DBLT48 ADSMT LENS ASSEMBLY	4 ft. replacement lens
*237LT8	2DBLT48 SDSMT LENS ASSEMBLY	4 ft. replacement lens
*237LTA	2DBLT48 ADPT SENSOR LENS ASSEMBLY	4 ft. replacement lens
*237M52	2DBLT48 SDPT SENSOR LENS ASSEMBLY	4 ft. replacement lens
*237M5A	2DBLT48 ADSMT SENSOR LENS ASSEMBLY	4 ft. replacement lens
*237M5L	2DBLT48 SDSMT SENSOR LENS ASSEMBLY	4 ft. replacement lens

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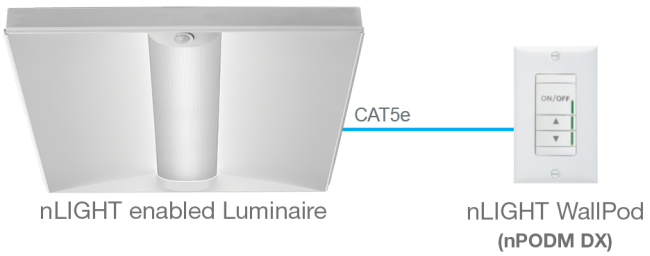
LED: One Lithonia Way Conyers, GA 30012 Phone: 800-858-7763 www.lithonia.com

Rev. 03/13/17

2BLT Volumetric Recessed Lighting 2'x4'

Sensor Options						
Option	Automatic Dimming Photocell	Occupancy Sensing		nLight Wired Networking	nLight AIR Networking	nLight AIR Zone
		PIR	PDT			
MSD7ADCX	X	X				
MSDPDT7ADCX	X		X			
NES7		X		X		
NES7ADCX	X	X		X		
NESPDT7			X	X		
NESPDT7ADCX	X		X	X		
RES7N	X	X			X	
RES7Z	X	X				X

Basic nLight Zone



Integrated Sensor with Individual Control

The MSD7ADCX PIR occupancy sensor/automatic dimming photocell is ideal for areas without obstructions and where daylight harvesting may be desired. Suggested applications include, but not limited to, hallways, corridors, storage rooms, and breakrooms or other areas where people are typically moving.

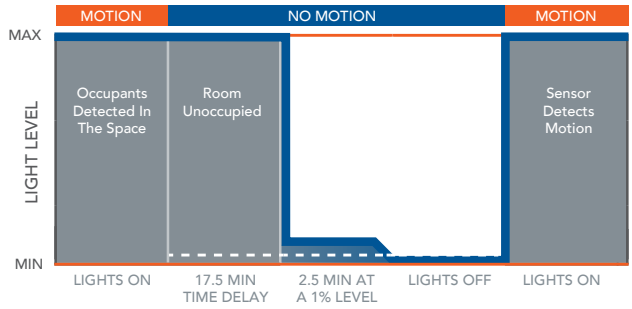
The MSDPDT7ADCX PIR/Microphonics Dual Tech occupancy sensor/automatic dimming photocell is ideal for areas with obstructions and where daylight harvesting is desired. Suggested applications include, but not limited to, open offices, private offices, classrooms, public restrooms, and conference rooms.

nLight Wired Networking

The nES 7 is ideal for small rooms without obstructions or areas with primarily walking motion. Ideal areas include hallways, corridors, storage rooms, and breakrooms. Additionally, the NES7ADCX includes an integrated photocell, which enables daylight harvesting controls.

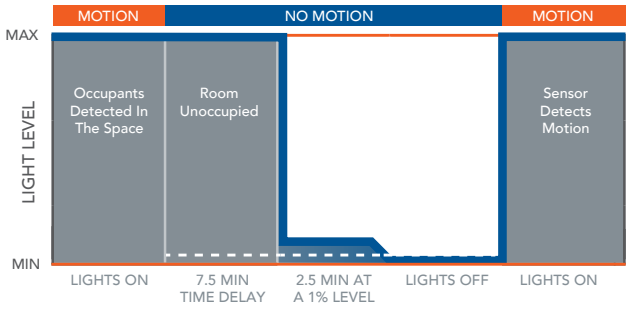
For areas like restrooms, private offices, open offices, conference rooms or any space with obstructions, the nES PDT 7 dual technology sensor is recommended. The nES PDT 7 utilizes both PIR (passive infrared) and Microphonics technologies to detect occupancy. Additionally, the NESPDT7ADCX includes an integrated photocell, which enables daylight harvesting controls which is ideal for areas where windows are present.

Sequence of Operation



*The presetting on the automatic dimming photocell is 5fc.

Sequence of Operation



*The presetting on the automatic dimming photocell is 5fc.

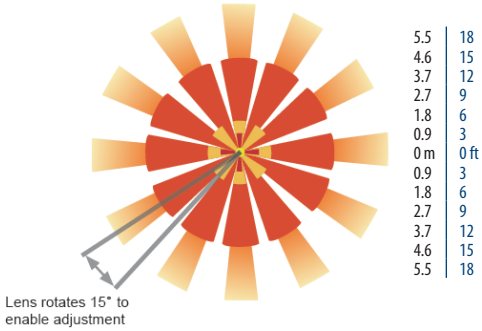
Sensor Coverage Pattern
Mini 360° Lens

- Recommended for walking motion detection from mounting heights between 8 ft (2.44 m) and 20 ft (6.10 m)
- Initial detection of walking motion along sensor axes at distances of 2x the mounting height up to 15 ft (4.57 m) and
- 1.75x up to 20 ft (6.10 m).
- Provides 12 ft (3.66 m) radial detection of small motion when mounted at 9 ft (2.74 m)
- Initial detection will occur earlier when walking across sensor's field of view than when walking directly at sensor

nLight AIR Wireless

nLight AIR is the ideal solution for retrofit or new construction spaces where adding additional wiring can be labor intensive and costly. The integrated rES 7 smart sensor is part of each luminaire in the nLight AIR network, which can be grouped to control multiple luminaires. The granularity of control with the digital PIR occupancy detection and daylight sensing makes a great solution for any application.

9 FT Mounting



Simple as 1,2,3

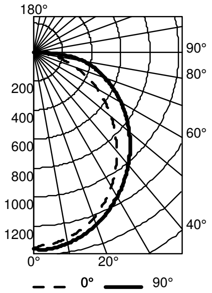
1. Install the nLight® AIR fixtures with embedded smart sensor
2. Install the wireless battery-powered wall switch
3. With CLAIRITY app, pair the fixtures with the wall switch and if desired, customize the sensor settings for the desired outcome

LED: One Lithonia Way Conyers, GA 30012 Phone: 800-858-7763 www.lithonia.com

Rev. 03/13/17

PHOTOMETRICS

2BLT4 40L ADP LP835, 3945 delivered lumens, test no. LTL28918P37, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1356	1356
5°	1330	1361
15°	1269	1309
25°	1147	1212
35°	984	1085
45°	795	938
55°	599	777
65°	407	609
75°	216	437
85°	54	179
90	6	2

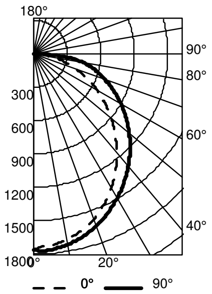
Coefficients of Utilization (pf 20%)

pc	80%			70%			50%		
pw / RCR	70%	50%	30%	50%	30%	10%	50%	30%	10%
0	119	119	119	116	116	116	111	111	111
1	108	103	98	100	96	92	96	92	89
2	98	89	82	87	80	75	83	78	73
3	89	78	69	76	68	62	73	66	61
4	81	69	60	67	59	52	65	57	52
5	75	61	52	60	52	45	58	50	44
6	69	55	46	54	46	39	52	45	39
7	64	50	41	49	41	35	48	40	34
8	59	46	37	45	37	31	44	36	31
9	56	42	34	41	33	28	40	33	28
10	52	39	31	38	30	25	37	30	25

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1037	26.3	26.3
0° - 40°	1686	42.7	42.7
0° - 60°	2970	75.3	75.3
0° - 90°	3947	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	3947	100.0	100.0

2BLT4 48L ADP LP835, 5121 delivered lumens, test no. LTL28918P41, tested in accordance to IESNA LM-79



CP Summary

	0°	90
0°	1760	1760
5°	1726	1767
15°	1647	1699
25°	1490	1574
35°	1277	1409
45°	1033	1217
55°	778	1008
65°	528	791
75°	280	567
85°	70	232
90	8	3

Coefficients of Utilization (pf 20%)

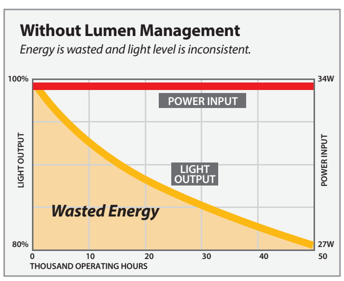
pc	80%			70%			50%		
pw / RCR	70%	50%	30%	50%	30%	10%	50%	30%	10%
0	119	119	119	116	116	116	111	111	111
1	108	103	98	100	96	92	96	92	89
2	98	89	82	87	80	75	83	78	73
3	89	78	69	76	68	62	73	66	61
4	81	69	60	67	59	52	65	57	52
5	75	61	52	60	52	45	58	50	44
6	69	55	46	54	46	39	52	45	39
7	64	50	41	49	41	35	48	40	34
8	59	46	37	45	37	31	44	36	31
9	56	42	34	41	33	28	40	33	28
10	52	39	31	38	30	25	37	30	25

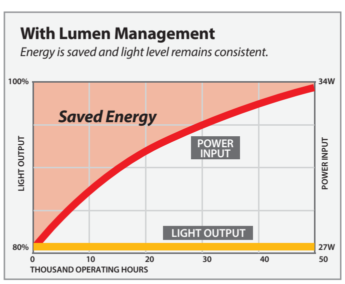
Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1346	26.3	26.3
0° - 40°	2188	42.7	42.7
0° - 60°	3856	75.3	75.3
0° - 90°	5123	100.0	100.0
90° - 180°	0	0.0	0.0
0° - 180°	5123	100.0	100.0

Constant Lumen Management

Enabled by the embedded nLight control, the BLT actively tracks its run-time and manages its light source such that constant lumen output is maintained over the system life. Referred to as lumen management, this feature eliminates the energy waste created by the traditional practice of over-lighting.





Performance Data

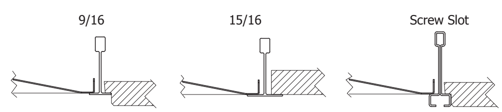
Lumen Package	Lumens	Input Watts	LPW
30L ADP LP830	3286	30	110
30L ADP LP835	3371	30	113
30L ADP LP840	3445	30	115
30L ADP LP850	3614	30	121
40L ADP LP830	3846	34	113
40L ADP LP835	3945	34	116
40L ADP LP840	4032	34	118
40L ADP LP850	4230	34	124
48L ADP LP830	4993	45	111
48L ADP LP835	5121	45	114
48L ADP LP840	5234	45	116
48L ADP LP850	5492	45	122
60L ADP LP830	6014	53	114
60L ADP LP835	6169	53	117
60L ADP LP840	6305	53	119
60L ADP LP850	6615	53	125
72L ADP LP830	7388	67	110
72L ADP LP835	7579	67	113
72L ADP LP840	7746	67	115
72L ADP LP850	8127	67	121
AIR 30L ADP LP830	3075	30	103
AIR 30L ADP LP835	3138	30	105
AIR 30L ADP LP840	3223	30	108
AIR 30L ADP LP850	3250	30	108
AIR 40L ADP LP830	3599	34	105
AIR 40L ADP LP835	3673	34	108
AIR 40L ADP LP840	3772	34	110
AIR 40L ADP LP850	3804	34	111
AIR 48L ADP LP830	4672	45	104
AIR 48L ADP LP835	4897	45	109
AIR 48L ADP LP840	4897	45	109
AIR 48L ADP LP850	4939	45	110
AIR 60L ADP LP830	5628	53	106
AIR 60L ADP LP835	5743	53	108
AIR 60L ADP LP840	5899	53	111
AIR 60L ADP LP850	5949	53	112
AIR 72L ADP LP830	6914	67	103
AIR 72L ADP LP835	7055	67	105
AIR 72L ADP LP840	7247	67	108
AIR 72L ADP LP850	7309	67	109

HE Performance Data

Lumen Package	Lumens	Input Watts	LPW
48LHE ADP LP830	4655	36	127
48LHE ADP LP835	4775	36	130
48LHE ADP LP840	4880	36	133
48LHE ADP LP850	5121	36	139
60LHE ADP LP830	5473	42	129
60LHE ADP LP835	5614	42	132
60LHE ADP LP840	5738	42	135
60LHE ADP LP850	6020	42	142
72LHE ADP LP830	6805	52	130
72LHE ADP LP835	6981	52	133
72LHE ADP LP840	7135	52	136
72LHE ADP LP850	7486	52	143
85LHE ADP LP830	8189	64	127.
85LHE ADP LP835	8400	64	131
85LHE ADP LP840	8585	64	134
85LHE ADP LP850	9008	64	140

MOUNTING DATA

Ceiling Type	Appropriate Trim Type
Exposed grid tee (1' and 9/16")	G
Concealed grid tee	G
Plaster or plasterboard	G*



*DGA accessory available to provide ceiling trim flange and fixture support for plaster or plasterboard ceiling. Recommended rough-in dimensions for DGA installation is 24-3/4" x 48-3/4" (Tolerance is +1/8", -0").

LITHONIA LIGHTING®
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LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	E

FEATURES & SPECIFICATIONS

INTENDED USE — Ideal for applications requiring attractive die-cast aluminum signage, superior illumination and low energy consumption.

CONSTRUCTION — Precision-molded, die-cast aluminum construction — ultra-slim, compact housing. Fine-grain brushed aluminum faceplate with matte black electrostatic polymeric trim. Clear lacquer finish on brushed face inhibits fingerprints and other surface contaminants.

All electronics located inside housing.

Fully overlapping light seal prevents light leaks. Universal directional chevron knockouts are completely concealed and easily removed. Hinged faceplate and spring latches for easy lamp compartment access, no exposed hardware.

Letters 6" high with 3/4" stroke, with 100 ft viewing distance rating, based upon UL924 standards.

U.S. Patent No. 5,739,639, 5,954,423 and 6,502,044. Canada Patent No. 2,204,218. Other patents pending.

OPTICS — Lamp is constructed using new LED technology. Provides perfectly uniform illumination to meet 3/4" letter stroke required by code.

The typical life of the exit LED lamp is 10 years, based on continuous operation. Unique LED lamp platform accommodates both single-face and double-face exits.

Low energy consumption — red exit consumes std .81W, 1.3W (120V), green exit consumes std is 1W, 1.5W (120V). Universal input voltage capabilities (120V through 277V, 50 or 60 HZ).

ELECTRICAL — Solid-state electronic elements to eliminate risk of electromechanical failures.

Surge protection meets ANSI/IEEE C62.41 category B and IEC 1000 immunity standards for high voltage surges, electrostatic discharges, high frequency electrical fast transients and line voltage dips/swells.

Emergency Operation (for EL N option only): Battery: Sealed, maintenance-free nickel-cadmium battery delivers 90 minutes capacity to lamp.

Self-diagnostics (SD option only): Two-state constant-current charger maximizes battery life and automatically recharges after battery discharge. Test switch provided for manual testing.

Self-diagnostic testing for five minutes every 30 days, 30 minutes at 180-day interval, and 90 minutes annually.

Diagnostic evaluation of LED light source, AC to DC transfer, charging and battery condition.

Continuously monitors AC functionality.

Low voltage disconnect prevents excessive deep discharge that can permanently damage the battery.

Single-point microcomputer control for all electronic features.

Crystal oscillator timing system with watchdog protection for precision accuracy.

AC/LVD reset allows battery connection before AC power is applied and prevents battery damage from deep discharge.

Brownout protection is automatically switched to emergency mode when supply voltage drops below 80% of nominal.

Single multi-chromatic LED indicator to display two-state charging, test activation and three-state diagnostic status.

Test switch provides manual activation of 30-second diagnostic testing for on-demand visual inspection.

LE surface

LRE recessed

Signature®

Die-Cast Aluminum Exits

LE and LRE

LED

NEMA Premium

INSTALLATION — Universal mounting (top, end or back). Double face available with top or end mounting only. LRE: Trim ring has 3/4" depth adjustment to ensure a flush fit against the surface. Protrudes 1/10" from the surface. No exposed hardware.

Die-cast aluminum canopy provided for surface mount only.

LISTINGS — UL damp location listed 50°F - 104°F (10°C - 40°C). Meets UL 924, NFPA 101 (current Life Safety Code), NEC and OSHA illumination standards. North Carolina Department of Insurance. NEMA Premium certified.

WARRANTY — 5-year limited warranty. (Battery is prorated.) Complete warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Actual performance may differ as a result of end-user environment and application.

All values are design or typical values, measured under laboratory conditions at 25 °C.

Note: Specifications subject to change without notice.

ORDERING INFORMATION

For shortest lead times, configure products using **bolded options**.

Example: LE S 1 R EL N SD

Series	Face type	Housing color	Number of faces	Letter color	Input voltage	Operation	Options
LE LED, surface mount	**S** Stencil	**(blank)** Matte black, brushed aluminum face	**1** Single face	**R** Red	**(blank)** Universal input voltage (120-277V, 50 or 60 HZ)	**(blank)** AC only	(blank) None
LRE LED, recessed	P Panel [1]	BZ Dark bronze [2]	**2** Double face [2]	**G** Green		EL N Nickel-cadmium battery back-up	TP Two tamper proof Torx-head screws
		W White				X2 Lamp wired on two separate AC circuits [3]	VR Vandal-resistant shield (1/8" thick polycarbonate) [4]
		B Matte black [2]					FI FA Field selectable fire alarm interface or flashing emergency operation with intermittent audible alarm (one flash per minute) [5]
							FI Fire alarm flashing interface [6]
							FA Flashing emergency operation and intermittent audible alarm [7]
							SD Self-diagnostics [7]

Accessories: *Order as separate catalog number.*

ELA US12	12" stem kit (see spec sheet ELA-StemKits) [2,8]	ELA LEHO 120/277 N	Remote-capable exit with black canopy; provides 90 minutes of 11.1W capacity for remote head [2,8]
ELA WG1	Back-mount wire guard (see spec sheet ELA-WG) [2]	ELA ERK	Recess mounting rough-in kit for LRE only (see spec sheet ELA-ERK-LEHO)
ELA WGEXT	Top-mount wire guard (see spec sheet ELA-WG) [2]		
ELA WGEXE	End-mount wire guard (see spec sheet ELA-WG) [2]		

Notes

1. Panel face available for special wording only (see Custom Signage spec sheet).
2. Not available with LRE models.
3. UL Listed as emergency lighting.
4. VR contains tamper proof screws.
5. Available with SD option only.
6. Available with AC only or EL N option only.
7. Available with EL N option only.
8. Add W for white.

SPECIFICATIONS

ELECTRICAL				
Primary circuit				
Type	**Typical LED life[1]**	**Supply voltage**	**Input watts**	**Max. amps**
Red LED AC only	10 Years	120	0.81	0.05
		277	1.2	0.06
Green LED AC only	10 Years	120	1.05	0.05
		277	1.32	0.06
Red LED emergency	10 Years	120	1.3	0.06
		277	1.4	0.07
Green LED emergency	10 Years	120	1.5	0.07
		277	1.7	0.07

BATTERY			
Sealed Nickel-Cadmium			
Shelf life[2]	**Typical life[2]**	**Maintenance[3]**	**Optimum temperature[4]**
3 years	7-9 years	none	50°F – 104°F (10°C – 40°C)

Notes

1 The typical life of the exit LED lamp is 10 years, based on continuous operation.

2 At 77°F (25°C).

3 All life safety equipment, including emergency lighting for path of egress must be maintained, serviced, and tested in accordance with all National Fire Protection Association (NFPA) and local codes. Failure to perform the required maintenance, service, or testing could jeopardize the safety of occupants and will void all warranties.

4 Optimum ambient temperature range where unit will provide capacity for 90 minutes. Higher and lower temperatures affect life and capacity.

SELF-DIAGNOSTICS
(SD option only)

- Five-minute test every 30 days
- 30-minute test every six months
- 90-minute test annually
- Diagnostics evaluate the battery, lamp, charger and AC to DC transfer.

Condition	Indication
Normal mode	Steady green
Self-testing	Flashing green
Emergency mode	Off
Hi-charge	Steady red
Battery failure	Single-flash red
Lamp failure	Double-flash red
Circuit failure	Triple-flash red

KEY FEATURE

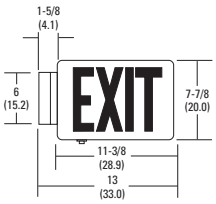
The typical life of the exit LED lamp is 10 years.

MOUNTING

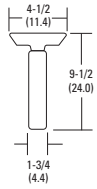
All dimensions are in inches (centimeters). For VR option, add 1/4" to height and width. Add 1/8" depth for single face; 1/4" depth for double face.

Shipping weight: LE - 4 lbs (1.8 kgs)
LE EL N- 5 lbs (2.3 kgs)
LRE - 4 lbs (1.8 kgs)
LRE EL N - 5 lbs (2.3 kgs)

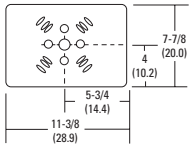
LE - End Mounting



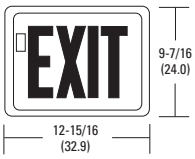
LE - Top Mounting

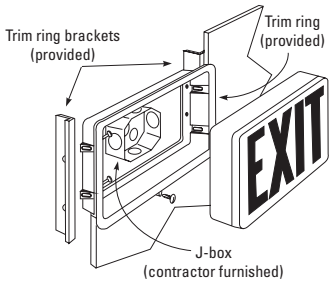


LE - Back Mounting



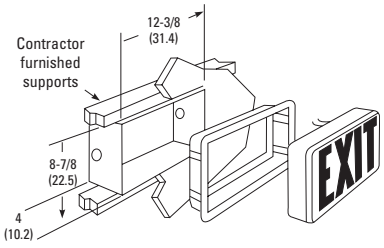
STANDARD MOUNTING





Wall opening dimensions: 8-3/4" H x 12-3/8" W x 1-3/4" D

MOUNTING WITH OPTIONAL ROUGH-IN KIT (ELA ERK)



Wall opening dimensions: 8-7/8" H x 12-3/8" W x 4" D

LITHONIA LIGHTING®
An AcuityBrands Company

EMERGENCY: One Lithonia Way, Conyers, GA 30012 Phone: 800-334-8694 Fax: 770-981-8141 www.lithonia.com

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	EE

FEATURES & SPECIFICATIONS

INTENDED USE — Suitable for applications requiring both exit sign and unit equipment. Attractive, 8" tall, streamlined design is great for above-the-door applications and other tight fits. Optional high-output version with remote lamps are ideal for emergency egress lighting. **Certain airborne contaminants can diminish integrity of acrylic and/or polycarbonate. Click here for Acrylic- Polycarbonate Compatibility table for suitable uses.**

CONSTRUCTION — Engineering-grade thermoplastic housing is impact-resistant, scratch-resistant and corrosion-proof. UL94V-O flame rating. UV-stable resin resists discoloration from natural and man-made light sources.

Rugged unibody housing snaps together with no additional fasteners. Faceplate and back cover are interchangeable on housing. Positive snap-fit tabs hold faceplate securely, yet are easily removable for lamp compartment access. Universal, directional chevron inserts are easily removed and reinserted.

Uniform graphics illumination without shadows or hot spots. Letters are 6" high with 3/4" stroke, with 100 ft. viewing distance rating based upon UL924 standard.

LEDs mounted on primary circuit boards for sign illumination. Low-energy LED lamp in sign operates in normal (AC input) and emergency (DC input) modes.

Low-profile, integrated test switch/pilot light. Easily viewed bright red status indicator.

Unique track-and-swivel arrangement permits full range of direction of lamp head adjustment. Universal J-box mounting pattern. Tool-less access for maintenance. Conduit entry position on top of unit.

U.S. Patent No. 6,848,798; 6,499,866; 6,142,648; 5,797,673; D379,373; 5,526,251; D484,272; D473,672; 5,611,163; 5,646,502.

OPTICS — Twin LED lamp heads operate in emergency (DC input) mode with 12 series-parallel white LEDs in each head. Provides redundant light sources to ensure emergency lighting performance. The typical life of the exit LED lamp is 10 years.

ELECTRICAL — Dual-voltage input capability (120/277V). Edge connector on printed circuit board ensures long-term durability.

Current-limiting charger maximizes battery life and minimizes energy consumption. Provides low operating costs.

Short-circuit protection — current-limiting charger circuitry protects printed circuit board from shorts.

Thermal compensation adjusts charger output to provide optimum charge voltage relative to ambient temperature.

Regulated charge voltage maintains constant-charge voltage over a wide range of line voltages. Prevents over/undercharging that shortens battery life and reduces capacity.

Filtered charger input minimizes charge voltage ripple and extends battery life.

AC/LVD reset allows battery connection before AC power is applied and prevents battery damage from deep discharge.

Single multi-color LED indicator to display two-state charging, test activation and three-state diagnostic test. Test switch provides manual activation of 30-second diagnostic testing for on-demand visual inspection. Self-diagnostic testing for 30 seconds every 30 days, 30 minutes at 180-day interval, and 90 minutes annually. Diagnostic evaluation of LED light source, AC-to-DC transfer, charging and battery condition.

Battery: Sealed, maintenance-free nickel-cadmium battery delivers 90-minute capacity to emergency lamps. Two-state contstant-current charge maximizes battery life and automatically recharges after battery discharge. Low-voltage disconnect prevents excessively deep discharge that can permanently damage the battery. Optional high-output battery to power both local and optional LED remote lamp heads simultaneously.

QUANTUM®
Thermoplastic Exits

LHQM LED

LED Lamp Head
Nickel-Cadmium Battery

HO RO

INSTALLATION — Top, end or back mounting. Housing snaps to canopy with positive-locking tabs. Cam locking pin secures housing to canopy.

Easily removed mounting knockouts. Conduit entry knockout for 1/2" flexible conduit. J-box pattern on back panel.

LISTINGS — UL damp location listed standard 50°-104°F (10°-40°C). Meets UL 924, NFPA 101 (current Life Safety Code), NEC and OSHA illumination standards.

WARRANTY — 5-year limited warranty. (Battery is prorated). Complete warranty terms located at www.AcuityBrands.com/CustomerResources/Terms_and_Conditions.aspx.

Note: Actual performance may differ as a result of end-user environment and application.

All values are design or typical values, measured under laboratory conditions at 25 °C.

Specifications subject to change without notice.

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: LHQM LED G

LHQM		LED							
Family		**Lamp type**		**Housing color**		**Letter color**		**Options**	
LHQM	Stencil face, single face plate with extra face plate	LED	Two 1.5W/9.6V white LED	(blank)	White	R	Red	HO	High-output Ni-cad battery
				B	Black	G	Green	HO R0	High-output option, less lamp heads
								SD	Self-diagnostics
								NOM	Meets Mexican standards[1]
								NOM SALIDA	Salida signage (non-UL)[2]

Accessories: *Order as separate catalog number.*

ELA Q L0309 SD	Single LED indoor remote head, white, self-diagnostics [3,4,5]	ELA WG3	Wireguard, 30"W x 13-1/2"H x 6"D[6]
ELA T Q L0309 SD	Twin LED indoor remote head, white, self-diagnostics [3,4,5]	ELA WG2M	Wireguard, 21-1/4"W x 15"H x 12"D[6]
ELA QWP L0309 SD	Single LED weather-proof remote head, gray, self-diagnostics [3,4,5]	ELA LQMUS12	12" white stem kit[7]
ELA T QWP L0309 SD	Twin LED weather-proof remote head, gray, self-diagnostics [3,4,5]	ELA LED M12	Single LED remote lamp[8,9]
ELA Q L0309	Single LED indoor remote head, white[4,5]	ELA LED T M12	Twin LED remote lamp[8,9]
ELA T Q L0309	Twin LED indoor remote head, white[4,5]	ELA LED WP M12	Single LED Weather proof remote lamp [8,9]
ELA QWP L0309	Single LED weather-proof remote head, gray[4,5]	ELA LED T WP M12	Twin LED Weather proof remote lamp [8,9]
ELA T QWP L0309	Twin LED weather-proof remote head, gray[4,5]		

Notes

1. Available in black or white. Consult factory for options.
2. Only available in white. NOM standard.
3. Only compatible with self-diagnostic option. (ex: HO SD)
4. Also available in black. Add "B" after ELA to order black finish. Example: ELA B Q L0309.
5. Only compatible with HO option . See spec sheet ELA-Q-LED.
6. See spec sheet ELA-WG.
7. See spec sheet ELA-Stemkits.
8. See spec sheet ELA LED (Contractor Select LED Remotes).
9. Not available with SD.

LHQM LED QUANTUM® Exit/Unit Combo

SPECIFICATIONS

Electrical **Primary Circuit**				
	Typical LED life[1]	Supply voltage	Max amps	Max watts
Red and green LED	10 years	120	.05	4.3
		277	.03	4.3

BATTERY

Ni-Cad				
Voltage	Typical Shelf life[2]	Typical life[2]	Maintenance[3]	Optimum temperature[4]
9.6	3 years	7-9 years	none	50-104°F (10-40°C)

1 Based on continuous operation.

2 At 77°F (25°C).

3 All life safety equipment, including emergency lighting path of egress, must be maintained, serviced and tested in accordance with all National Fire Protection Association and local codes. Failure to perform the required maintenance, service or testing could jeopardize the safety of occupants and will void all warranties.

4 Optimum ambient temperature range where unit will provide capacity for 90 minutes. Higher and lower temperatures affect life and capacity.

5. Battery life is negatively impacted by many variables including temperature, charging rates, number of cycles and deep discharges due to long periods of time without AC power.

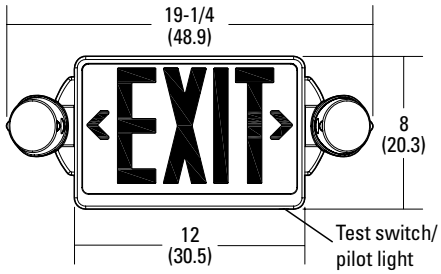
Remote Output Capacity			
Standard unit	Combo	Combo/high-output battery(HO)	Combo/high-output (HO) and no heads (RO)
NA	NA	3W	6W

MOUNTING

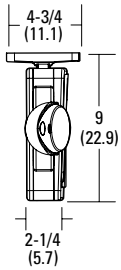
All dimensions are inches (centimeters).

Shipping weight: 3.6 lbs. (1.6 kgs.).

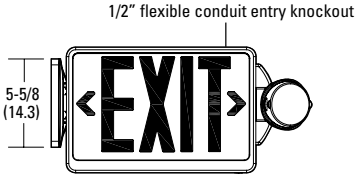
Face



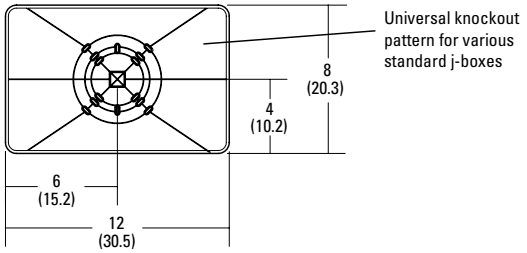
Top



End

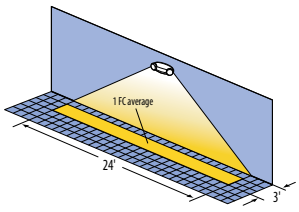


Backplate

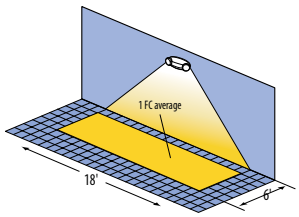


LAMP PHOTOMETRICS

QUANTUM LED SERIES – SINGLE COVERAGE
3W Total White LEDs
Using a single unit at a typical 7.5′ mounting height delivers an average illuminance of 1.0 FC over a distance of 24′ on a 3′ path of egress and 18′ on a 6′ path of egress.

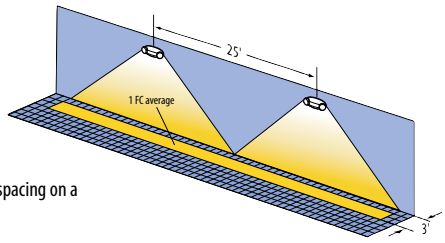


Example of single LHQM LED exit illuminating a 3' path of egress

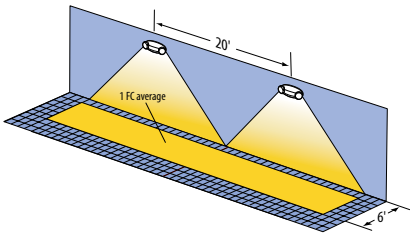


Example of single LHQM LED exit illuminating a 6' path of egress

QUANTUM LED SERIES – MULTIPLE COVERAGE
3W Total White LEDs
Using multiple units at a typical 7.5′ mounting height delivers 25′ center-to-center spacing on a 3′ path of egress and 20′ center-to-center spacing on a 6′ path of egress.



Example of multiple LHQM LED exits illuminating a 3' path of egress



Example of multiple LHQM LED exits illuminating a 6' path of egress

EXTENDED RUN-TIME FOR HIGH-OUTPUT EXITS

Product	Run time
LHQM LED HO (no remotes)	3.8 hours
LHQM LED HO RO (no remotes)	7.5 hours

EMERGENCY: One Lithonia Way Conyers, GA 30012 Phone: 800-334-8694 www.lithonia.com

Simplex

LifeAlarm Fire Alarm Controls

UL, ULC, CSFM Listed; FM Approved;
*MEA (NYC) Acceptance**

4009 IDNet NAC Extender for Control with IDNet Communications or Conventional NACs

Features

Provides additional notification appliance circuit (NAC) capacity with flexible operation modes and power-limited design

Four, Class B NACs are standard:

- Rated 2 A each for conventional reverse polarity 24 VDC notification appliances and providing multiple operation modes
- Can be selected to provide synchronization for Simplex® visible notification strobe flashes
- Capable of controlling TrueAlert non-addressable notification appliances operating with SmartSync two-wire control mode**

Input control options:

- IDNet addressable communications from a Simplex model 4007ES, 4010, 4010ES, 4100ES, or 4100U Fire Alarm Control Panel**
- Or from one or two conventional 24 VDC NACs with multiple output control options

IDNet communications control benefits:

- Provides status monitoring and individual NAC control using a single address per 4009 IDNet NAC Extender
- Supports IDNet "Device Level" earth fault location

WALKTEST operation is available with either input choice

Internal 8 A power supply/battery charger:

- Charges internal batteries up to 12.7 Ah or up to 18 Ah batteries in external cabinet
- Provides status monitoring of battery, input power, and earth faults
- Rated 8 A for "Special Application" appliances; including Simplex 4901, 4903, 4904, and 4906 Series horns, strobes, horn/strobes, and speaker/strobes
- Rated 6 A for "Regulated 24 DC" appliance power

Optional 4009 IDNet NAC Extender modules:

- IDNet Communications Repeater provides Class B or Class A output
- IDNet Communications Fiber Optic Receiver/Repeater, available as Class B or Class X
- Four additional Class B NACs, rated 1.5 A for Special Application appliances; 1 A for Regulated 24 DC appliance power
- Class A, Two Circuit Adapter Module

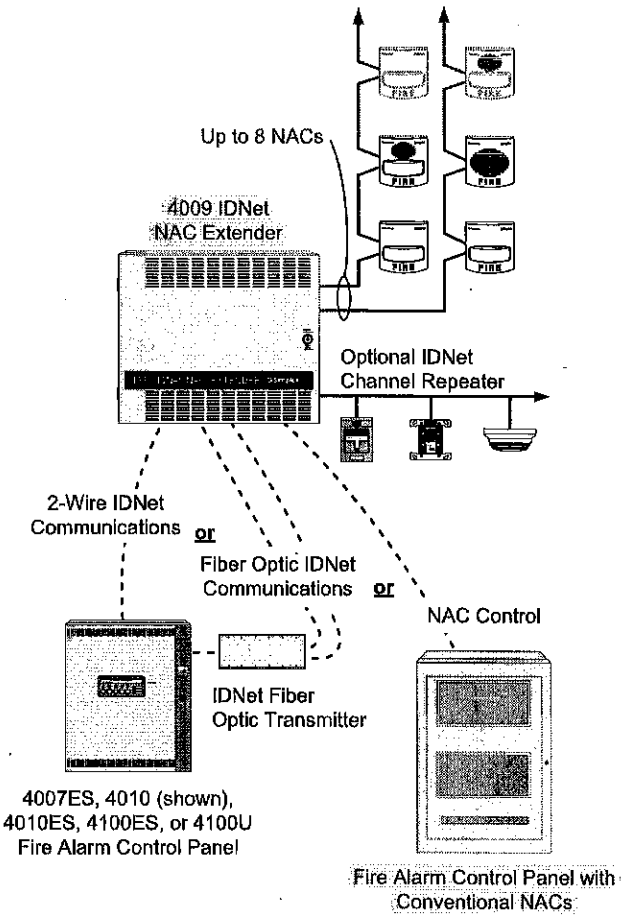
UL Listed to Standard 864

External Accessories

IDNet communication fiber optic transmitters:

- For applications requiring the data integrity available with fiber optic communications
- Available as Class B or Class X
- Mounts in standard six-gang electrical box

External battery cabinet for 18 Ah batteries



4009 IDNet NAC Extender Connection Reference Drawing

Introduction

ADA Compliance. Complying with the notification requirements of ADA (Americans with Disabilities Act) may require more notification appliance power than is available within the fire alarm control panel. When additional power is required, a Simplex 4009 IDNet NAC Extender can provide up to 8 A of NAC power with up to eight, supervised reverse polarity NACs.

Location Flexibility. The 4009 IDNet NAC Extender can be mounted close to a compatible dedicated host panel or can be located remotely for convenient power distribution. Multiple operation modes and multiple connection options further increase location flexibility.

Additional Information. For additional operation detail and application information, refer to Installation Instructions 574-181 and field wiring diagram 842-068.

* ULC listed model is 4009-9202CA. This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7300-0026:214 for allowable values and/or conditions concerning material presented in this document. Accepted for use – City of New York Department of Buildings – MEA35-93E. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

** 4100U requires revision 11 software or higher for compatibility. 4010 requires revision 2 software or higher for compatibility.

Application and Operation Information

IDNet Addressable Communications Compatible. Up to ten (10), 4009 IDNet NAC Extenders can be controlled per 4007ES, 4010ES, 4100ES, or 4100U IDNet communications channel; up to five (5) can be controlled on the 4010 IDNet communications channel. Each output NAC can be individually controlled for general alarm or selective area notification requiring only one point address per Extender. Individual Extender NACs can also be manually controlled from the host panel. IDNet controlled extenders will inform the host panel of troubles via IDNet communications. 4007ES, 4010ES, 4100ES, and 4100U control panels control using multi-point rules, refer to data sheet S4090-0011 for details.

Optional IDNet Repeaters. IDNet communications can be repeated with the optional IDNet Repeater Module or with the optional Fiber Optic Receiver Module. Up to 100 of the IDNet channel points can be repeated once (refer to pages 3 and 5 for details). Repeated IDNet communications also support the "device level" earth fault location utility of the host panel.

Hardwire Control Applications. For applications where an existing (or new) conventional NAC needs additional power, the 4009 IDNet NAC Extender can be controlled directly from the NAC. Either one or two NACs, from either the same, or from different host fire alarm control panels, can be connected to control the 4009 IDNet NAC Extender output NACs. Multiple control selections provide flexible operation. (Refer to page 4 for more detail.) Alarms from the host panel will activate the four, 4009 IDNet NAC Extender NACs (or optionally, eight NACs) to extend the alarm.

The 4009 IDNet Extender monitors itself and each of its output NACs for trouble conditions, including earth faults. Extenders wired to conventional NACs will indicate a trouble by opening the path to the NAC's end-of-line resistor, but retaining the ability to respond to alarms. Individual troubles are also annunciated by LEDs located on the 4009 IDNet NAC Extender main circuit board. (Refer to page 7 for more diagnostic information.)

Product Selection

Standard Models

Model	Description	
4009-9201**	120 VAC input	4009 IDNet NAC Extender with 4, Class B NACs and 8 A power supply
4009-9202CA*		
4009-9301	240 VAC input	

* ULC listed model

** 4009-9201 has been seismic tested and is certified to IBC and CBC standards as well as to ASCE 7 categories A through F, requires battery brackets as detailed on data sheet S2081-0019

Optional Modules (for on-site installation)

Model	Description		Comments
4009-9807	Additional four point NAC module, rated 1.5 A Special Application appliances; 1 A for Regulated 24 DC appliance power, Class B		One maximum
4009-9808	Dual Class A adapter (for two NAC outputs)		Select as required (4 maximum)
4009-9809	IDNet Repeater, output is Class A or Class B		Select **either** an IDNet Repeater **or** a Fiber Optic Receiver as required; one transmitter can connect to one receiver
4009-9810	Fiber Optic Receiver	Class B	
4009-9811		Class A (IDNet), Class X (fiber)	
4009-9805	Red Appliqué for door		Select if required
2975-9801	Semi-Flush Trim Kit	Beige trim	1-7/16" wide (78 mm), use if required for semi-flush installations
2975-9802		Red trim	

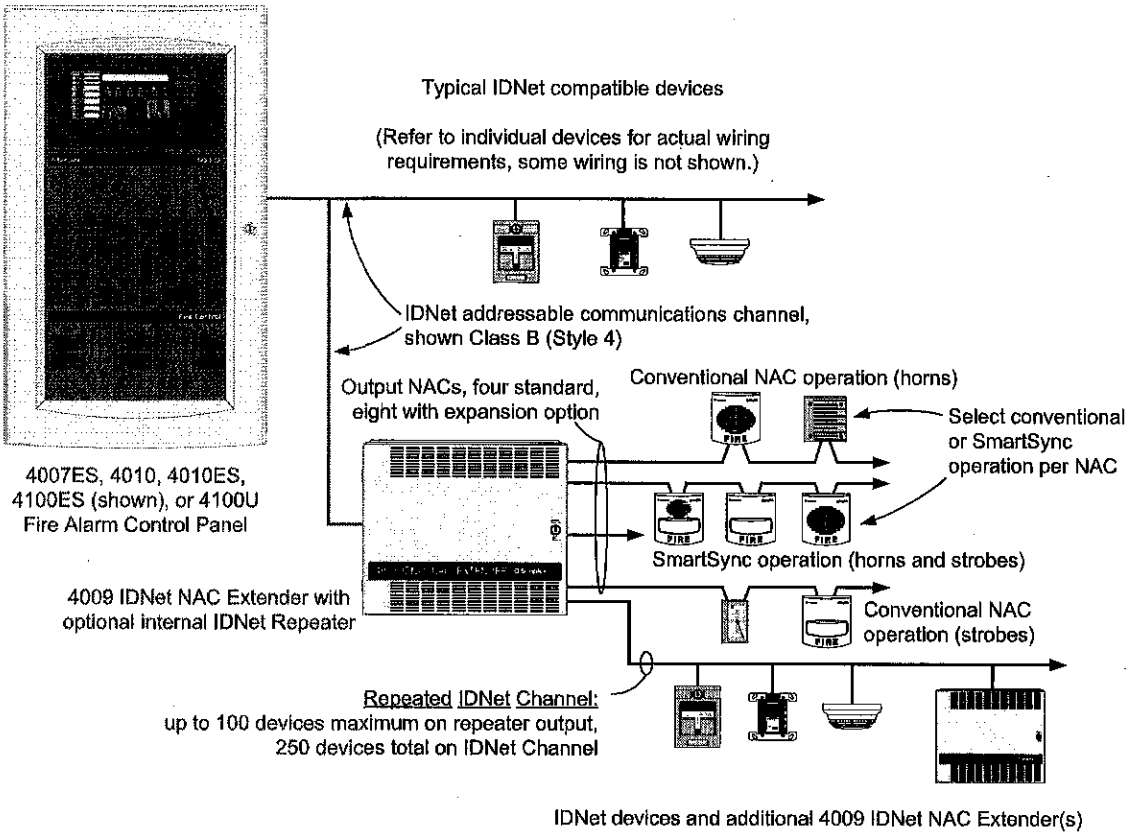
Battery Selection (select battery size per system requirements)

Model	Description	Comments
2081-9272	6.2 Ah Battery, 12 VDC	Two batteries are required, 24 VDC operation
2081-9274	10 Ah Battery, 12 VDC	
2081-9288	12.7 Ah Battery, 12 VDC	
2081-9275	18 Ah Battery, 12 VDC	Requires external battery cabinet, two batteries are required, 24 VDC operation

External Accessories (select per system requirements)

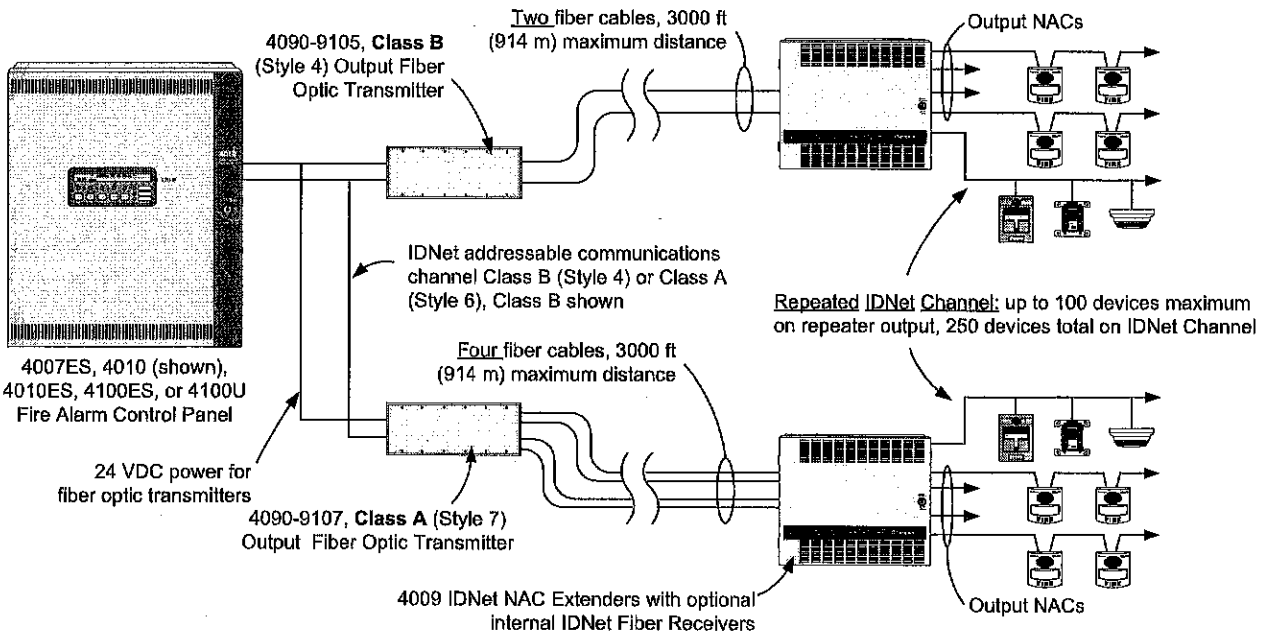
Model	Description		Comments
4090-9105	IDNet Fiber Optic Transmitter	Class B operation	Mounts in six-gang electrical box, refer to page 4 for mounting details
4090-9107		Class X operation	
4009-9801	External battery cabinet for up to 18 Ah batteries, beige		16-1/4" W x 13-1/2" H x 5-3/4" D (413 mm x 343 mm x 146 mm)
4081 Series	End-of-Line Resistor Harnesses; see data sheet S4081-0003 for details		

Typical IDNet Connection Example



NOTE: Up to ten (10) 4009 IDNet NAC Extenders may be connected per 4007ES, 4010ES, 4100ES, or 4100U IDNet channel, up to five (5) on the 4010 IDNet channel. IDNet communications can be repeated only once (can pass through only one series connected repeater or one fiber optic receiver).

Typical Fiber Optic System Connections



NOTE: Up to ten (10) 4009 IDNet NAC Extenders may be connected per 4007ES, 4010ES, 4100ES, or 4100U IDNet channel, up to five (5) on the 4010 IDNet channel. IDNet communications can be repeated only once (can pass through only one series connected repeater or one fiber optic receiver). Fiber optic transmitters connect to only one receiver in a 4009 IDNet NAC Extender.

Hardwire Control Connection Information

NAC Input Selections. The 4009 IDNet NAC Extender can be selected to:

- Track input NAC operation **or** to provide a locally generated code, selectable per NAC input
- If selected for local coding, NAC outputs can be either **Temporal Coded** or **60 Beats/min March Time Coded,** one code selection per extender (input NACs must be on continuous with Alarm)
- Additionally, NAC outputs can be selected to provide the Simplex strobe synchronization signal. This signal will synchronize the flashes of synchronized strobes but will be ignored by free-run strobes and audible devices. (Strobes are for operation by noncoded NACs.)

NAC input to NAC output control can be selected for standard and optional NACs per the following table:

Conventional NAC Output Operation Options

Input	A	B	C
NAC 1	NACs 1 & 2, 5 & 6	NACs 1-4	NACs 1-8
NAC 2	NACs 3 & 4, 7 & 8	NACs 5-8	None

SmartSync NAC Output Operation

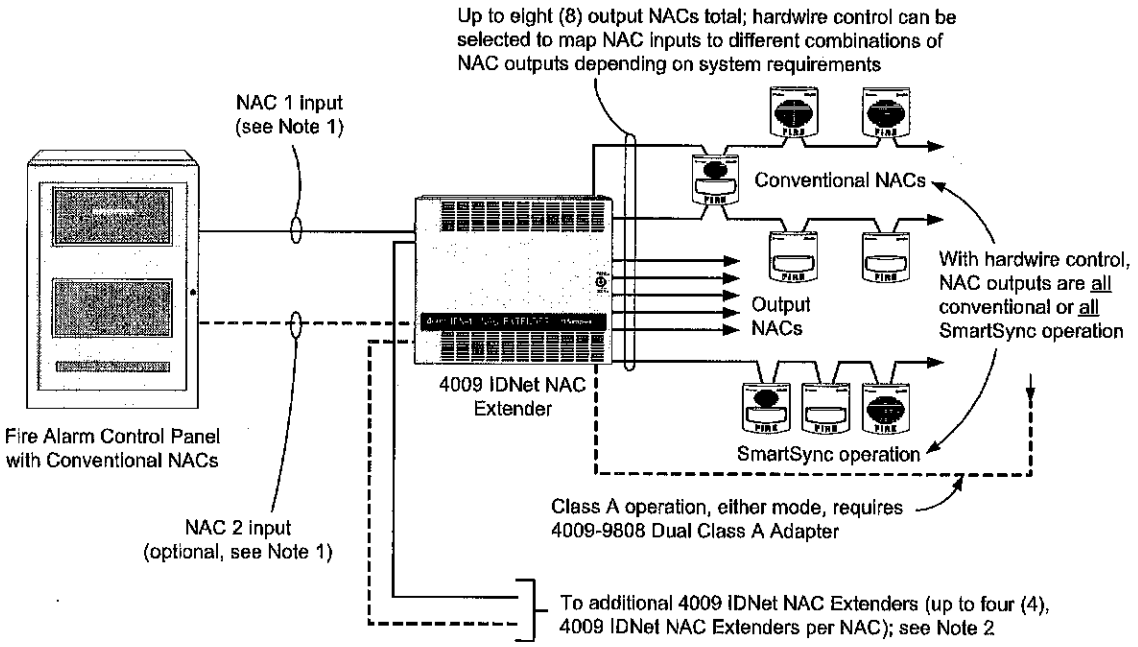
Input	NAC Control Function	
NAC 1	Strobe Control	All NAC outputs (1-8)
NAC 2	Horn Control	

SmartSync Notification Appliance Control

The TrueAlert Notification Appliance product line includes addressable and non-addressable operation. Non-addressable models are available with 2-wire SmartSync operation or conventional 4-wire operation. The following details apply to use with the 4009 IDNet NAC Extender:

- TrueAlert non-addressable models with SmartSync operation allow audible notification to be separately controlled over the same wire pair that controls visible notification
- 4009 IDNet NAC Extenders can be selected to provide SmartSync operation whether controlled by IDNet communications or conventional NACs
- IDNet control allows output NACs to be **individually selected** for conventional **or** SmartSync operation
- With NAC input control, **all** output NACs are selected for either conventional **or** SmartSync operation
- Refer to data sheet S4009-0003 for TrueAlert Addressable operation details, contact your local Simplex product supplier for further information on specific TrueAlert notification appliances

Hardwire Control NAC Connection One-Line Reference Diagram



Notes:

1. For separate audible and visible output NAC control, or SmartSync NAC output operation, two (2) input NACs are required. NAC 1 is "on-until-reset" and NAC 2 is "on-until-silenced."
2. To synchronize strobe flash outputs for up to four (4) 4009 IDNet NAC Extenders, use the synchronized strobe output from a Synchronized Flash Module (4905-9914 for Class B operation, 4905-9922 for Class A operation) or, if available, from a NAC selected to provide synchronized strobe flash output. **NOTE: DO NOT USE a NAC selected for SmartSync operation for this function.**

Refer to Installation Instructions 574-181 for additional information and application guidance

4009 IDNet NAC Extender Specifications

Input Ratings	120 VAC Input (4009-9201)	3A @ 102-132 VAC, 60 Hz
	240 VAC Input (4009-9301)	1.5A @ 204-264 VAC, 50/60 Hz
	Hardwire Control from External NACs, Input Requirements	Conventional reverse polarity operation
		5 mA maximum; 16 to 33 VDC
Output Ratings	Total Rating	8 A, Special Application appliances 6 A, Regulated 24 DC appliance power
	Standard NACs	2 A each, Special Application or Regulated 24 DC appliance power
	Optional NACs (requires 4009-9807)	1.5 A each, Special Application appliances 1 A each, Regulated 24 DC appliance power
	Special Application Appliances	Simplex non-addressable horns, strobes, and combination horn/strobes and speaker/strobes (contact your Simplex product representative for compatible appliances)
	Regulated 24 DC Appliances	Power for other UL listed appliances; use associated external synchronization modules where required
	Strobe Operation	Up to 33 strobes per NAC can be synchronized; output NACs configured for Simplex synchronized strobe operation are synchronized to each other
	Auxiliary Output	500 mA @ 24 VDC nominal

Optional Modules Ratings

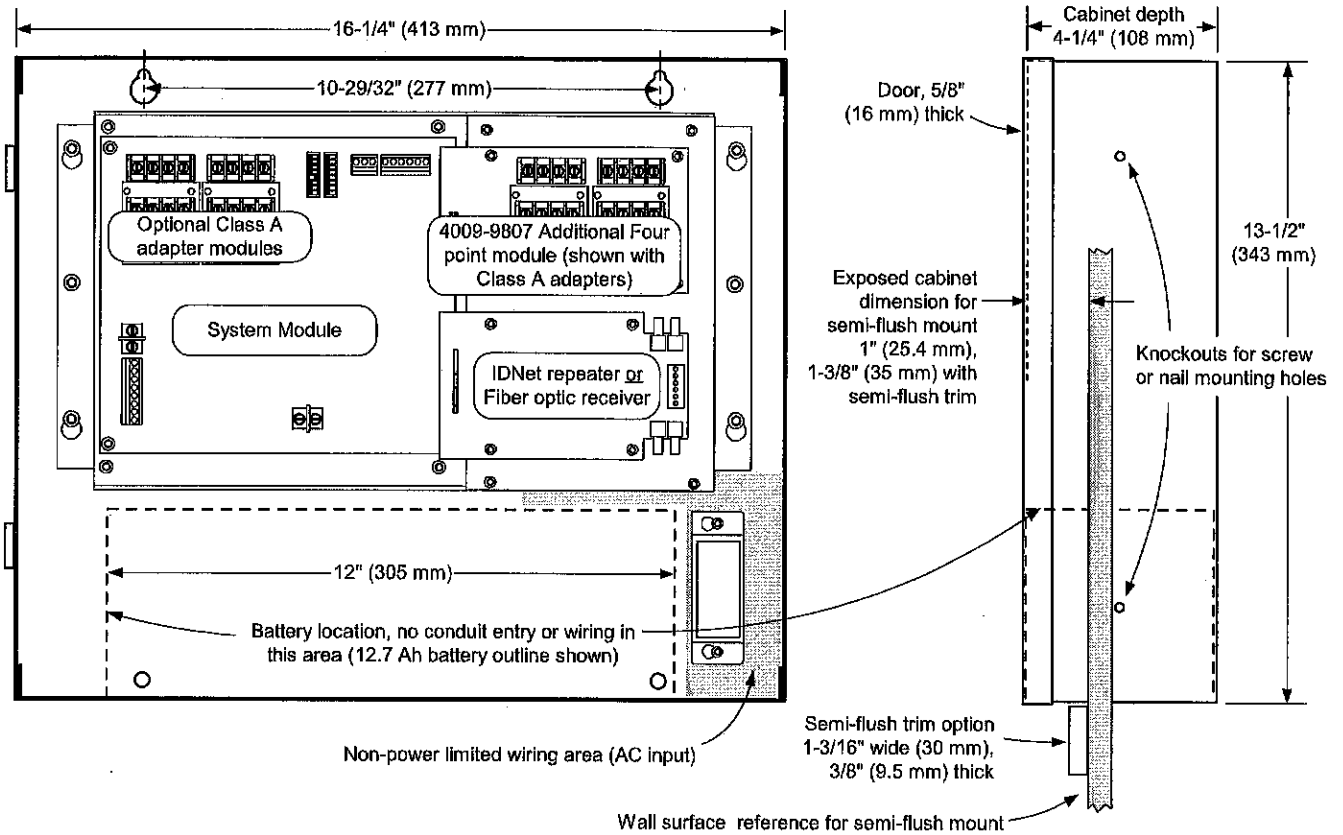
IDNet Repeater Module (4009-9809)	Input Power	70 mA @ 24 VDC, system supplied
	IDNet Input, One Address	Maximum distance from IDNet source is 2500 ft (762 m)
	IDNet Output Specifications	Repeated IDNet output for up to 100 devices (total IDNet devices not to exceed 250 per channel)
		Maximum distance to farthest device is 2500 ft (762 m)
		Total distance including "T-taps" is 10,000 ft (3048 m)
		Class A loop maximum distance is 2500 ft (762 m), no "T" taps
Fiber Optic Receiver Modules		
Input Current		4009-9810, Class B, 65 mA @ 24 VDC, system supplied
		4009-9811, Class X, 80 mA @ 24 VDC, system supplied
IDNet Output Specifications		Same as those for Repeater Module (see above)
Fiber Optic Transmission Distance		3000 ft (914 m) maximum
General (LED status indicators are listed on page 7, dimensions and mounting details are on page 6)		
Operating Temperature		32° to 120° F (0° to 49° C)
Operating Humidity Range		10% to 90% RH from 32° F to 104° F (0° C to 40° C)
Wiring Connections*		Terminal blocks for 18 AWG (stranded) to 12 AWG (solid)

Fiber Optic Transmitter Specifications

Input Voltage	18.9-32 VDC from compatible listed fire alarm supply
Input Current	4090-9105, Class B, 30 mA @ 24 VDC
	4090-9107, Class X, 35 mA @ 24 VDC
Fiber Optic Connections and cable requirements	Multimode, graded index, 50/125µm, 62.5/125 µm, 100/40 µm, or 200 µm
	Type ST connectors
	4090-9105, Class B operation, two fiber cables required
	4090-9107, Class X operation, four fiber cables required
Module Size (with mounting bracket)	6-13/16" W x 3-3/4" H x 1-1/8" D (173 mm x 95 mm x 29 mm)
On-board Status Indicators	Green LED flashing = transmit
	Red LED flashing = receive
	Separate red LED on 4090-9107 = Class X receive
Communications	Simplex IDNet
Fiber Optic Transmission Distance	3000 ft (914 m) maximum
Wiring Connections*	Terminal blocks for 18 AWG (stranded) to 12 AWG (solid)
Operating Humidity	10% to 90% RH from 32° to 104° F (0° to 40° C)
Operating Temperature	32° F to 120° F (0° to 49° C)

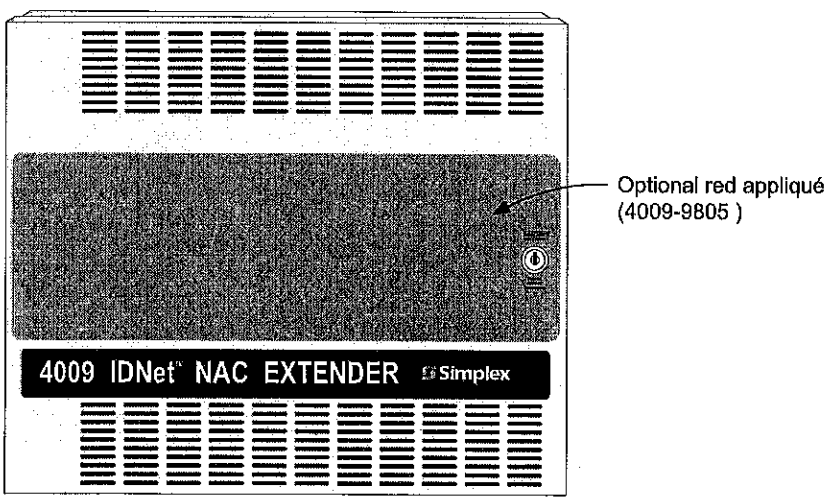
* Metric wire equivalents: 18 AWG = 0.82 mm^2; 12 AWG = 3.31 mm^2

4009 IDNet NAC Extender Mounting and Module Placement Information

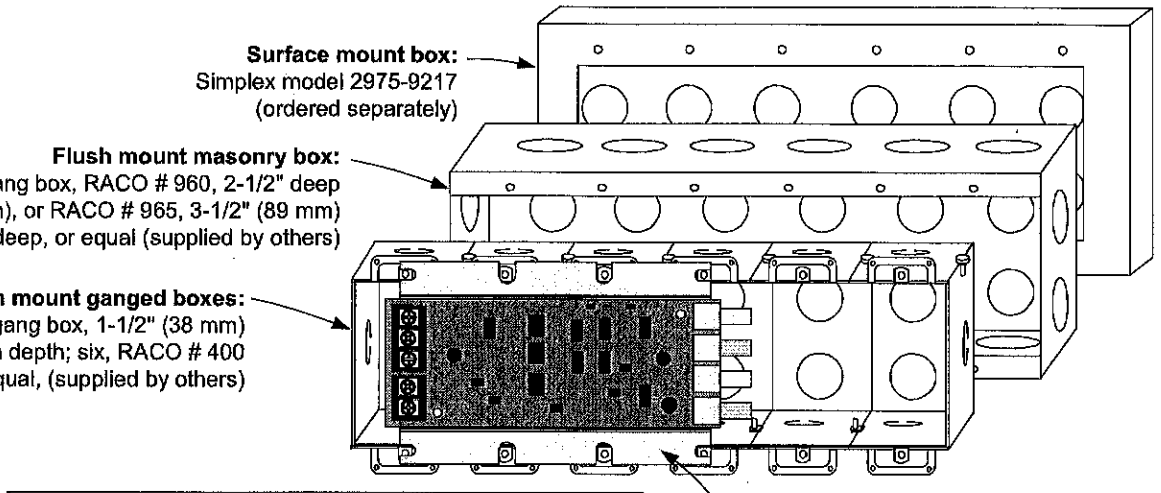


NOTE: Recommended conduit entrance varies with module selection. Refer to general installation instructions 574-181, specific module installation instructions, and to field wiring diagrams 842-068 before locating conduit entrance.

4009 IDNet NAC Extender Cabinet with Door Detail



4090-9105/9107 IDNet Fiber Optic Transmitter Mounting Information



Service Diagnostic Features

Power-up Self-Diagnostics. Upon power-up, the 4009 IDNet NAC Extender tests each module and performs earth fault diagnostics. Trouble conditions are communicated to the host control panel and are also displayed on diagnostic status LEDs in the 4009 IDNet NAC Extender. When connected via IDNet communications, detailed status information is available at the host. When controlled with conventional NAC inputs, common troubles are signaled by providing a polarized open circuit that disconnects the NAC wiring from its end-of-line resistor but still allows a reversed polarity alarm to be received.

Door Mounted Reference Label. The 4009 IDNet NAC Extender has a detailed programming and diagnostic label inside the front door that provides a quick reference for both installation and checkout.

LED Status Indicators are provided for the following:

- **Each NAC** (standard and optional) has a dedicated yellow LED that:
  - During supervision provides a slow flash to indicate a short circuit condition and a fast flash to indicate an open circuit
  - During an alarm, the LED follows the NAC output (on steady or flashing with coded output)
- **Four, general status yellow LEDs** provide nine separate indications listed in priority of urgency. As a trouble is eliminated, any remaining trouble(s) will then be indicated until the 4009 IDNet NAC Extender is returned to normal operation.
- **AC power status** is indicated by a green LED that is on when AC is normal. During low AC (brownout) conditions or with no AC, the LED is off. Additional power and battery status is indicated by the general status LEDs.

4009 IDNet NAC Extender Current Calculation Chart

Step 1. Calculate Basic Extender Battery Requirements (minus NAC loads)

Panel, NAC Options, and Auxiliary Power (underlined model numbers are optional modules)

Model	Description		Supervisory Current	Actual Supervisory	Alarm Current	Actual Alarm
4009-9201	120 VAC input	Basic Panel	85 mA	85 mA	185 mA	185 mA
4009-9301	240 VAC input					
4009-9807	Additional Four Point NAC		40 mA	+_____	40 mA	+_____
4009-9808	Dual Class A Adapter (no additional current)		–	–	–	–
Auxiliary Power Output			(500 mA maximum)	+_____	(500 mA maximum)	+ **[A1]** _____
				Basic Panel Supervisory Current	= **[S1]** _____	
					Basic Panel Alarm Current	= **[A2]** _____

Step 2. Calculate IDNet Output Module and Device Current (if used)

4009-9809	IDNet Repeater	Select one per Extender	70 mA	+_____	70 mA	+_____
4009-9810*	Fiber Optic Receiver, Class B		65 mA		65 mA	
4009-9811*	Fiber Optic Receiver, Class X		80 mA		80 mA	
IDNet Devices (connected to Repeater or Receiver above), 0.7 mA each, maximum of 100			Total devices x 0.7 mA each	+_____	Total devices x 0.7 mA each	+_____
				IDNet Module Supervisory Current	**[S2]** = _____	
					IDNet Module Alarm Current	= **[A3]** _____

* Note: IDNet Fiber Optic Transmitter current is supplied from the host fire alarm control panel

Step 2. Calculate Available NAC Current

Maximum Available Current	**= 8 A***
Subtract Auxiliary Power Output	- **[A1]** _____
Subtract IDNet Module Current	- **[A3]** _____
Available NAC Current	= **[A4]** _____

* 8 A for Special Application Appliances; 6 A for Regulated 24 DC Appliances

Step 3. Calculate Actual NAC Loading (Limited to Available NAC Current per Step 2.)

NAC Type	NAC Circuit #	NAC Alarm Current
Standard Panel NACS, 2 A maximum per NAC	Circuit 1	+_____
	Circuit 2	+_____
	Circuit 3	+_____
	Circuit 4	+_____
Optional Four Point NAC Module, 1.5 A maximum Special Application rating, 1 A maximum Regulated 24 DC rating, per NAC	Circuit 5	+_____
	Circuit 6	+_____
	Circuit 7	+_____
	Circuit 8	+_____
	Total Actual NAC Load Alarm Current	= **[A5]** _____

Step 4. Calculate Total Supervisory Current

Total Supervisory Current = Basic Panel Current **[S1]** + IDNet Module Current **[S2]** = _____

Step 5. Calculate Total Alarm Current

Total Alarm Current = Basic Panel Current **[A2]** + IDNet Module Current **[A3]** + Actual NAC Current **[A5]** = _____

Simplex

Fire Alarm Control Panel Accessories

*Listings**

System Batteries, Sealed Lead-Acid; with Applications Reference for Battery Cabinets, and Battery Cabinets with Charger

Features

Rechargeable, sealed lead-acid batteries:

- Lead-calcium grid structure with immobilized electrolyte in absorbent separator
- Low maintenance with no need to add water
- Low self-discharge characteristics
- One-piece, high impact polystyrene cell cover with high reliability dual seal construction
- UL 924 recognized pressure relief valves

Available in a variety of capacities:

- Batteries for internal mounting range from 6.2 Ah up to 50 Ah, depending on control panel cabinet size
- Larger batteries, up to 110 Ah, mount in external battery cabinets with models available with internal chargers

Battery cabinets with chargers:

- Battery cabinets with charger communicate with their connected fire alarm control panel and are available for 4100ES/4010ES/4100U Series and 4010 Series panels

Description

Simplex® rechargeable sealed-lead acid batteries provide reliable and repeatable discharge and recharge characteristics for use in fire alarm and other systems applications. They are designed with immobilized electrolyte in an absorbent separator, allowing them to provide rated capacity on the first cycle.

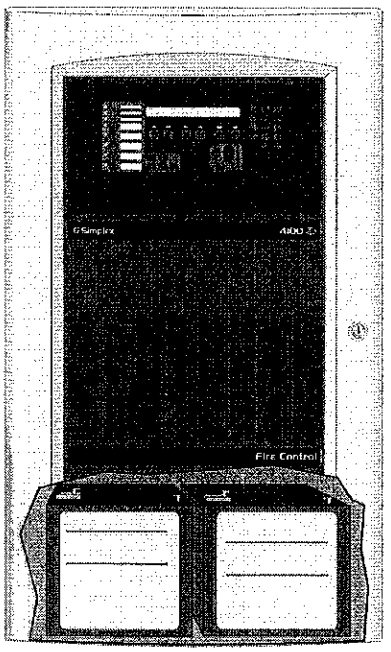
Because of their sealed construction, packaging is allowed within the system electronics enclosure (see illustration on page 2). When this is applicable, the quantity of system cabinets and the battery wiring distances are both minimized. Where required, external battery cabinets can be close-nippled to the control panel to house larger batteries with battery chargers available in some battery cabinet sizes.

Battery Details

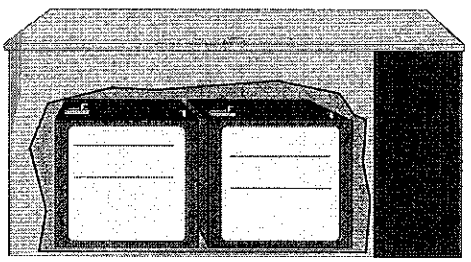
Charging. These batteries are intended to be used with compatible Simplex battery chargers.

Series Connections. These batteries are required to be connected in series to produce 24 V system voltage. Battery sets must be of identical voltage, model number, appearance, and approximately the same date of manufacture for proper operation.

Testing. Battery capacity testing is recommended to be performed by using a sealed lead-acid battery tester designed to withdraw a minimum of battery charge. The preferred tester applies a variety of amplitude and duration controlled test pulses that compares terminal voltage against those predicted for the specific battery size. (Testing is available through your local Simplex product supplier.)



Compatible Sealed Lead-Acid Batteries can be Installed Inside Fire Alarm Control Panel Cabinets



Remote Battery Cabinets are Available for Larger Battery Requirements

Battery Details *(Continued)*

Shipping. Sealed lead-acid batteries are shipped via ground or sea transportation only. They are not shipped via air.

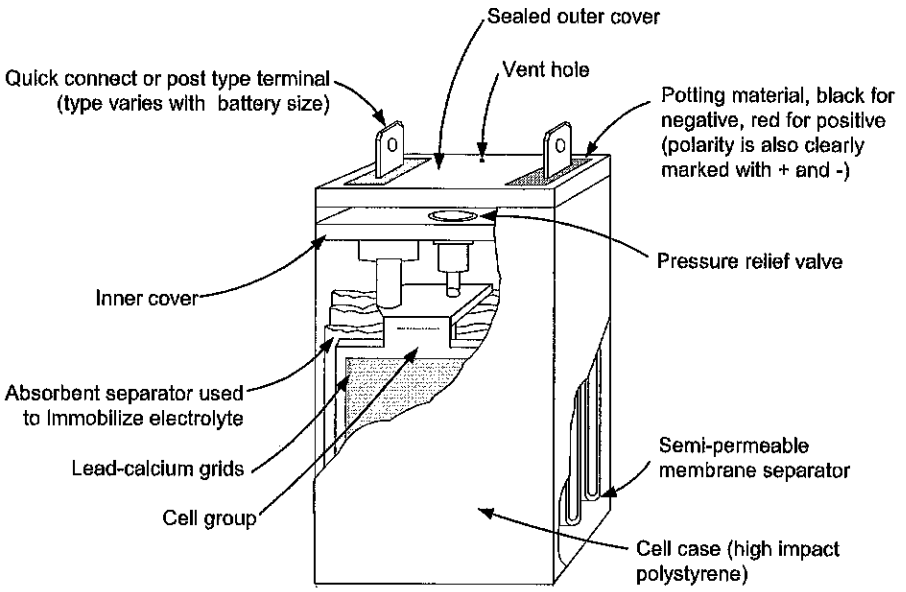
Disposal. Battery chemicals and materials can be recycled. Refer to information shipped with the battery or on its case. Return to the battery manufacturer or to a similarly qualified battery processing facility for proper disposal.

Seismic Activity Applications. Battery brackets are available for systems tested for compliance with specific batteries. Please refer to data sheet S2081-0019 for details.

* Refer to details on page 4 and to the referenced individual product data sheets for agency listing status of battery cabinets and chargers. The batteries detailed in this document meet the requirements of UL, ULC, and Factory Mutual for use with respective equipment battery chargers as listed on page 3. Contact your local Simplex product supplier for proper battery selection per system requirements. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

Battery Construction Reference

Actual appearance will vary with battery size.



Battery Size Specifications

Battery Model	Capacity @ 20 Hour Discharge Rate	Width*	Depth*	Height with Terminals	Approximate Weight*
2081-9272	**6.2 Ah**	6-1/8" (156 mm)	2-5/8" (67 mm)	4" (102 mm)	5.75 lbs (2.6 kg)
2081-9274	**10 Ah**	6" (153 mm)	4-1/16" (103 mm)	4" (102 mm)	9.2 lbs (4.2 kg)
2081-9288	**12.7 Ah**	6" (153 mm)	4" (102 mm)	4" (102 mm)	9 lbs (4.1 kg)
2081-9275	**18 Ah**	7-1/4" (184 mm)	3-3/8" (86 mm)	6-5/8" (168 mm)	14.3 lbs (6.5 kg)
2081-9287	**25 Ah**	6-5/8" (168 mm)	5" (127 mm)	7" (178 mm)	19.4 lbs (8.8 kg)
2081-9271 (rectangular case, typically for service)	**33 Ah**	12-1/2" (318 mm)	3-3/8" (86 mm)	7-1/16" (179 mm)	26.6 lbs (12.1 kg)
2081-9276 ("square" case, use for new)	**33 Ah**	7-3/4" (197 mm)	5-1/4" (133 mm)	6-3/4" (171 mm)	26.5 lbs (12 kg)
2081-9296	**50 Ah**	9" (229 mm)	5-1/2" (140 mm)	8-7/8" (225 mm)	41.8 lbs (19 kg)
2081-9279	**110 Ah**	11-3/16" (284 mm)	10-1/2" (267 mm)	9" (230 mm)	82 Lbs (37 kg)

* Dimensions and weight are per battery and are for reference only. Exact size may vary. Refer to the tables on page 3 for mounting compatibility. These batteries are 12 V each and series connected for 24 V system use.

NOTE: When wired in series for 24 V output, these batteries are to be of identical voltage, appearance, model number, and approximately the same date of manufacture.

General Battery Specifications

Nominal Voltage Rating	12 Volts per battery
Discharge Rating	20 Hour Rate
Typical Charge/Discharge Cycles	100 to 150
Preferred Charge Temperature Range	60° F to 90° F (15.6°C to 32.2° C)

Battery Compatibility for Fire Alarm Control Panel Mounting

NOTE: Refer to individual fire alarm control panel product data sheets for additional battery application information

Battery Model	Capacity	Simplex Control Panel Model Series (see legend and notes below)								
		4003EC	4004R	4007ES & 4005	4006 & 4008	4009 (all models)	4010	4010ES	4100ES/ 4100U	4100 & 4120 (2, 4 or 6-Unit)
2081-9272	6.2 Ah	✓	✓	✓	✓	✓	✓	✓	✓	✓
2081-9274	10 Ah	✓	✓	✓	✓	✓	✓	✓	✓	✓
2081-9288	12.7 Ah	✓	✓	✓	✓	✓	✓	✓	✓	✓
2081-9275	18 Ah	Ext	Note 3	✓	Ext	Ext	Note 2	✓	✓	✓
2081-9287	25 Ah	Ext	Note 3	Ext	Ext	NA	✓	✓	✓	✓
2081-9271 rectangular	33 Ah	Ext	Note 3	Ext	NA	NA	Note 3	✓	✓	Ext
2081-9276 "square"	33 Ah	Ext	Note 3	Ext	NA	NA	Note 3	✓	✓	✓
2081-9296	50 Ah	NA	Note 3	NA	NA	NA	Note 3	Note 6	2 or 3 bay	Ext
2081-9279	110 Ah	Requires external battery cabinet, compatible with 4100ES, 4010ES, 4100, and 4120 Series only								

✓ = Can be placed in the respective equipment cabinet

Ext = External battery cabinet is required, refer to selection chart on page 4

NA = Not applicable/not compatible

NOTES:

1. These batteries meet the requirements of UL, ULC, and Factory Mutual for use with respective equipment battery chargers listed above. Contact your local Simplex product supplier for proper battery selection per system requirements.
2. 4010 Cabinets will accommodate 2081-9275, 18 Ah batteries, but will not allow bottom entry conduit.
3. Use 4081 series companion cabinet and charger, refer to page 4.
4. Some control panel models are listed for battery replacement reference only.
5. For 2 bay international applications only, 50 Ah batteries will fit in the cabinet.

External Battery Cabinet Compatibility Reference

Battery Cabinets without Chargers (connects to charger in panel)

Cabinet	Panel Compatibility	Battery					
		2081-9275 18 Ah*	2081-9287 25 Ah	2081-9271 Rectangular 33 Ah	2081-9276 Square 33 Ah	2081-9296 50 Ah	2081-9279 110 Ah
2081-9280	4100ES, 4010ES, 4100U, and 4100+	NA	NA	NA	NA	NA	✓
2081-9281 2081-9282	multiple	✓	✓	✓	✓	✓	NA
4009-9801	multiple	✓	✓**	NA	NA	NA	NA
4009-9802	multiple	✓	NA	✓	NA	NA	NA

Battery Cabinets with Chargers

Cabinet	Panel Compatibility	2081-9275 18 Ah*	2081-9287 25 Ah	2081-9271 Rectangular 33 Ah	2081-9276 Square 33 Ah	2081-9296 50 Ah	2081-9279 110 Ah
4081-9301 4081-9302	4004R and 4010	✓	✓	✓	✓	✓	NA
4081-9306 4081-9308	4100ES, 4010ES, and 4100U	NA	NA	NA	NA	✓	✓

* Batteries smaller than those listed are normally mounted in the product cabinet

** 25 Ah capacity was effective as of 7/2005.

✓ = Can be placed in the respective equipment cabinet

NA = Not applicable/not compatible

External Battery Cabinet Specification Reference

Battery Cabinets Without Chargers; Shallow Design with Front Door

Model	Color	Listings	Description		Dimensions
2081-9281	Beige	UL and FM	2-Unit, 4100 style cabinet **without** charger; with locking solid door and battery shelf, primarily for use with 50 Ah batteries		25-3/4" W x 20-3/4" H x 6-3/4" D (654 mm x 527 mm x 171 mm)
2081-9282	Red				
4003-9860	Beige	Multiple	Intended for use with 4003EC systems, for up to 33 Ah batteries (refer to 4003EC data sheet S4003-0002)		9-1/2" H x 24" W x 9" D (241 mm x 610 mm x 229 mm)
4009-9801*	Beige	UL and FM	For up to 25 Ah batteries*	External battery cabinet **without** charger, with locking solid door and battery harness; for close-nippled mounting to fire alarm control panel cabinet	16-1/4" W x 13-1/2" H x 5-3/4" D (413 mm x 343 mm x 146 mm)*
4009-9802	Beige	UL	For up to 33 Ah batteries		25-3/4" W x 20-3/4" H x 4-1/8" D (654 mm x 527 mm x 105 mm)

* Depth increased for 25 Ah batteries effective 7/2005.

Chargers for use with 4010 Fire Alarm Control Panels and 4004R Suppression Release Systems

(refer to data sheet S4081-0001)

Model	Color	Input Voltage	Description	Dimensions
4081-9301	Beige	120 VAC	Battery cabinet **with** charger for the 4010 and 4004R fire alarm control panel; **for up to 50 Ah batteries**; with front door *Listings include: UL, ULC, FM, CSFM, and MEA (NYC), see data sheet for details*	22-1/2" W x16-3/4" H x 8-3/8" D (572 mm x 425 mm x 213 mm)
4081-9302	Red			

Battery Cabinet Without Charger for 110 Ah Batteries; for use with compatible panel mounted chargers

(refer to data sheet S2081-0012)

Model & Listings	Color	Cabinet Description	Compatible Chargers	Charger Description	Dimensions
2081-9280 *Listings include: UL and CSFM*	Red	Battery cabinet for 2081-9279, 110 Ah batteries; includes 80 A battery fuse, terminals and battery connection cables; see data sheet for details	4010-9xxx Series	4010ES Main System Supply (MSS)	26-1/2" W x 12" H x 12" D (673 mm x 305 mm x 305 mm)
			4100-9xxx Series	4100ES/4100U System Power Supplies (SPS)	
			4100-5111 4100-5112 4100-5113	4100ES/4100U Additional SPS	
			4100-5125 4100-5126 4100-5127	4100ES/4100U Remote Power Supply (RPS)	
			4100-5120 4100-5121 4100-5122	4100ES/4100U TrueAlert Addressable Power Supply (TPS)	
			4100-0104 4100-0114 4100-0124	4100 Legacy power supplies	

4100ES/4010ES/4100U Compatible Battery Cabinet With Charger for 110 Ah Batteries (for ULC listed systems and for other applications unable to use panel mounted power supply charger; *refer to data sheet S4081-0002*)

Model	Color	Input Voltage	Description	Dimensions
4081-9306	Red	120 VAC	Battery cabinet with charger for up to 110 Ah batteries; **NOTE:** Required for ULC listed charging of 110 Ah batteries; *Listings include: UL, ULC, FM, CSFM, and MEA (NYC), see data sheet for details*	27-7/8" W x 13-1/2" H x 14-5/8" D (708 mm x 343 mm x 371 mm)
4081-9308	Red	220/230/240 VAC, multi-tapped		
4100-9837	Green LED Power-on Indicator Kit, **required for ULC listing,** mounts above access panel using knockout provided			

Simplex

TrueAlert Multi-Candela Notification Appliances

*UL, ULC, CSFM Listed; FM Approved; MEA (NYC) Acceptance**

SmartSync Operation Audible/Visible Notification with Horn and Synchronized Flash, Non-Addressable

Features

Audible/visible (A/V) notification appliances with efficient electronic horn and high output xenon strobe, available for wall or ceiling mount

- Operation is compatible with ADA requirements (refer to important installation information on page 3)
- Rugged, high impact, flame retardant thermoplastic housings are available in red or white with clear lens

Operates over a two-wire SmartSync circuit to provide:

- Horns that are controlled separately from strobes on the same two-wire circuit
- "On-until-silenced" and "on-until-reset" operation on the same two-wire pair
- SmartSync horn activation of Temporal pattern, March Time pattern (at 60 BPM), or on continuously
- Strobe appliances on the same circuit operating at a synchronized 1 Hz flash rate
- Class B operation requires connection to a compatible SmartSync NAC or to SmartSync Control Module (SCM) 4905-9938
- Class A operation when connected to the 4905-9938 SCM or with 4100U series fire alarm control panel NACs

Wall mount A/Vs features:

- Wiring terminals are accessible from the front of the housing providing easy access for installation, inspection, and testing
- Covers are available separately to convert housing color
- Available UL listed sound damper for locations requiring attenuation of 5 to 6 dBA (stairwells, small rooms, highly reverberant areas, etc.)

Optional adapters and wire guards:

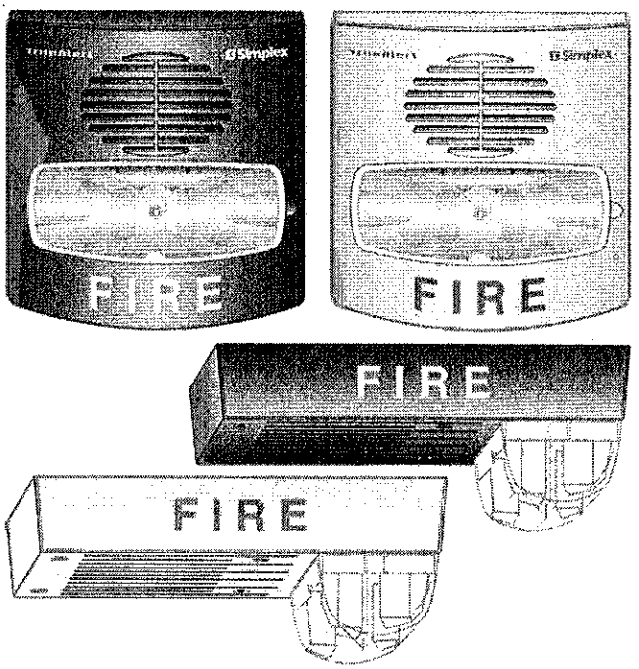
- Wall mount A/V adapters are available to cover surface mounted electrical boxes and to adapt to Simplex® 2975-9145 boxes
- UL listed red wire guards are available for wall or ceiling mount A/Vs

Visible notification appliance (strobe):

- 24 VDC xenon strobe; intensity is selectable as 15, 30, 75, or 110 candela with visible selection jumper secured behind strobe housing
- UL listed to Standard 1971
- Regulated circuit design ensures consistent flash output and provides controlled inrush current

Audible notification appliance (horn):

- Low current, 24 VDC electronic horn with harmonically rich sound output suitable for either steady or coded operation (Temporal or 60 BPM March Time pattern)
- UL listed to Standard 464



Wall and Ceiling Mount A/Vs

Description

Multi-Candela TrueAlert A/Vs with horn and synchronized strobe provide convenient installation to standard electrical boxes. The enclosure designs are both impact and vandal resistant and provide a convenient strobe intensity selection. Since each model can be selected for strobe intensity output, on-site model inventory is minimized and changes encountered during construction can be easily accommodated.

Wall mount A/V housings are a one-piece assembly (including lens) that mounts to a single or double gang, or 4" square standard electrical box. The cover can be quickly removed (a tool is required) and covers are available separately for color conversion.

Ceiling mount A/Vs install using standard 4" electrical boxes. Color choice is determined by model number.

Strobe Intensity Selection

During installation, a selection plug at the back of the housing determines the desired strobe intensity. An attached flag with black letters on a highly visible yellow background allows the selected intensity to be seen at the side of the strobe lens.

* This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7125-0026:317 for allowable values and/or conditions concerning material presented in this document. Accepted for use – City of New York Department of Buildings – MEA35-93E. Refer to page 2 for listing status of wire guards. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

Strobe Application Selection

Proper selection of visible notification is dependent on occupancy, location, local codes, and proper applications of: the *National Fire Alarm Code* (NFPA 72), ANSI A117.1; the appropriate model building code: BOCA, ICBO, or SBCCI; and the application guidelines of the Americans with Disabilities Act (ADA).

Synchronized Strobes

Multiple Strobes. When multiple strobes and their reflections can be seen from one location, synchronized flashes reduce the probability of photo-sensitive reactions as well as the annoyance and possible distraction of random flashing. The multi-candela strobes of these A/Vs are synchronized by the controlling SmartSync operation NAC.

SmartSync Two-Wire Control

SmartSync operation mode allows a two-wire circuit to provide the ability to activate both the horn and strobe on the same NAC and then allow the horn to be silenced while the strobe remains flashing. The horn operates as "on-until-silenced" while the strobe operation is "on-until-reset."

SmartSync Control Sources

- **4006, 4007ES Hybrid, 4008, 4010, 4010ES, 4100ES, and 4100U Fire Alarm Control Panels** (refer to individual product data sheets for more information)
- **4009 IDNet NAC Extender** (refer to data sheet S4009-0002)
- **SmartSync Control Module (SCM)** 4905-9938 (refer to data sheet S4905-0003)

Additional SmartSync compatible notification appliances include separate horns and combination horn/strobe notification appliances.

Product Selection

Multi-Candela A/Vs

Model	Mounting	Housing Color	"FIRE" Lettering	Description
4906-9127	Wall	Red	White	Horn with Multi-Candela Strobe; strobe intensity selectable as: 15, 30, 75, or 110 candela; operates with SmartSync two-wire control
4906-9129		White	Red	
4906-9128	Ceiling	Red	White	
4906-9130		White	Red	

Wall Mount A/V Accessories

Model	Description	Dimensions
4905-9937	Red Surface Mount Adapter Skirt; use to cover 1-1/2" (38 mm) deep surface mounted boxes	5-3/8" H x 5-1/4" W x 1-5/8" D (136 mm x 133 mm x 41 mm) depth with strobe = 4-3/8" (111 mm)
4905-9940	White Surface Mount Adapter Skirt; use to cover 1-1/2" (38 mm) deep surface mounted boxes	
4905-9931	Red Adapter Plate for mounting to Simplex 2975-9145 box (typically for retrofit, may be mounted vertical or horizontal)	8-5/16" x 5-3/4" x 0.060" Thick (211 mm x 146 mm x 1.5 mm)
2975-9145	Red Mounting Box, requires Adapter Plate 4905-9931	7-7/8" x 5-1/8" x 2-3/4" D (200 mm x 130 mm x 70 mm)
4905-9838	Optional Sound Damper; package of 20; field installed adhesive backed horn output attenuator; reduces output 5 to 6 dBA **NOTE:** After Sound Damper installation, measure sound level to ensure compliance with applicable code requirements	1-3/4" Diameter (44.5 mm) with 0.31" (8 mm) sound opening

SmartSync Control Module

Model	Description	Dimensions
4905-9938	SmartSync Control Module with Class B or Class A output; mounts in 4" (102 mm) square box; refer to data sheet S4905-0003 for details	4" x 4-1/8" x 1-1/4" D (102 mm x 105 mm x 32 mm)

Replacement Covers for Wall Mount A/Vs

Model	Description	Dimensions
4905-9994	Red cover with white "FIRE" lettering	5-1/8" H x 5" W x 1-1/2" D (130 mm x 127 mm x 38 mm)
4905-9995	White cover with red "FIRE" lettering	

Wire Guards and Ceiling Mount A/V Adapter

Model		Description	Dimensions
4905-9961*		Wall mount red wire guard with mounting plate, compatible with semi-flush or surface mounted boxes	6-1/16" H x 6-1/16" W x 3-1/8" D (154 mm x 154 mm x 79 mm)
4905-9927*	Ceiling Mount	Red Wire Guard for mounting to flush mounted electrical box	8-1/2" x 6-1/8" x 3" (216 mm x 156 mm x 76 mm)
4905-9928*		Red Adapter Plate, required to mount guard to surface mounted electrical box	9" x 7" (229 mm x 178 mm)
4905-9915		White Surface Mount Adapter Box Extension, use to cover 1-1/2" deep surface mounted boxes	4-3/4" x 6-7/8" x 1-1/2" deep, (121 mm x 175 mm x 38 mm)
4905-9916		Red Surface Mount Adapter Box Extension, use to cover 1-1/2" deep surface mounted boxes	

* UL listed by Space Age Electronics Inc.

A/V Specifications

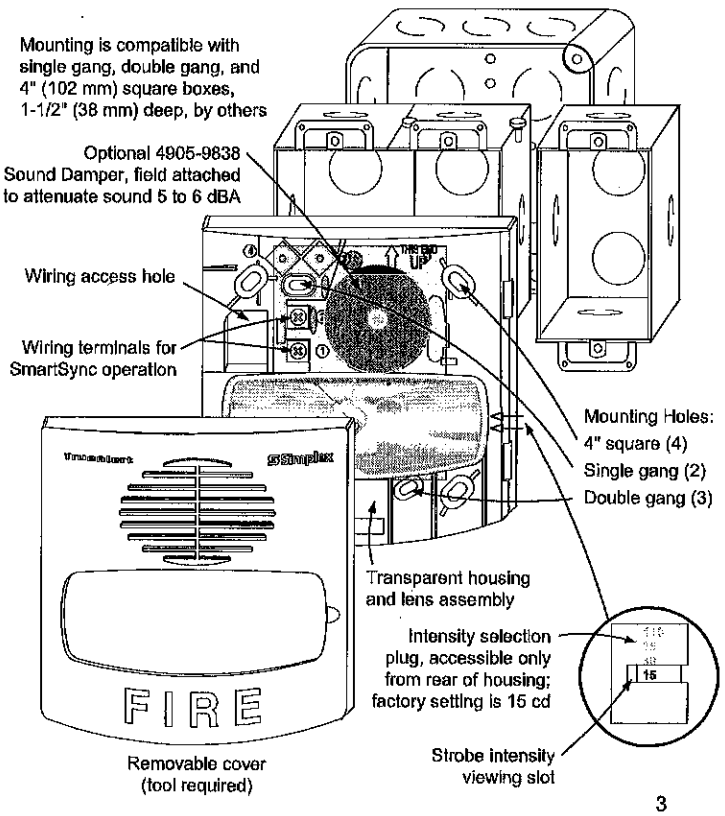
Wall Mount or Ceiling Mount, Common Specifications							
Rated Voltage Range	UL Listed Rating	Regulated 24 DC; see Note 1 below					
	ULC Listed Rating	20 VDC to 30 VDC per ULC S526-M878					
Flash Rate and Synchronized NAC Loading		1 Hz; with up to 35 synchronized strobes maximum per NAC					
Environmental; Temperature and Humidity		32° to 122° F (0° to 50° C); 10% to 93%, non-condensing at 100° F (38° C)					
Connections		Terminal blocks for 18 AWG to 12 AWG (0.82 mm^2 to 3.31 mm^2); two wires per terminal for in/out wiring					
Horn Output Characteristics		2400 to 3700 Hz sweep, modulated at 120 Hz rate					
Horn Output Ratings @ 10 ft (3 m) (see Note 2)	Voltage	16 VDC		24 VDC		33 VDC	
	Sound Type (see Note 2)	Steady	Coded	Steady	Coded	Steady	Coded
	UL 464 Reverberant Chamber	86 dBA	82 dBA	88 dBA	84 dBA	90 dBA	86 dBA
	Anechoic Chamber	92 dBA	91 dBA	94 dBA	95 dBA	96 dBA	96 dBA

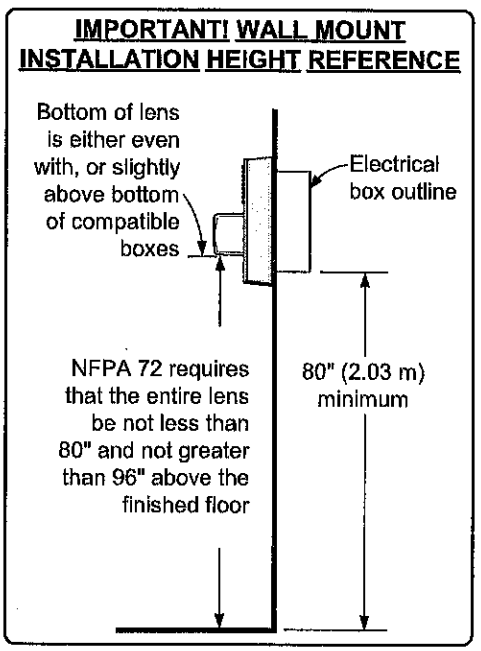
Wall Mount	Housing Dimensions (with lens)	5-1/8" H x 5" W x 2-3/4" D (130 mm x 127 mm x 70 mm)				
	Maximum RMS Current Rating per Strobe Setting (see Note 3 below)	**15 cd**	**30 cd**	**75 cd**	**110 cd**	
		75 mA	**116 mA**	**221 mA**	**285 mA**	
	Reference RMS Currents at other voltages 18 VDC	67 mA	103 mA	196 mA	253 mA	
	24 VDC	50 mA	77 mA	147 mA	190 mA	
Ceiling Mount	Housing Dimensions (with lens)	4-3/4 L" x 6-7/8" W x 2-5/8" D (121 mm x 175 mm x 67 mm)				
	Maximum RMS Current Rating per Strobe Setting (see Note 3 below)	**15 cd**	**30 cd**	**75 cd**	**110 cd**	
		86 mA	**132 mA**	**250 mA**	**320 mA**	
	Reference RMS Currents at other voltages 18 VDC	76 mA	117 mA	222 mA	284 mA	
	24 VDC	57 mA	88 mA	167 mA	213 mA	

NOTES:

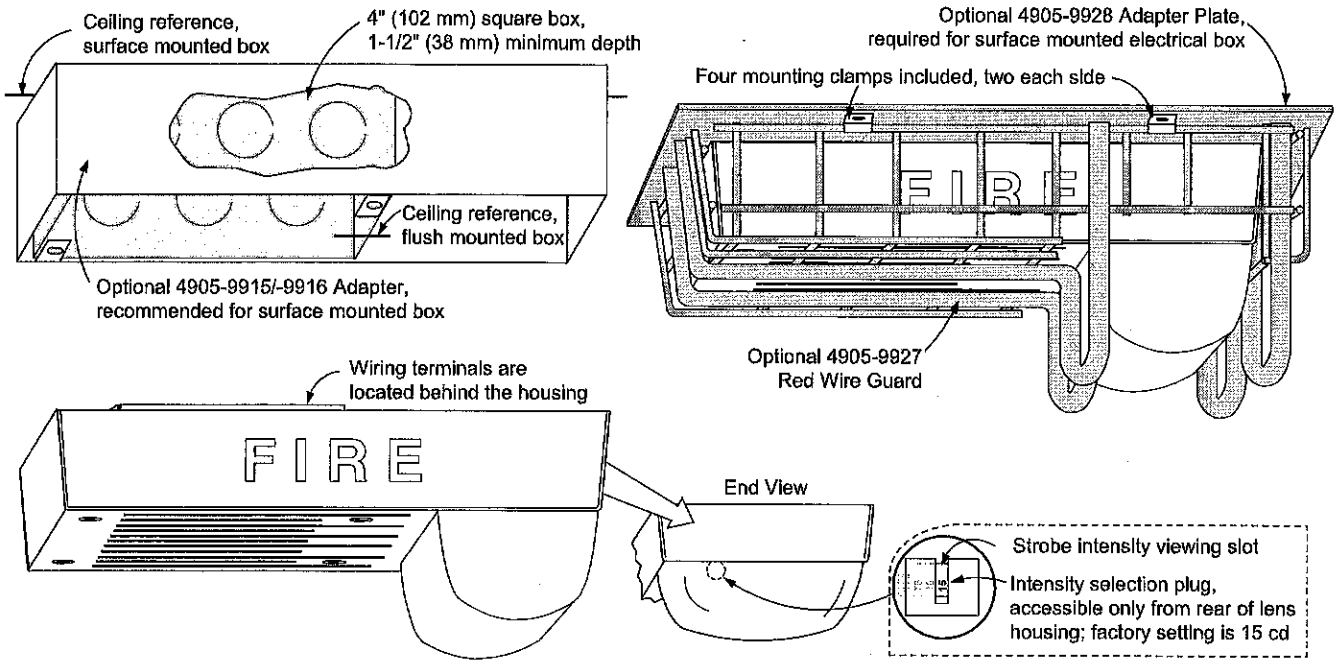
1. "Regulated 24 DC" refers to the voltage range of 16 to 33 VDC per UL Standard 1971, *Signaling Devices for the Hearing Impaired*. This voltage range is the absolute operating range. Operation outside of this range may cause permanent damage to the appliance. Please note that 16 VDC is the lowest operating voltage that is allowed at the last appliance on the NAC under worst case conditions.
2. Coded values are typical of the output measured with a Temporal coded or a March Time coded pulse and with a sound level meter reading on a "fast" setting. Under the same test conditions, coded horn output "peak" sound level readings are typically 4 dBA higher. Anechoic horn output ratings are typically more representative of actual installed sound output.
3. Currents are with horn on steady. The maximum RMS current listed is the device nameplate rating. Strobe designs are constant wattage and the maximum RMS current rating occurs at the lowest allowable operating voltage. (RMS is root mean square and refers to the effective value of a varying current waveform.)

Installation Reference, Surface or Semi-Flush Mounting

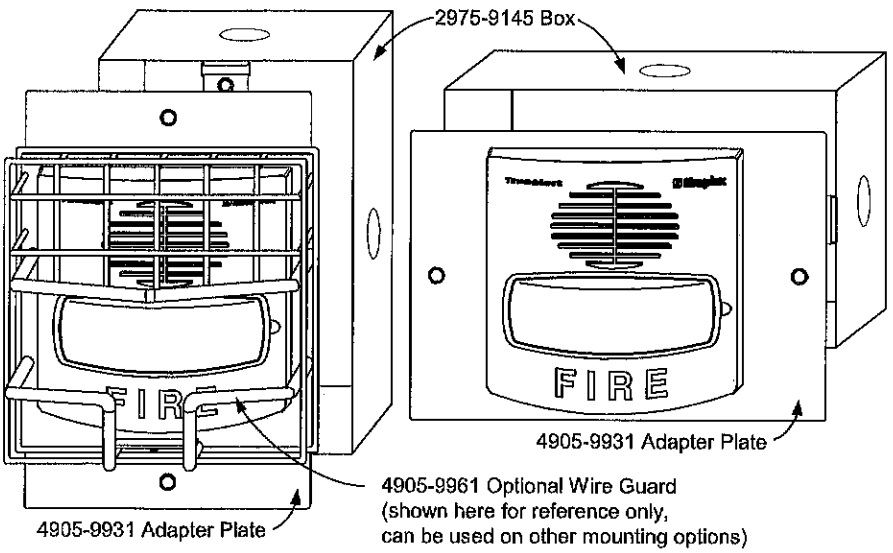




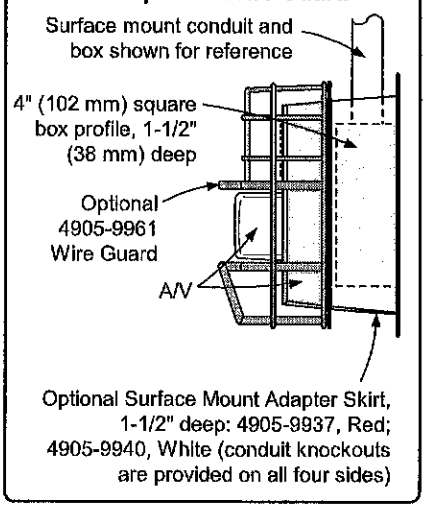
Ceiling Mount A/V and Guard Installation Reference



Wall Mount Installation Reference; Adapter Plate, Guard, and Adapter Skirt



Surface Mounting Reference with Optional Adapter Skirt and Optional Wire Guard



CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7300-0026:0214

CATEGORY: 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

LISTEE: Simplex100 Simplex Drive, Westminster, MA 01441-0001
Contact: Jim Goyette (978) 731-8580 Fax (978) 731-8881
Email: jgoyette@tycoint.com

DESIGN: Models* 4009-9001, 4009-9002, 4009-9101, 4009-9102, 4009-9201, 4009-9301, 4009-9401 Notification Appliance Circuit (NAC) Power Extenders. Refer to listee's data sheet for detailed product description and operational considerations. Unit components:

565-594	Power Supply
565-569	Style Y Signal Card
565-358	Voice Controller Card
562-907	Amplifier Board
565-388	Style Z Signal Card
4009-9807	NAC Option Card
4009-9810	Fiber Receiver
4090-9105,*-9107	Fiber Transmitter
4009-9809	IDNet Repeater
4009-9808	Class A Adaptor
4009-9803,-98044	Circuit NAC Card
4905-9929	Isolator Module
4009-9806	Earth Detect Module
*4003-9803	Remote Microphone Module

RATING:

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes & ordinances and in a manner acceptable to the authority having jurisdiction. The NAC must be fully supervised and must have the secondary power supply capable of operating the system for at least 24 hours (battery standby) in the normal condition and followed by not less than 5 minutes of alarm as required by code.

MARKING: Listee's name, model number, electrical rating and UL label.

APPROVAL: Listed as power extender units for use with listee's separately listed fire alarm control units.

NOTE:

*Rev/Recert. 03-29-2006 jw

Date Issued: **July 01, 2017** *Listing Expires* **June 30, 2018**

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. 7125-0026:0317

CATEGORY: 7125 -- FIRE ALARM DEVICES FOR THE HEARING IMPAIRED

LISTEE: Simplex100 Simplex Drive, Westminster, MA 01441-0001
Contact: Jim Goyette (978) 731-8580 Fax (978) 731-8881
Email: jgoyette@tycoint.com

DESIGN: Models 4906-9127, 4906-9129 wall mount and Models 4906-9128 and 4906-9130 ceiling mount multi-candela horn/strobes. Refer to listee's data sheet for detailed product description and operational considerations.

RATING: Electrical: 16-33 Vdc
Candela: 15, 30, 75, 110cd

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances, and in a manner acceptable to the authority having jurisdiction. For indoor use only.

MARKING: Listee's name, model number, electrical/candela rating, and UL label.

APPROVAL: Listed as multi-candela horn/strobes with a signaling appliance suitable for the hearing impaired when used with listee's separately listed fire alarm control units. All models require the use of Model 4905-9938 (CSFM Listing No. 7125-0026:235) sync control module unless the horn/strobes are used with the listee's Model 4010 (CSFM Listing No. 7170-0026:226) or 4100 (CSFM Listing Nos. 7170-0026:250 and 7165-0026:251). Refer to listee's Installation Instruction Manual for details.

NOTE:

07-22-2004

Date Issued: **July 01, 2017** *Listing Expires* **June 30, 2018**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

Simplex

4100ES Fire Control Panels

UL, ULC, CSFM Listed; FM Approved;
*MEA (NYC) Acceptance**

*Info*Alarm Command Center
for the 4100ES Fire Alarm Control Panel

Features

Multi-line expanded content display interface for Simplex® 4100ES Series fire alarm control panels, available with the following products:

- Fire alarm control panels (stand-alone or networked) including Redundant CPU options (Software Revision 12 or higher is required)
- Network Display Units (NDU) supports up to 12,000 points
- Remote Annunciator panels and models that mount in a dedicated cabinet (4100ES and 4100U control panels support Remote InfoAlarm Command Centers independent of host panel display type)
- Upgrade kits are available for legacy 4100 (1000 pt, 4100+ systems) and 4100ES and 4100U standard control panels
- UL listed to Standard 864

InfoAlarm Command Centers provide customized operating convenience:

- "Activity in System" primary display choices include: First and Most Recent, First 5 and Most Recent, First 8, Site Plan with activity status icons, General Alarm, or Direct to List; selectable individually by event type
- System reports are easily viewed; logs can be read with minimal scrolling required
- Up to six "softkeys" per screen provide functions that vary with the particular screen information aiding operators to determine how to proceed
- Up to two languages are available per system, easily selected by programmable key press (systems with IMS/GCC/NPU or 2 x 40 LCD panels or annunciators require one language to be the default font)
- International models allow customized language legends for operator keys and status LEDs

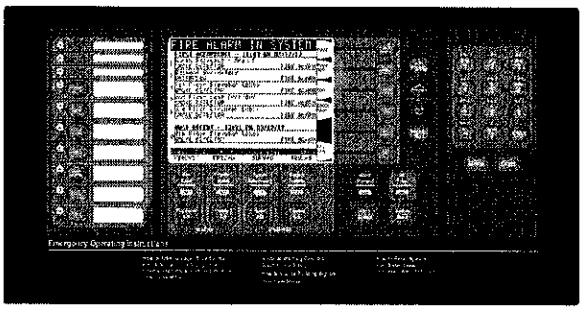
Display properties:

- 320 x 240 dot matrix (QVGA) display provides an active area of 4.53" W x 3.4" H (115 mm x 86 mm) displaying up to 854 characters using standard ASCII character font
- Bright white LED backlighting provides efficient and long lasting illumination; operation is selectable as continuous or off with power fail or with no key presses

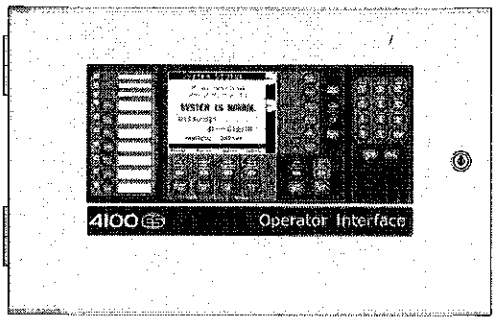
Introduction

Displaying more information. 4100ES Controls using the InfoAlarm Command Center provide an expanded content, multi-line LCD interface that requires minimal key presses to access detailed information. Because it is system-powered, its detailed information is provided without requiring separate supplementary equipment.

InfoAlarm Command Center Control Panel. By using a larger area format instead of an individual text line display, the LCD provides text information for Alarm, Supervisory, or Trouble. The format is flexible and able to be customized per application allowing additional information to be presented to suit the specific application.



InfoAlarm Command Center for Control Panel Mounting



InfoAlarm Command Center in Remote Cabinet

Description

InfoAlarm Command Centers for 4100ES fire alarm systems provide a large display with extended information content, dual language support including 2 byte character languages, and an intuitive control key interface per the following:

- Up to 10 InfoAlarm Command Centers are supported per 4100ES/4100U control panel; able to allow one InfoAlarm Command Center to take-control and to designate access levels for interfaces not in-control; LEDs can be programmed for in-control status indications
- Menu-driven format conveniently prompts operators for the next action required
- Key controls are provided to select the highlighted entry, load next screen of information, or jump to top or bottom of activity lists
- Direct point callup displays individual points alphabetically and then homes in on the logical choice as more point information is entered
- A Site Plan bitmap can be displayed for reference; icons can be added to indicate system status
- Up to 50 custom point detail messages can be generated
- Date formats are either MM/DD/YY or DD/MM/YY
- Time formats are either 24 hour or 12 hour with AM/PM
- System Normal screen supports a gray scale bitmap (watermark) for location name, company logo, or site plan

* This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7165-0026:251 for allowable values and/or conditions concerning material presented in this document. It is subject to re-examination, revision, and possible cancellation. Accepted for use – City of New York Department of Buildings – MEA35-93E. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.

Control Panel Operation Reference

NOTE: Refer to page 7 for international control panel reference information. Detailed operator instructions are on document 579-685.

THREE PROGRAMMABLE LEDs provide custom labeling, the top two LEDs are selectable as red or yellow, the third LED is selectable as red or green

ULC SYSTEMS require designating a Ground Fault indicator

Custom label insert (typical choices shown for reference)

320 x 240 DOT MATRIX DISPLAY, White LED backlighting provides easy viewing; operation is programmable for key inactivity timeout and/or AC power fail

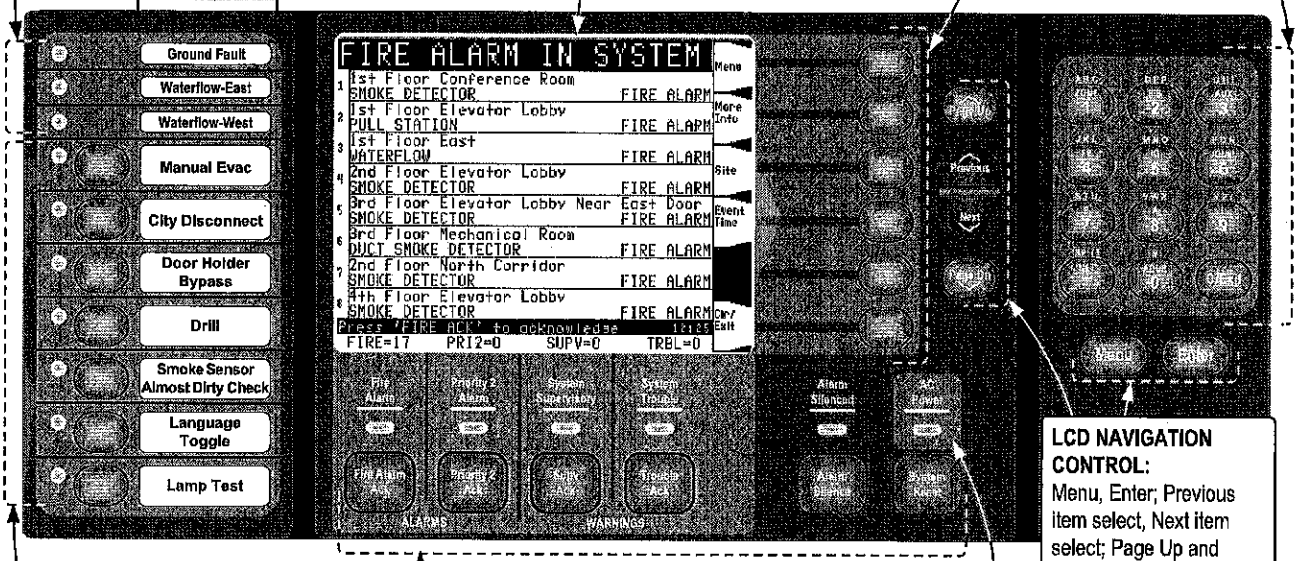
PRIMARY "ACTIVITY IN SYSTEM" DISPLAY OPTIONS: Choices include "First 8" (shown below for "Fire Alarm in System"), "First and Most Recent," "First 5 and Most Recent," "Site Plan," "General Alarm," or "Direct to List." After the event is acknowledged, screen reverts to the sequential event list until Clr/Exit softkey is selected or after timeout (~ 30 seconds); applicable to Fire Alarm, Priority 2 Alarm, System Supervisory, and System Trouble, each category is independently selectable for primary display mode

SIX SOFT KEYS are available when required. This sample provides **Menu** to call up the available operations; **More Info** to call up specific point details, **Site** to call up the Site Plan Graphic Screen, **Event Time** (while pressed) displays time and date for all displayed events, and **Clr/Exit**; the following are other typical soft keys:

Point Enable and Disable
Force On or Arm
Force Off or Disarm
Return On/Off or
Arm/Disarm to Auto Mode
Event Time Request
More Information Request

NUMERIC KEYPAD for point category and point selection (alphabet characters are not used at this time)

C/Exit Key duplicates the **Clr/Exit** softkey when present



LCD NAVIGATION CONTROL: Menu, Enter; Previous item select, Next item select; Page Up and Page Down

SEVEN PROGRAMMABLE FUNCTION SWITCHES, each equipped with dual color LED indicators; the top six LEDs are selectable as either red or yellow, the bottom LED is selectable as either red or green; **NOTE: Program the bottom switch as "Lamp Test" for UL listed systems**

FIRE ALARM ACK acknowledges a Fire Alarm condition, logs the acknowledge, silences the operator panel and all annunciator tone-alerts, and displays sequential alarm list

PRIORITY 2 ACK acknowledges a Priority 2 Alarm condition, logs the acknowledge, silences the operator panel and all annunciator tone-alerts, and displays sequential Priority 2 alarm list

SUPV ACK acknowledges system supervisory conditions, logs the acknowledge, silences the operator panel and all annunciator tone-alerts, and displays sequential supervisory condition list

TROUBLE ACK acknowledges system troubles, logs the acknowledge, silences the operator panel and all annunciator tone-alerts, and displays sequential trouble list

ALARM SILENCE causes notification appliances to be deactivated, typically after evacuation is complete and while alarm source is being investigated. May be programmed to silence audible notification and allow visible notification to continue (strobes still flashing).

SYSTEM RESET restores control panel to normal when all alarmed inputs are returned to normal

SIX SYSTEM STATUS INDICATOR LEDs provide system status indications in addition to LCD information, LEDs flash to indicate the condition and then when acknowledged, remain on until reset : Fire Alarm & Priority 2 Alarm, red LED Supervisory & Trouble, yellow LED Alarm Silenced, yellow LED AC Power, green LED (on for normal)

Display Feature Reference (shown actual size)

FIRST OCCURRENCES (UP TO 5) AND MOST RECENT OCCURRENCE, ACTIVITY IN SYSTEM DISPLAY ("Fire Alarm in System" screen shown for reference, see page 2 for a First 8 Events display)

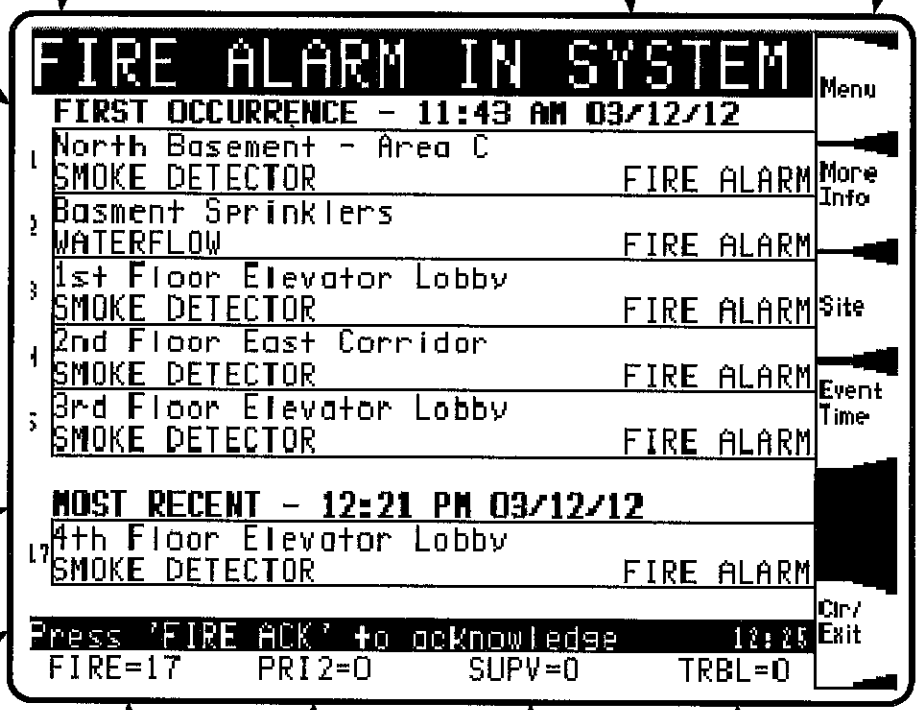
FIRST OCCURRENCE advises of the time, date, device type, and custom label of the first occurrence of the event type displayed; the numerical count identifies the sequence of occurrence; when selected as the primary display screen, display of first occurrence and most recent occurrence is maintained until events are acknowledged which brings up the event list (similar to the First 8 display); the display reverts back to "First and Most Recent" when the Clr/Exit softkey is selected or after a time delay

FONT ATTRIBUTES include:

Normal, **Bold**, Underline, Double, Dim, Reverse, Flash On/Off, Flash On/Dim, and commands for Vertical and Horizontal Placement

SOFT KEYS in this column correspond to the panel pushbutton switches; programming allows the soft keys to appear only when the functions are enabled

DISPLAY SIZE:
4.53" W x 3.4" H
(115 mm x 86 mm)



TALLY COUNTS list the number of activities per category of Fire Alarm (FIRE), Primary 2 Alarm (PRI2), Supervisory (SUPV), and Trouble (TRBL)

COMMAND PROMPT advises the operator of the action required and displays local panel time

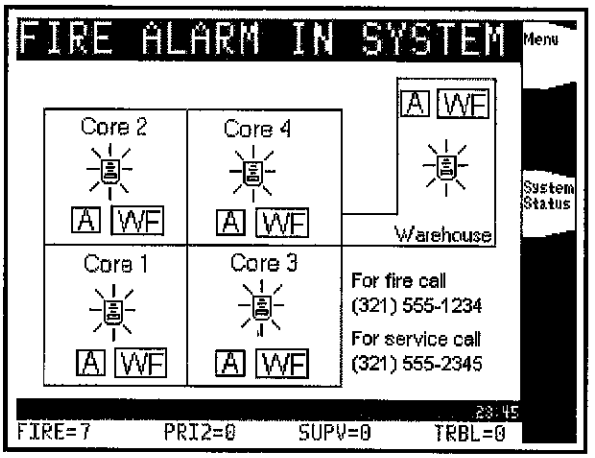
MOST RECENT advises of the time, date, device type, and custom label of the most recent occurrence of the list shown, in this case, the Fire Alarm list

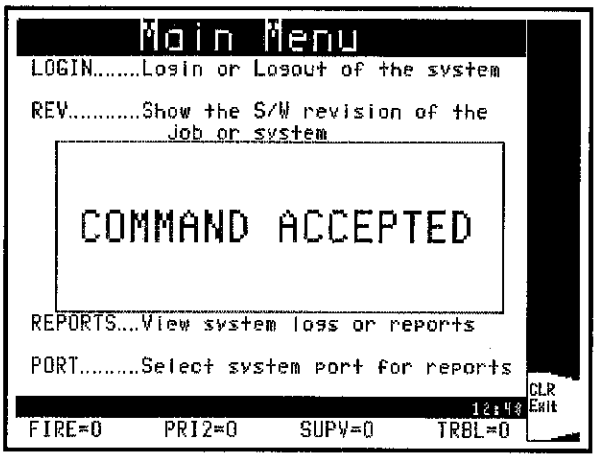
Site Plan with Event Icons

Site Plan Bitmap. The InfoAlarm Command Center supports a site plan monochrome bitmap image (size is 281 pixels wide by 192 pixels high) that can also display icons indicating activity and location. Shown to the right is a sample site plan with icons shown in each building area. For this example, each area is showing an "A" for an initiating device in alarm, a "WF" for waterflow occurring, and an icon indicating notification appliances in alarm. (Icons can be created for site specific symbology, these are for example only.)

Site Plan Selection and Detail. If desired, the site plan can be the primary display screen for system activity or can be for reference, available by selecting the "Site" softkey. Depending on the facility layout, the site plan can also be a convenient location for common reference information such as primary call phone numbers, street address, etc. to assist operators in their assigned response.

System Normal Screen. The site plan (or another bitmap image) can be displayed on the System Normal screen as a grey image watermark behind the screen text. (Size and type are the same as that for a site plan bitmap). This can be used to identify the specific location of the 4100ES or can display a site-specific logo or other information. (A sample is shown on page 6.)





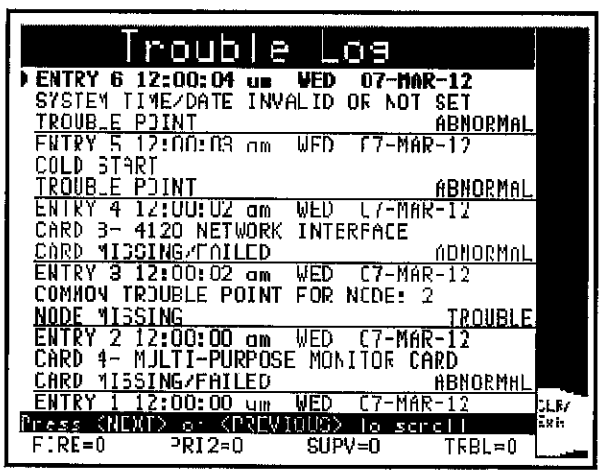
Customized Emphasis

The Main Menu screen illustration to the left demonstrates how print/display statements appear for status information or for prompting of user input. Other examples of this format occur when setting time and date, entering a password, or identification of a status change such as point enabling or disabling. Use of this feature allows the display to clearly focus the user on required information or actions.

Information Review

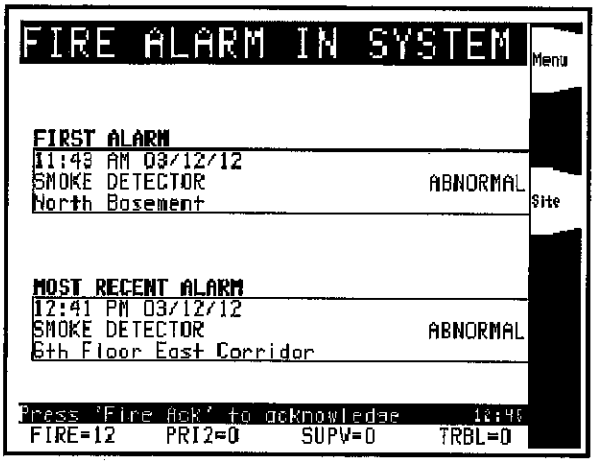
The Trouble Log History screen shown to the right identifies the ability to view multiple event entries with minimal scrolling. For specific information access, pressing "Next" or "Previous" on the keypad highlights the selected next or previous item in the list as indicated by the arrow and the bolded first line of Entry 6.

For access to the next or previous full screen of information, use the Page Dn or Page Up keys located to the right of the soft keys, each to the right of the display.

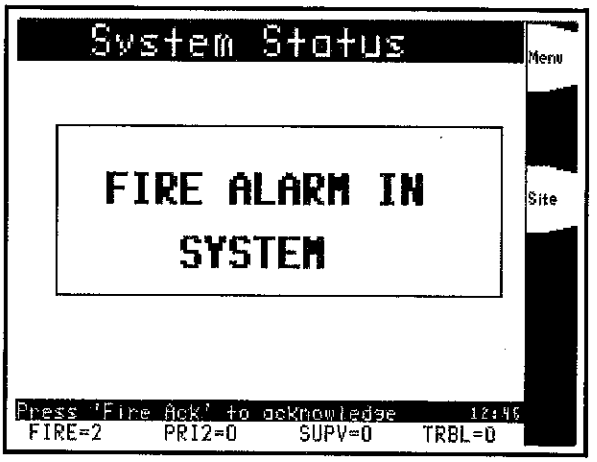


Additional Primary Display Screens

Below are samples of a First and Most Recent primary display and of a General Alarm display.

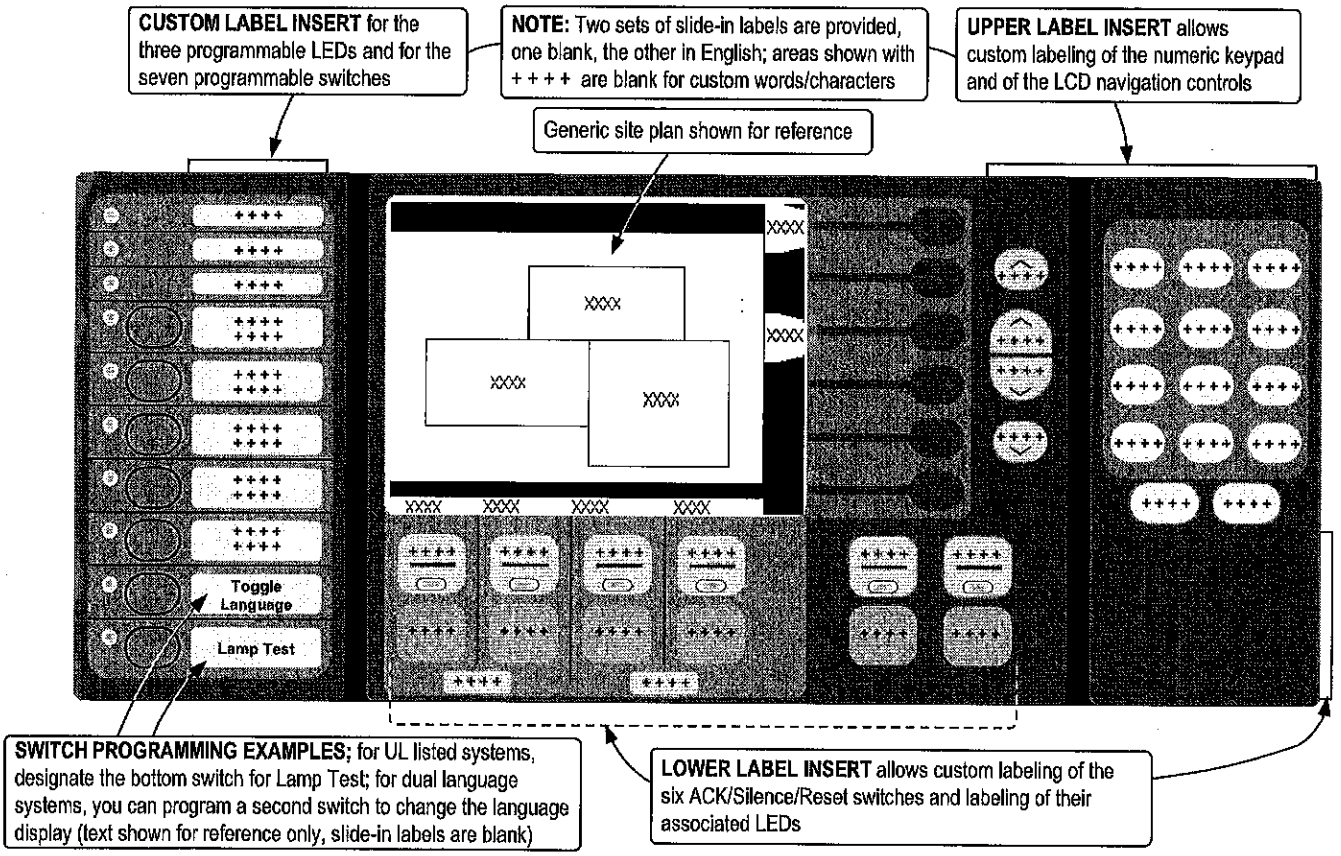


First and Most Recent Primary Display Option



General Alarm Primary Display Option

International Display Details



Additional 4100U Data Sheet Reference

Data Sheet	Subject	Data Sheet	Subject	Data Sheet	Subject
S4100-0031	Standard Panel Reference	S4100-0035	MINIPLEX Transponders	S4100-0034	Audio/Phone Modules
S4100-0036	Network Display Unit	S4081-0002	Remote Battery Charger	S4100-0032	LED/Switch Modules
S4100-0038	Remote Annunciators	S4100-0046	IDNet+ Module w/Quad Isolator	S4100-0037	Enclosure Options

Product Selection

4100ES Master Controller with InfoAlarm Command Center (see data sheet S4100-0031 for descriptions of the 4100ES Basic Control Panel details, standard product features, options, and reference for related fire alarm control panel products)

Model	Model Type	UL	ULC	Voltage	InfoAlarm Command Center Type	Master Controller Features
4100-9114	English	✓	—	120 VAC, 60 Hz	**Master Controller Assembly**; raised keys with fixed labels	9 A system power supply/battery charger (SPS), 250 point IDNet interface, 3 NACs, auxiliary relay, and external RUI communications interface
4100-9115	English	—	✓			
4100-9116	French					
4100-9213	International	✓	—	120 VAC, 60 Hz	**Master Controller Assembly**; flat keys with inserts for custom key labels	
4100-9212	International	✓	—	220/240 VAC, 50/60 Hz		
4100-9122	English	✓	—	120 VAC, 60 Hz	**Redundant CPU** (Master Controller); raised keys with fixed labels	One Command Center, two CPU cards, and an SPS in a two bay assembly; **NOTE: For external RUI, use 4100-1291 RUI Expansion module(s)**
4100-9222	International	✓	—	220/240 VAC, 50/60 Hz	**Redundant CPU** (Master Controller); flat keys with inserts for custom key labels	

Upgrade Kits (see NOTE for NDU upgrades; Upgrade kit are UL and ULC listed)

Model	Model Type	Description	NOTE
4100-7153	English	**Upgrade Kit for existing 4100ES or 4100U Series Fire Alarm Control Panels**; includes complete bay front assembly with InfoAlarm Command Center providing raised keys with fixed labels; uses existing power supply and Master Controller Board (CPU card)	**NDU upgrades *require*** **4100-0640** Display Memory Expansion, see below for details
4100-7154	English	**Upgrade Kit for existing 4100 (Legacy 1000 pt, 4100+ systems) Series Fire Alarm Control Panels (non-4100U);** includes complete bay front assembly with InfoAlarm Command Center; raised keys with fixed labels, and replacement Master Controller Board; uses existing power supply	
4100-7155	International	**Upgrade Kit for existing 4100ES or 4100U Series Fire Alarm Control Panels**; includes complete bay front assembly with InfoAlarm Command Center providing flat keys with inserts for custom key labels; use for non-English language applications including French for Canada; uses existing power supply and Master Controller Board (CPU card)	
4100-7156	International	**Upgrade Kit for existing 4100 (Legacy 1000 pt, 4100+ systems) Series Fire Alarm Control Panels (non-4100U);** includes complete bay front assembly with InfoAlarm Command Center; flat keys with inserts for custom key labels, and replacement Master Controller Board; use for Canadian French applications; uses existing power supply	

Network Display Unit (NDU) Master Controller with InfoAlarm Command Center
(**NOTE:** See data sheet S4100-0036 for NDU feature details and for details on SPS NAC ratings for NDU with VCC)

Model	Model Type	UL	ULC	Voltage	NDU Type	Master Controller Features
4100-9151	English	✓	—	120 VAC, 60 Hz	**NDU (Standard, Non-Voice);** raised keys with fixed labels	**Includes:** 4100-0640 InfoAlarm Memory Expansion, Network Interface Module (select media cards separately), 9 A SPS power supply/batt. charger, and external RUI; (**NOTE:** SPS IDNet channel and NACs are disabled)
4100-9153	English	—	✓			
4100-9154	French					
4100-9245	International	✓	—	120 VAC, 60 Hz	**NDU (Standard, Non-Voice);** flat keys with inserts for custom key labels	
4100-9243	International	✓	—	220/240 VAC, 50/60 Hz		
4100-9152	English	✓	—	120 VAC, 60 Hz	**NDU with Voice Interface and Control;** raised keys with fixed labels	**Includes above features and adds:** VCC Bay with Standard CPU Module, Network Interface Module (select media cards separately), 9 A SPS with 250 Point IDNet Interface, (3) 3 A NACs, and ext. RUI comm. interface
4100-9155	English	—	✓			
4100-9156	French					
4100-9246	International	✓	—	120 VAC, 60 Hz	**NDU with Voice Interface and Control;** flat keys with inserts for custom key labels	
4100-9244	International	✓	—	220/240 VAC, 50/60 Hz		

Remote Annunciator with InfoAlarm Command Center (see data sheet S4100-0038 for Remote Annunciator features)

Model	Model Type	UL	ULC	InfoAlarm Command Center Type		Master Controller Features
4100-9612	English	✓	✓	With raised keys and fixed labels	**Basic Remote Annunciator**	Includes Expansion Bay with PDI, Remote TIC module; **power is supplied from host control panel**
4100-9613	French	—	✓			
4100-9614	International	✓	—	With flat keys & inserts for custom key labels		
4100-9607	English	✓	✓	With raised keys and fixed labels	**Remote Annunciator**	Includes Expansion Bay with PDI, Remote TIC module; **power supply is specified separately when configured**
4100-9608	French	—	✓			
4100-9609	International	✓	—	With flat keys & inserts for custom key labels		

InfoAlarm Command Center Memory Option (may be required to be ordered separately, see description details)

Model	Description
4100-0640	**Display Memory Expansion Module**; included with NDU systems; **required for *all* InfoAlarm Command Centers connected to a panel *if any* are using 2 byte character fonts**; 6 Meg module mounts on rear of display board

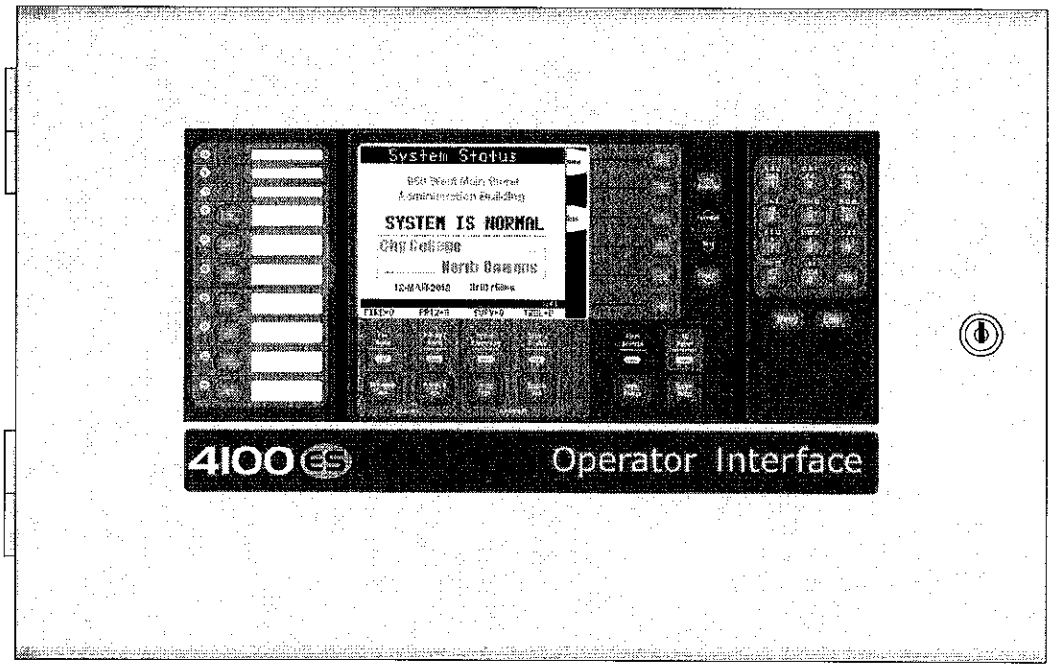
(continued on next page)

Product Selection *(Continued)*

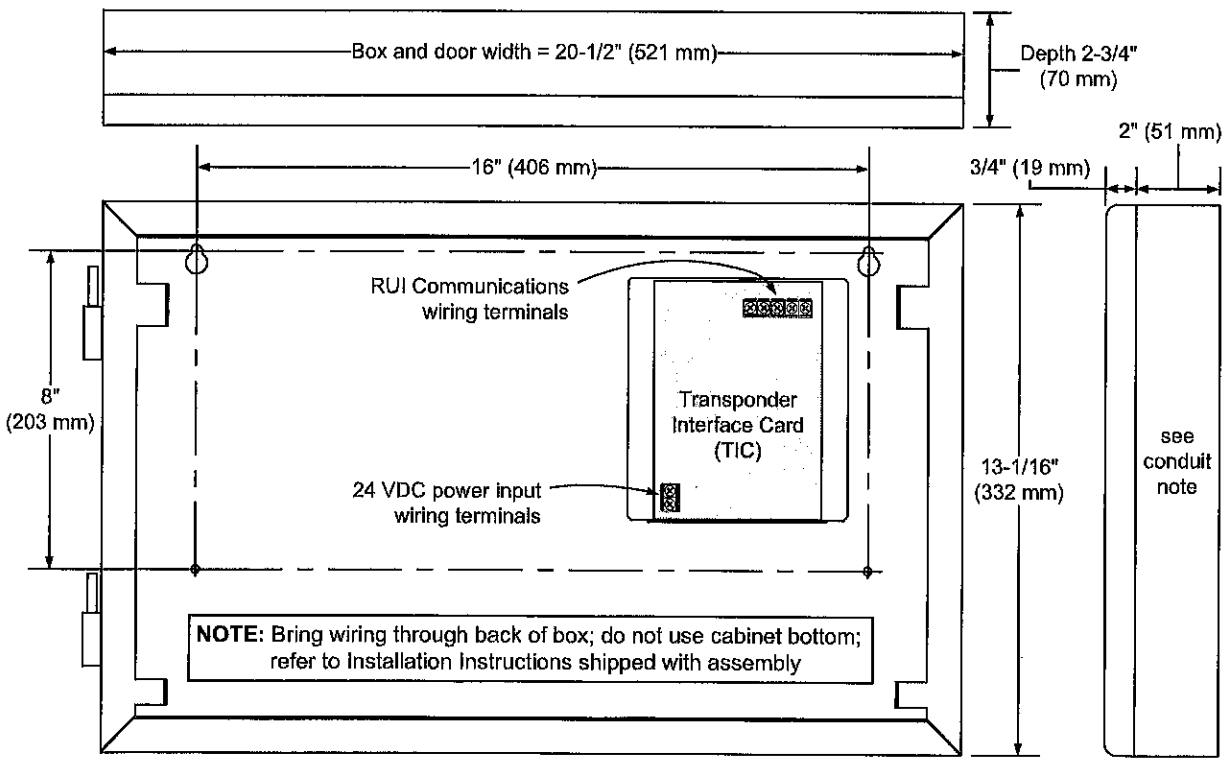
Remote InfoAlarm Command Center Control Assembly with Cabinet for Surface Mounting

Model Number/Cabinet Color		Application Type	Listing	Description
Red	Platinum			
4100-9401	4100-9403	English	UL & ULC	**Remote InfoAlarm Command Center with cabinet**; for surface mounting; includes mounting box and door assembly with glass insert; uses RUI communications; requires external 24 VDC system voltage; see illustrations below and Installation Instructions 579-687 for details
4100-9421	4100-9423	French/Canada	ULC	
4100-9441	4100-9443	International	UL	

Remote InfoAlarm Command Center Front View



Remote InfoAlarm Command Center Mounting Reference



Specifications

General Display Specifications

Size Reference	Dot Matrix Size	320 x 240
	Active Display Area	4.53" W x 3.4" H (115 mm x 86 mm), includes header, footer, and softkey area; 5.66" diagonal measurement (144 mm)
	Characters	Up to 854 characters total using standard ASCII character font
	Designation	QVGA; one quarter of standard VGA (Video Graphics Array) display
Display Polarizer Type		Transflective with rear backlight
Display Adjustment		Contrast adjustment is located on the controller module
Backlight		White LEDs with intensity adjustment and selectable AC power fail operation; intensity adjustment is located on the controller module
Backlighting Operation Options		On continuously; Off with AC power fail until a switch is pushed; selectable timeout without switch activity

Control Panel Mounted InfoAlarm Command Center Current Requirements

Master Controllers (4100-9114, -9115, -9116, -9212, -9213, -9222)	Supervisory	445 mA @ 24 VDC	Panel currents only are shown, add external device loading per system requirements
	Alarm	540 mA @ 24 VDC; backlight and tone-alert on	
Redundant CPUs (4100-9122, -9222)	Supervisory	636 mA @ 24 VDC	
	Alarm	818 mA @ 24 VDC; backlight and tone-alert on	
Network Display Units, Non-Voice (4100-9151, -9153, -9154, -9243, -9245)	Supervisory	491 mA @ 24 VDC	
	Alarm	546 mA @ 24 VDC; backlight and tone-alert on	
Network Display Units, Voice (4100-9152, -9155, -9156, -9244, -9246)	Supervisory	900 mA @ 24 VDC	
	Alarm	1.017 A @ 24 VDC; backlight and tone-alert on	
Upgrade Kits	4100-7153 & -7155 for 4100U	add 82 mA supervisory; add 127 mA for alarm	
	4100-7154 & -7156 for Legacy 4100+	add 235 mA supervisory; add 280 mA for alarm	

Remote Annunciators with InfoAlarm Command Center, Powered from Control Panel

Voltage		19 to 33 VDC (24 VDC nominal), system supplied; requires separate wiring
Current	Supervisory	169 mA @ 24 VDC
	Alarm	202 mA @ 24 VDC; backlight and tone-alert on
Mounting Details; Stand-Alone Cabinet Models		See page 6 for reference illustration
4100ES Capacity, RUI Output	Type	RUI (Remote Unit Interface) external annunciator communications line SLC (signaling line circuit)
	Capacity	Up to 31 total remote RUI devices, including up to 10 InfoAlarm Command Center devices
	RUI Device Reference List	4100ES: InfoAlarm Command Center, Remote Annunciators, MINIPLEX Transponders; 4603-9101 LCD Annunciator, 4602-9101 Status Command Unit (SCU), and 4602-9102 Remote Command Unit (RCU); refer to data sheet S4100-0031 for additional 4100ES RUI information
Wiring Requirements	Data	Single twisted, shielded pair, 18 AWG (0.82 mm^2)
	Power	18 to 12 AWG (0.82 mm^2 to 3.31 mm^2) wires for 24 VDC system power
	Earth	A dedicated earth ground connection to the electrical box is required for proper ESD and EMI protection; wire in accordance with NFPA 70 (*National Electrical Code*) Article 250

Custom Point Detail Messages

Message Location Details		Select "more info" softkey when investigating point detail and scroll to the bottom of the information; typical messages might include contact details (phone numbers, pager numbers, etc.) and other contact or reference information
Number of Messages		Up to 50
Message Size	Character Details	120 characters; visible characters = 116; (lines 1 and 2 require one carriage return character and one line feed character)
	Line Details	3 lines total; 40 characters maximum per line; line 3 may be limited to 36 visible characters depending on characters in lines 1 and 2
Environmental	Operating Temperature	32° to 120°F (0° to 49° C)
	Operating Humidity	Up to 93% RH, non-condensing @ 90° F (32° C) maximum

Simplex

4100ES Fire Control Panels

UL, ULC, CSFM Listed; FM Approved;
*MEA (NYC) Acceptance**

Addressable Fire Detection and Control
MINIPLEX Transponders

Features

4100ES Series MINIPLEX transponders allow remotely located initiating and notification functions:

- Transponder operation is available as standard or with local mode operation
- Communications with the host fire alarm control panel use the Remote Unit Interface (RUI) format

Initiating functions include:

- Conventional initiating device circuit (IDC) support
- Addressable device support including TrueAlarm analog sensor compatibility

Notification functions include:

- Conventional DC notification appliance circuits including TrueAlert strobe and horn appliances
- Emergency voice/alarm communications

Local mode operation provides:

- Default local initiating and notification operation in the event of a communications loss with the host control panel
- Enabling of an optional Local Mode Controller with a local alarm sounder, LED status indicators, and keyswitch enabled control switches
- Support for IDNet addressable devices, conventional notification appliances, and default output tones from local amplifiers

Optional modules include:

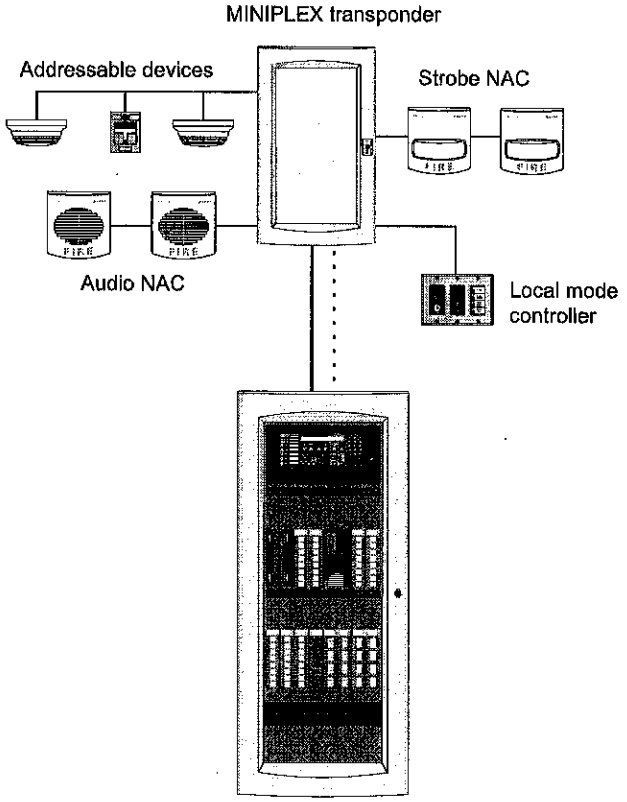
- Digital or Analog audio riser modules for connection to system audio signals
- Digital or analog input audio amplifiers with integral on-board NACs
- Power supplies with or without battery chargers
- City Connect modules and RS-232 ports for printers or maintenance terminals
- Alarm relays, auxiliary relays, additional IDC modules, and NAC expansion modules

NEMA 1/IP30 cabinets are equipped with solid doors (platinum or red) and in one, two, or three bay sizes

Listed to:

- UL 864, Fire Detection and Control (UOJZ), and Smoke Control Service (UUKL)
- UL 2017, Process Management Equipment (QVAX)
- UL 1076, Proprietary Alarm Units-Burglar (APOU)
- UL 1730, Smoke Detector Monitor (UULH)
- UL 2572, Mass Notification Systems (PGWM)
- ULC S527, Control Units for Fire Alarm Systems

* See pages 4 and 5 for product that is listed as UL or ULC. This product has been approved by the California State Fire Marshal (CSFM) pursuant to Section 13144.1 of the California Health and Safety Code. See CSFM Listing 7165-0026:251 for allowable values and/or conditions concerning material presented in this document. Accepted for use – City of New York Department of Buildings – MEA35-93E. Additional listings may be applicable; contact your local Simplex product supplier for the latest status. Listings and approvals under Simplex Time Recorder Co. are the property of Tyco Fire Protection Products.



Typical 4100ES MINIPLEX System One-Line Drawing

Introduction

4100ES MINIPLEX transponders connect to a host 4100ES Fire Alarm Control Panel using Simplex® remote unit interface (RUI) communications. At the transponder, RUI communications are received by the transponder interface module and translated into the same internal communications format that is used in the host control panel.

Remotely located modules. With RUI communications, the transponder can remotely provide the same initiating and notification functions that occur at the host control panel without requiring multiple long distance wiring runs. Connections to the host panel are low current communications and audio wiring with distances up to 2500 ft (762 m).

4100U Series Products Note. The system modules and features listed in this data sheet are both compatible with, and listed for use with 4100U series fire alarm control panels. Contact your local Simplex product supplier for details.

Introduction *(Continued)*

Please refer to document S4100-0031 and the other documents listed on page 3 for additional information concerning the extensive initiating and notification features of the 4100ES fire alarm control panels.

Module Bay Description

Transponder model 4100-9600 includes a bay assembly, a power distribution interface module (PDI), a Basic Transponder Interface Module, and an interconnect harness. Communications with the host fire alarm control panel are via a Remote Unit Interface (RUI) connection that allows for up to 2500 ft (762 m) distance. RUI can communicate with up to a total of 31 remote devices and can be either Style 4 or Style 7 communications.

Transponder model 4100-9601 substitutes a Local Mode Transponder Module for the Basic Transponder Module.

Optional Expansion Bays each include a PDI and accept a variety of optional modules (refer to list starting on page 4).

The Battery Compartment (bottom) accepts two batteries, up to 50 Ah, that can be mounted within the cabinet. Battery mounting does not interfere with available module space. A power supply with battery charger is required for each battery set.

Packaging Availability

- Modules are power-limited (except as noted, such as relay modules)
- Enclosure are available for one, two, or three bay sizes or for cabinet rack mounting
- NEMA 1/IP30 boxes and solid doors are available in platinum or red (ordered separately)
- Up to eight close-nippled cabinets can be connected at one transponder location (close-nippled is mounted within 20 ft (6 m) and with interconnecting wiring enclosed in conduit)
- Refer to document S4100-0037 for enclosure details

Local Mode Control Operation

Default Stand-Alone Operation. In the event of a communications loss with the host fire alarm control panel, model 4100-9601 MINIPLEX Local Mode Transponders provide fire alarm response default operation for its connected devices and appliances per the following.

Input Operation. During local mode operation, TrueAlarm initiating devices connected to the transponder will cause an alarm at their least sensitive alarm threshold.

- Photoelectric sensors will alarm at 3.7%/ft smoke obscuration
- Ionization sensors will alarm at 1.3%/ft obscuration
- Heat sensors will alarm at a fixed temperature of 135° F (57° C)
- TrueAlarm device LEDs will be activated to indicate a device in alarm

Local Mode Control Operation *(Continued)*

Notification Operation. Fire alarm conditions reported against a fire alarm point type within a transponder in local mode will cause all notification appliance circuits in that transponder to:

- Sound a general alarm temporal pattern horn tone
- Activate visible notification appliance circuits

Local Mode Module Support. Local mode operation provides support for the following 4100ES modules:

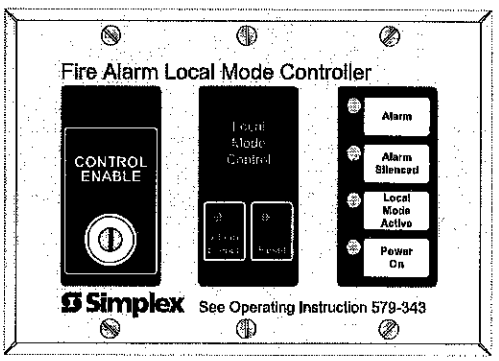
- System Power Supplies (SPS), Expansion Power Supplies (XPS), and Remote Power Supplies (RPS), including on-board notification appliance circuits (NACs) and expansion signal modules, operated at a temporal pattern,
- IDNet addressable device circuits, including those on-board the SPS, and communications from IDNet 2 and IDNet 2+2 modules
- 4100ES amplifiers will provide their on-board horn tones (500 Hz) at a temporal pattern through their on-board amplifier NACs

Local Mode Operation Module Exclusion. Modules not listed above but that are listed as compatible with MINIPLEX transponders per this document, do not interfere with local mode operation but **are not supported** during local mode operation.

Local Mode Controller

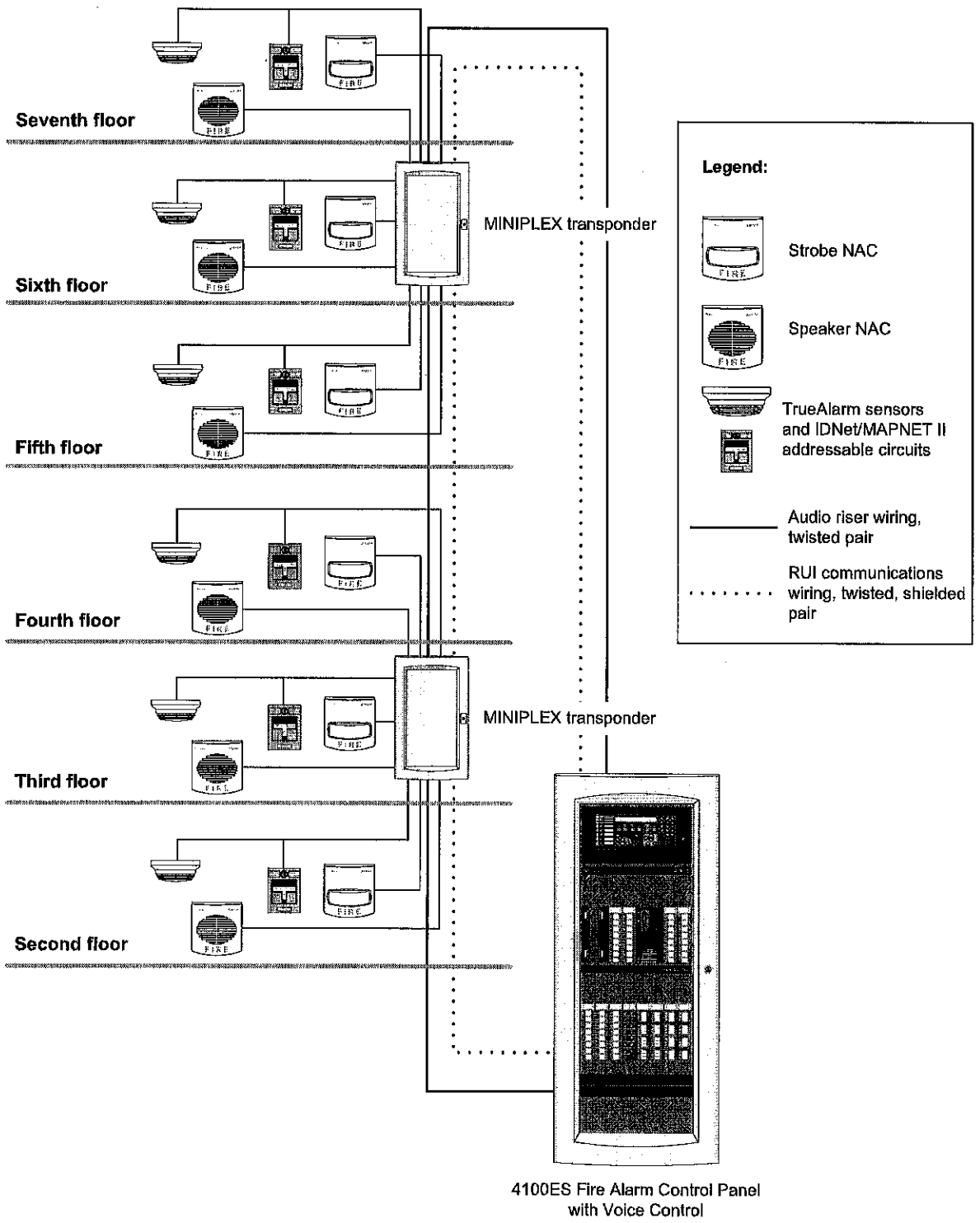
Operation. During local mode operation, an optional Local Mode Controller will indicate status (see illustration below) and can be enabled using a keyswitch to perform local alarm silence or reset. If alarms occurring during local mode are reset using a Local Mode Controller, upon restoration of communications, **those alarms will not be sent to the master controller**. If alarms are still present upon restoration of communications, then the alarm condition will be reported and host fire alarm control panel programmed alarm functions will occur. When communications are re-established, the local mode transponder restores automatically.

Mounting. Local Mode Controllers are mounted on three-gang plates, are available in beige or red, and for either flush or semi-flush mounting. (See page 7 for details).



Local Mode Controller Module

Typical Multi-Floor MINIPLEX Audio System



Additional 4100ES Data Sheet Reference

Subject		Data Sheet	Subject	Data Sheet
MINIPLEX Transponders	With EPS Power Supplies	S4100-0103	4100ES Basic Panels	S4100-0031
4100ES Basic Panels		S4100-0100	Network Display Unit (NDU)	S4100-0036
Network Display Unit (NDU)		S4100-0102	Remote Battery Charger	S4081-0002
Enclosures		S4100-0037	LED/Switch Modules	S4100-0032
4100ES Audio/Phone Modules		S4100-0034	Remote Annunciators	S4100-0038
Addressable Device Compatibility		S4090-0011		

MINIPLEX Transponder Product Selection

Transponder Type

Model	Description		Supv.	Alarm
4100-9600	Basic Transponder, includes bay equipment with power distribution interface, and 4100-0620 Basic Transponder Interface Module mounted in Block A		87 mA	87 mA
4100-9601	Local Mode Transponder, includes bay equipment with power distribution interface, and 4100-0625 Local Mode Transponder Interface Module mounted in Block A	normal	87 mA	87 mA
		in local mode	112 mA	112 mA

Local Mode Controller Selection

Model	Description				Supv.	Alarm
4601-9108	Flush mount	Red with white lettering	Local Mode Controller, 3-gang plate mounted; flush mount requires a 1 ½" (38 mm) deep 3-gang box; surface mount controllers include a matching mounting box; see p. 7 for details	normal	12 mA	12 mA
4601-9109	Surface mount					
4601-9110	Flush mount	Beige with black lettering		in local mode	20 mA	60 mA
4601-9111	Surface mount					

Communication Modules

Model	Description			Size	Supv.	Alarm
4100-6031	**Select one per SPS**	City Circuit, with disconnect switches	For use with SPS only, not RPS	Mounts on SPS or RPS	20 mA	36 mA
4100-6032		City Circuit, without disconnect switches			20 mA	36 mA
4100-6033		Alarm Relay, 3 Form C relays, 2 A @ 32 VDC; for SPS or RPS			15 mA	37 mA
4100-6038	Dual RS-232 Interface			1 Slot	132 mA	132 mA
4100-6045	Decoder Module			3 Slots	85 mA	163 mA
4100-6048	VESDA Aspiration System Interface			1 Slot	132 mA	132 mA
4100-9816	Master Clock Interface Module with one standard RS-232 port (see S4100-0033)			1 Slot	132 mA	132 mA

Expansion, System, and Remote Power Supplies and Accessories (XPS, SPS, and RPS are rated 9 A for "Special Application" appliances, 3 A/NAC; and 5 A for "Regulated 24 DC" power, 2 A/NAC)

Model	Voltage/Listing		Description	Size	Supv.	Alarm
4100-5101	120 VAC	UL	**Expansion Power Supply (XPS);** 9 A output; 3 Class A/B NACs; Canadian models have low battery cutout*	2 Blocks	50 mA	50 mA
4100-5103	120 VAC, Canadian	ULC				
4100-5102	220-240 VAC	UL				
4100-5115	NAC Expansion Module, 3 NACs, Class A/B, **mounts on XPS only**			N.A.	25 mA	25 mA
4100-5111	120 VAC	UL	**System Power Supply (SPS);** 9 A power supply/charger with 250 point IDNet channel; 3 Class A/B NACs; expansion slot for City Circuit or Alarm Relay option; Canadian model has low battery cutout*	4 Blocks	175 mA	185 mA
4100-5112	120 VAC, Canadian	ULC				
4100-5113	220-240 VAC	UL				
4100-5125	120 VAC	UL	**Remote Power Supply (RPS);** 9 A power supply/charger similar to SPS except no IDNet channel or City Circuits; will accept one 4100-6033; Canadian model has low battery cutout*	4 Blocks	150 mA	185 mA
4100-5126	120 VAC, Canadian	ULC				
4100-5127	220-240 VAC	UL				
4100-5152	12 VDC Power Option, 2 A maximum			1 Block	1.5 A maximum	
4100-0636	Box Interconnection Harness Kit (non-audio); **order one for each close-nippled cabinet**					

Special Application Appliances	Simplex 4901, 4903, 4904, and 4906 Series horns, strobes, and combination horn/strobes and speaker/strobes (contact your Simplex product representative for compatible appliances)
Regulated 24 DC Appliances	Power for other UL listed appliances; use associated external synchronization modules where required

Miscellaneous Options and Accessories

Model	Description
4100-1290	24 Point I/O Module for external connections, select each point as either a switch input (momentary or maintained) or an output (for lamp/LED/relay); requires 1 Slot (refer to data sheet S4100-0032 for additional information)
4100-0632	Terminal Block Utility Module with 2, 16 position terminal blocks on 4" x 5" single block, for of up to 12 AWG wire (3.31 mm^2)
4100-0633	Door Tamper Switch, connects into Transponder Interface Module, one per cabinet assembly if required
4100-0634	120 VAC — Power Distribution Module (PDM) select per system voltage; **one required per box**
4100-0635	220/230/240 VAC — Power Distribution Module (PDM) select per system voltage; **one required per box**
4100-9837	Green LED Power-on Indicator Kit, **required for ULC listing of MINIPLEX transponder;** mounts on solid door knockout
2081-9031	Series resistor for WSO, IDCs (N.O. water flow and tamper on same circuit, wires after water flow and before tamper) 470 Ω, 1 W, encapsulated, two 18 AWG leads (0.82 mm^2), 2 ½" L x 1 ⅜" W x 1" H (64 mm x 35 mm x 25 mm)

Audio Riser Modules

Model	Description	Size	Supv.	Alarm
4100-0621	Dual Channel *Analog* Audio Riser Module; accepts one or two separate audio signals from host control panel; mounts in Block B, is controlled by Transponder Interface Module	1 Block	0 mA	15 mA
4100-0622	3-8 Channel *Digital* Audio Riser Module; similar to analog module, except receives and decodes a digital input signal with up to eight audio channels; with Non-Alarm Audio input	1 Block	70 mA	70 mA

* Standard power supply NACs can provide synchronized strobe or SmartSync, two-wire operation.

Continued on next page

MINIPLEX Transponder Product Selection *(Continued)*

Analog Emergency Voice/Alarm Communications Equipment, Constant Supervision Compatible*

Model	Description		Details		
4100-1361	25 VRMS output	Flex-35, 35 W Amplifier, constant supervision compatible	Includes three on-board Class B audio NACs; power is supplied from an XPS, RPS, or SPS	NAC rating = 1.4 A	35 W, or 100 speakers
4100-1362	70.07 VRMS output			NAC rating = 0.5 A	
4100-1312	25 VRMS output	Flex-50, 50 W Amplifier, constant supervision compatible		NAC rating = 2 A	50 W, or 100 speakers
4100-1313	70.7 VRMS output			NAC rating = 0.707 A	

100 W *Analog* Amplifiers with Power Supply, Constant Supervision Compatible

Model/Output Voltage		Power Supply Input/Listing		Description	Details	
25 VRMS	70.7 VRMS					
4100-1314	4100-1315	120 VAC, 60 Hz	UL	Primary 100 W Amplifier	Includes six, Class B audio NACs; NAC rating = 50 W or 100 speakers maximum; 2 A @ 25 VRMS; 1.4 A @ 70.7 VRMS	ULC models have low battery dropout circuit
4100-1316	4100-1317	120 VAC, 60 Hz	ULC			
4100-1318	4100-1319	220/230/240 VAC, 50/60 Hz	UL			
4100-1320	4100-1321	120 VAC, 60 Hz	UL	Backup 100 W Amplifier	Uses the six Class B NACs of primary amplifier	
4100-1322	4100-1323	120 VAC, 60 Hz	ULC			
4100-1324	4100-1325	220/230/240 VAC, 50/60 Hz	UL			

Digital Emergency Voice/Alarm Communications Equipment*

Model	Description		Details		
4100-1363	25 VRMS output	Flex-35, 35 W Amplifier, constant supervision compatible	Includes three on-board Class B audio NACs; power is supplied from an XPS, RPS, or SPS	NAC rating = 1.4 A	35 W, or 100 speakers
4100-1364	70.07 VRMS output			NAC rating = 0.5 A	
4100-1326	25 VRMS output	Flex-50, 50 W Amplifier, constant supervision compatible		NAC rating = 2 A	50 W, or 100 speakers
4100-1327	70.7 VRMS output			NAC rating = 0.707 A	

100 W *Digital* Amplifiers with Power Supply, Constant Supervision Compatible

Model/Output Voltage		Power Supply Input/Listing		Description	Details	
25 VRMS	70.7 VRMS					
4100-1328	4100-1329	120 VAC, 60 Hz	UL	Primary 100 W Amplifier	Includes six, Class B audio NACs; NAC rating = 50 W or 100 speakers maximum; 2 A @ 25 VRMS; 1.4 A @ 70.7 VRMS	ULC models have low battery dropout circuit
4100-1330	4100-1331	120 VAC, 60 Hz	ULC			
4100-1332	4100-1333	220/230/240 VAC, 50/60 Hz	UL			
4100-1334	4100-1335	120 VAC, 60 Hz	UL	Backup 100 W Amplifier	Uses the six Class B NACs of primary amplifier	
4100-1336	4100-1337	120 VAC, 60 Hz	ULC			
4100-1338	4100-1339	220/230/240 VAC, 50/60 Hz	UL			

Options for use with either Analog or Digital Amplifiers

Model	Description		Details and Mounting Reference
4100-1245	Flex-35/50 Expansion NAC Module; adds three Class B audio NACs	Choose one per amplifier	Mounts on Flex-35/50 assembly; NAC ratings = 1.5 A, 35/50 W, or 100 speakers maximum; *Supv = 8 mA, Alarm = 60 mA*
4100-1246	Flex-35/50 Class A Adapter Module; converts three on-board NACS to Class A operation		Mounts on Flex-35/50 assembly; NAC ratings = 2 A, 50 W, or 100 speakers maximum; *Supv =10 mA, Alarm = 30 mA*
4100-1248	100 W Amplifier Expansion NAC Module; NAC ratings = 1.5 A, 50 W, or 100 speakers max.	Choose one per amplifier	Provides six additional Class B audio NACs, mounts on 100 W amplifier assembly; *Supv = 17 mA, Alarm = 60 mA*
4100-1249	100 W Class A Adapter Module; NAC ratings = 2 A, 50 W, or 100 speakers max.		Converts six on-board NACs to Class A operation, mounts on 100 W amplifier assembly; *Supv = 1 mA, Alarm = 60 mA*

Model	Description		Details	
4100-1259	25 VRMS Output; NAC rating = 2 A, 50 W, or 100 speakers max.	Constant Supervision Adapter for three NACs; select per amplifier output; not compatible with amplifier NAC expansion modules; deactivated when on batteries	*Supv = 10 mA on batteries; Alarm = 35 mA*	Converts three Class B audio NACS to Class A or Class B Constant Supervision NACs; mounts on Flex-35/50 or 100 W amplifier assembly; use two for the six NACs on 100 W amplifiers
4100-1260	70.7 VRMS Output; NAC rating = 0.707 A, 50 W, or 100 speakers max.		*Supv = 38 mA on batteries; Alarm = 70 mA*	

Firefighters Telephone Options

Model	Description	Size	Supv.	In Use
4100-1272	Expansion Telephone Control Module with three Class B telephone NACS; required when telephone circuits are mounted in transponder;	1 Block	80 mA	130 mA
4100-1273	Telephone Class A Adapter Module; mounts on 4100-1272; no additional current required			

General Audio Options

Model	Description
4081-9018	End-of-line resistor harness for 70.7 VRMS NACs; 10 kΩ, 1 W
4100-2320	Audio Bay-to-Bay Interconnection Harness Kit; **order one for each audio bay addition**
4100-0637	Audio Box Interconnection Harness Kit; **order one for each close-nippled audio cabinet**

* Refer to document S4100-0034 for additional audio information.

Continued on next page

MINIPLEX Transponder Product Selection *(Continued)*

Audio Expansion Signal Module and Options

Model	Description	Details and Mounting Reference	
4100-5116	Expansion Signal Module; three, 1.5 A Class B NACs for Audio applications; up to five maximum per amplifier; NAC rating = 1.5 A, 50 W, or 100 speakers maximum	Converts one NAC input to three NAC outputs; selects between two inputs; for Flex-35/50 amplifiers only, two input NACs are required; Single Block module mounts in expansion bay; *Supv = 20 mA; Alarm = 80 mA*	
4100-1266	Expansion Signal Module NAC Expander; NAC rating = 1.5 A, 50 W, or 100 speakers max.	Expands module capacity to six, Class B NACs; *Supv = 0.84 mA; Alarm = 60 mA*	These modules mount on the 4100-5116; select one max. per 4100-5116 as required
4100-1267	Expansion Signal Module Class A Adapter; NAC rating = 1.5 A, 50 W, or 100 speakers maximum	Converts 3 Class B, NACs to Class A; *Supv = 0 mA; Alarm = 30 mA*	
4100-1268	Expansion Signal Module Constant Supervision Adapter; Converts 3 Class B NACs to Constant Supervision Class B or Class A NACs; for 25 VRMS or 70.7 VRMS audio	NAC rating = 1.4 A, 50 W, or 100 speakers max.; *Supv = 38 mA on batteries (constant supervision deactivated); Alarm = 70 mA*	

Initiating Device Circuits (IDCs)	Model	Description	Size	Supv.	Alarm
	4100-5005	Eight zones, Class B	1 Slot	75 mA	195 mA
	4100-5015	Eight zones, Class A	1 Slot	75 mA	195 mA

Addressable Interface Modules

Model	Description		Supv.	Alarm
4100-3109*	**IDNet 2 Module**, 250 point capacity; electrically isolated output with **two** short circuit isolating Class B or Class A output loops, 1 block; standard on EPS with IDNet 2 Module	no devices	50 mA	60 mA
		50 devices	90 mA	150 mA
		125 devices	150 mA	225 mA
		250 devices	250 mA	350 mA
4100-3110*	**IDNet 2+2 Module**, 250 point capacity; electrically isolated output with **four** short circuit isolating Class B or Class A output loops, 1 block; mounts in expansion bay or available master controller bay module locations only, not applicable for EPS mounting	no devices	50 mA	60 mA
		50 devices	90 mA	150 mA
		125 devices	150 mA	225 mA
		250 devices	250 mA	350 mA
4100-3111*	**IDNet Short Circuit Isolating Loop Output Module**; *for Aftermarket Field Installation Only*; mount up to two on a 4100-3109 module; for use with 4100-3109 modules only			

***Note:** Loading per IDNet device (no LEDs on) = 0.8 mA supervisory and 1 m A alarm.
Each IDNet 2 and IDNet 2+2 Short Circuit Isolating Loop Output can be individually controlled for system diagnostics and can be assigned a public point for Fire Alarm Network annunciation.

Model	Description		Supv.	Alarm
4100-3102	MAPNET II Module, 127 point capacity, add devices separately; Module size = 2 Slots; Loading per MAPNET II device = 1.7 mA	Module without devices	255 mA	275 mA
		Fully loaded module, total	471 mA	491 mA
4100-3103	Isolator Module **for MAPNET II communications**; converts a single connected SLC into four isolated outputs selectable as Class A or Class B; up to two Isolator Modules can be connected to one SLC; Module size = 1 Slot; **NOTE:** Compatible with MAPNET II Remote Isolators only		50 mA	50 mA

Relay Modules; Nonpower-Limited

Model	Description	Resistive Ratings		Inductive Ratings		Size	Supv.	Alarm
4100-3202	4 DPDT w/feedback	10 A	250 VAC	10 A	250 VAC	2 Slots	15 mA	175 mA
4100-3204	4 DPDT w/feedback	2 A	30 VDC/VAC	½ A	30 VDC/120 VAC	1 Block	15 mA	60 mA
4100-3206	8 SPDT	3 A	30 VDC/120 VAC	1 ½ A	30 VDC/120 VAC	1 Block	15 mA	190 mA

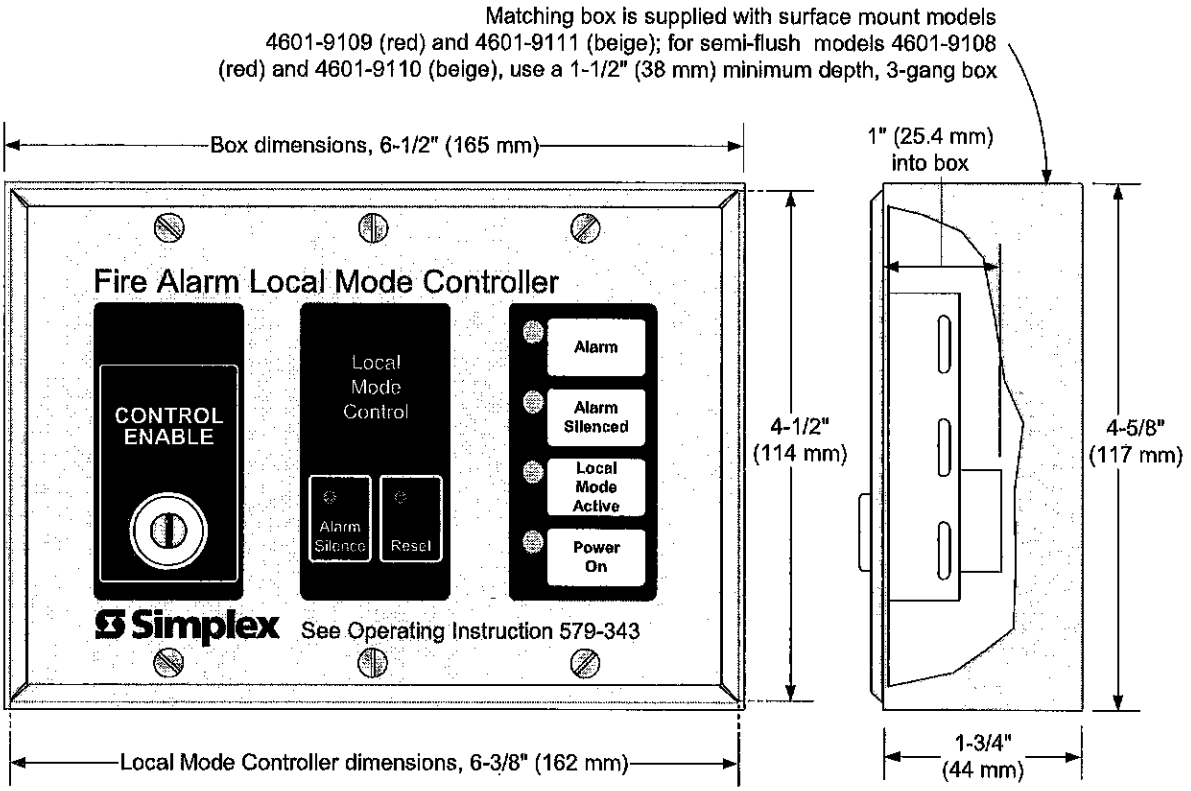
Current Calculation Notes:

1. For total supervisory current, add panel module currents to base system value **and** add all external loads panel-powered loads.
2. For total alarm current, add panel module currents to base system alarm current **and** add all panel NAC loads **and** all external loads powered from panel power supplies.

General Specifications

Input Power [System (SPS); Expansion (XPS); Remote (RPS); and 100 W amplifiers]		120 VAC Models	4 A maximum @ 102 to 132 VAC, 60 Hz	
		220-240 VAC Models	2 A maximum @ 204 to 264 VAC, 50/60 Hz; separate taps for 220/230/240 VAC	
Power Supply Output Ratings for SPS, XPS, and RPS (nominal 28 VDC on AC; 24 VDC on battery backup)	Total Power Supply Output Rating	**Including module currents and auxiliary power outputs;** 9 A total for "Special Application" appliances; 4 A total for "Regulated 24 DC" power		Output switches to battery backup during mains AC failure or brownout conditions
	Auxiliary Power Tap	2 A maximum	Rated 19.1 to 31.1 VDC	
	NACs Programmed for Auxiliary Power	2 A maximum per NAC; 5 A maximum total		
Battery Charger Ratings for SPS and RPS (sealed lead-acid batteries)	Battery capacity range	UL listed for battery charging of 6.2 Ah up to 110 Ah (batteries larger than 50 Ah require a remote battery cabinet); ULC listed for charging up to 50 Ah batteries		
	Charger characteristics and performance	Temperature compensated, dual rate, recharges depleted batteries within 48 hours per UL Standard 864, to 70% capacity in 12 hours per ULC Standard S527		
Environmental	Operating Temp. Range	32° to 120°F (0° to 49° C)		
	Operating Humidity Range	Up to 93% RH, non-condensing @ 90° F (32° C) maximum		
Installation Instruction Reference		574-844, Transponder Interface Cards	579-343, Local Mode Controller	

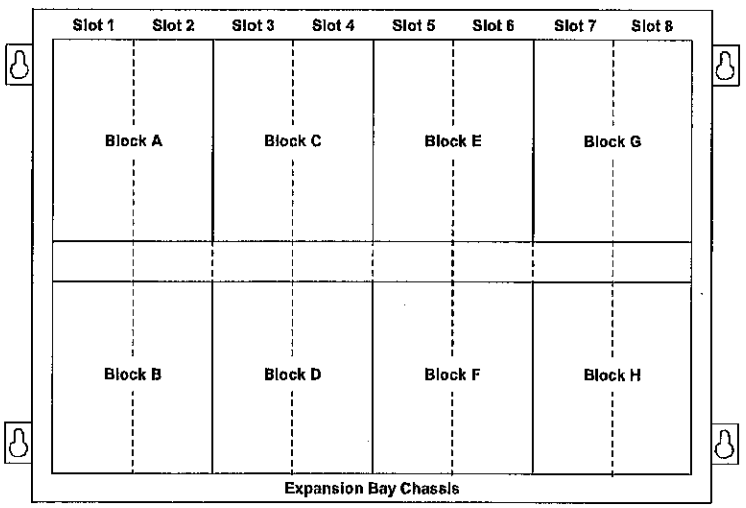
Local Mode Controller Detail



Local Mode Controller to Transponder Wiring:

1. Wire close-nippled to transponder, maximum distance = 20 ft (6.1 m).
2. Nine wires required: 24 VDC (2), one per LED indicator (4), and one per switch (3).
3. Wire size, 18 AWG (0.82 mm²).

Expansion Bay Module Loading Reference



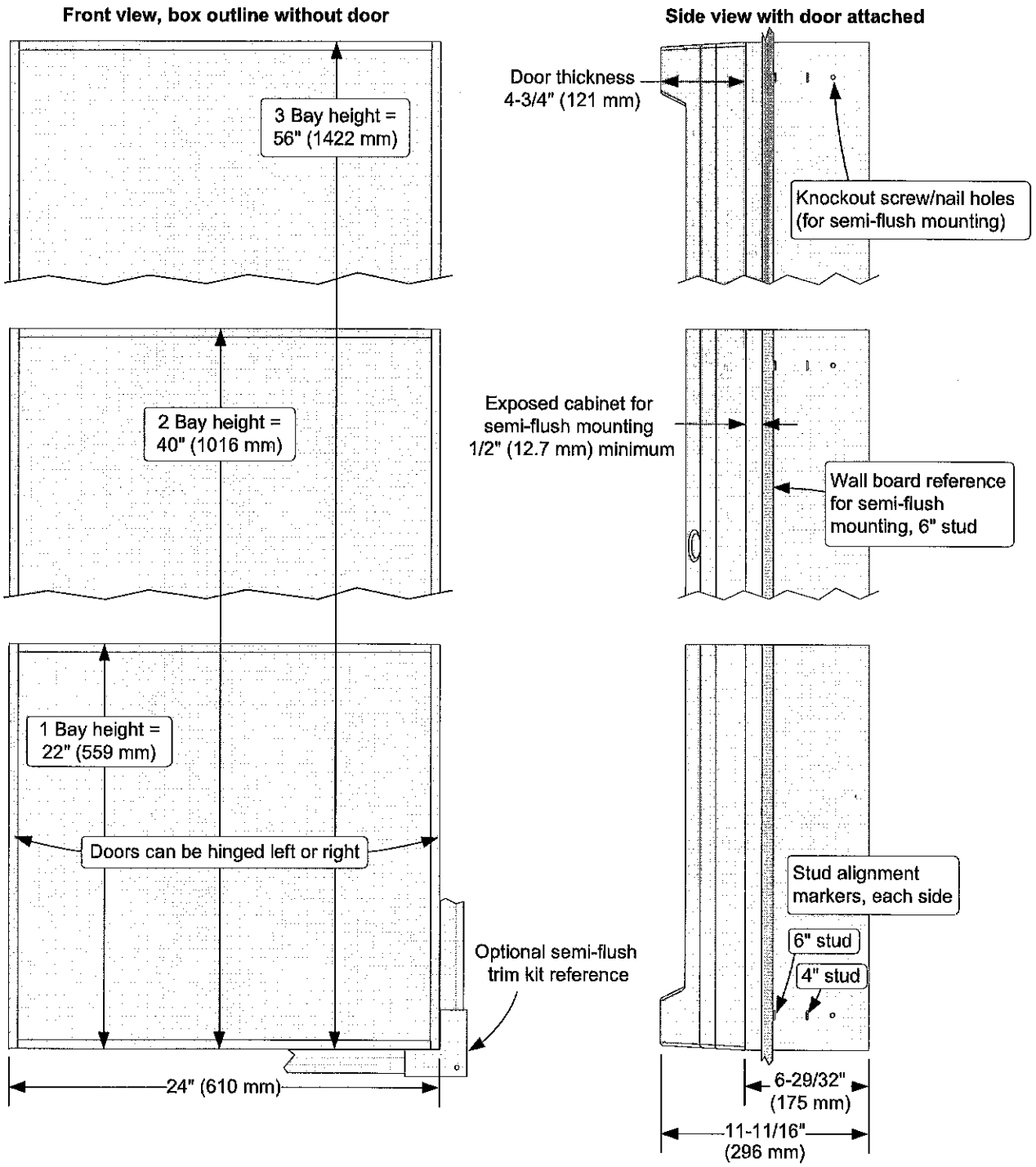
Size Definitions: Block = 4" W x 5" H (102 mm x 127 mm) card area

Slot = 2" W x 8" H (51 mm x 203 mm) motherboard with daughter card

Description		Mounting
Transponder Interface Modules		Block A
Audio Riser Modules		Block B
Terminal Block Module		1 Block
IDNet 2 and IDNet 2+2 Modules		1 Block
4, 2 A Relays	**NON Power-limited**	1 Block
4, 10 A Relays		4", 2 Slots
8, 3 A Relays		1 Block
VESDA Interface		2", 1 Slot
Class B IDC		2", 1 Slot
Class A IDC		2", 1 Slot
MAPNET II Module		4", 2 Slots
MAPNET II Isolator		2", 1 Slot
Decoder Module		6", 3 Slots
System or Remote Power Supply		Blocks E, F, G & H ONLY
Expansion Power Supply		Blocks G & H ONLY
NAC Expansion Module		On XPS ONLY
Flex-35 Amplifiers, 2 max /bay*		Blocks E & F; C & D; or A & B
Flex-50 Amplifiers, 2 max/bay*		Blocks E & F or C & D
100 W Amplifiers, 1 max/bay		Blocks E, F, G & H
100 W Backup Amplifiers, 1 max. per bay with primary amplifier		Blocks A, B, C & D
Telephone Expansion Module		1 Block
Expansion Signal Module		1 Block

* **NOTE:** When mounting dual Flex amplifiers on an expansion bay, special mounting rules apply.

Enclosure Installation Reference



NOTE: A system ground must be provided for Earth Detection and transient protection devices. This connection shall be made to an approved, dedicated Earth connection per NFPA 70, Article 250, and NFPA 780.

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7165-0026:0251

CATEGORY: 7165 -- FIRE ALARM CONTROL UNIT (COMMERCIAL)

LISTEE: Simplex100 Simplex Drive, Westminster, MA 01441-0001
Contact: Jim Goyette (978) 731-8580 Fax (978) 731-8881
Email: jgoyette@tycoint.com

DESIGN: Models 4100-9111, -9112, -9113, -9114, -9115, -9116, -9121, -9122, -9131, -9132, -9133, -9211, -9212, -9213, -9222, -9230, -9311, -9312, -9313, -9314, -9315, -9316, -9331, -9332, -9511, -9512, -9513, -9600, -9601 and -9602 fire alarm control units. Power limited, automatic, manual, local, auxiliary, remote station, proprietary and central station, process monitoring, smoke control system, smoke detector monitor, emergency communication and relocation, waterflow and sprinkler supervisory service. Suitable for releasing device service. Models 4100-9111, -9112, -9113, -9114, 9115, -9116 ,-9121, -9122, -9211, -9212, -9213, -9222, -9311, -9312, -9313, -9314, -9511, -9512 and -9513 suitable for mass notification system as an autonomous control unit. The network display units are suitable for mass notification system system as a central control station. The remote annunciators are suitable for mass noticication system system as a local operating console. Refer to listee's data sheet for detailed product description and operational considerations. System components:
4100-7101, -7104, -7113, -7115: Master Controller Assembly
4100-7105: Redundant Master Controller Assembly
4100-7150, -7151, -7152,-7154,-7156, -9833: Master Controller Replacements
4100-5005, -5015: 8-Point Class A IDC Module
4100-1291: Remote Unit Interface Module
4100-3102, -9812: MAPNET II Module
4100-3103: MAPNET/IDNET Isolator Module
4100-6038 RS-232/2120: Communication Module
4100-6014,-6078: Modular Network Interface Module
4100-1293: Printer
4100-6052,-6080: Event Reporting DACT
4100-6053: Point reporting DACT
4100-6067: Contact Closure DACT
4100-6031, -6032, -9827, -9828: City Module
4100-2300, -2320: Expansion Bay
2975-9408 thru -9412: Backbox
2975-9438 thru -9440: Backbox
4100-2101 thru -2103, -2121 thru -2123: Glass Door and Retainer
4100-2104 thru -2106, -2124 thru -2126: Glass Door and Retainer

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Date Issued: **July 01, 2017** *Listing Expires* **June 30, 2018**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*
Fire Engineering Division

4100-2111 thru -2113, -2131 thru -2133: Solid Door
4100-2114 thru -2116, -2134 thru -2136: Solid Door
2975-9422 thru -9426, -9428, -9429: Enclosure
2975-9431, -9432: Enclosure
2975-9441 thru -9452: Enclosure
4100-0633, -6034: Tamper switch
4100-9141,-9142,-9151,-9152,-9241 thru -9246,-9342,-9352,-9542 Network Display Unit
4100-6030, -6055 : Service Modem
4100-5101, -5102, -5103 : Expansion Power Supply
4100-5111, -5112, -5113 : System Power Supply
4100-5125, -5126, -5127: Remote Power Supply
4100-1288, -1289 : LED/Switch Controller
4100-1275 thru -1287, -1295, -1299: LED/Switch Module
4100-1300, -1301, -1302: LED/Switch Module
4100-1290 24: Point Graphic I/O Module
4100-9607,-9609,-9610, -9611,-9612,-9614,-9615 Remote Annunciator
4100-1292: Remote LCD Display
4100-3115: XA Loop Interface Module
4100-3101,-3104, -3105, -3106, -3107,-3108,*-3109,*3110,*3111,-9811 IDNET Module
4100-9116: Addressable IDNET Isolator
4090-9117: Addressable Power Isolator
4100-9643: Utility Cabinet
4100-0634, -0635: Power Distribution Module
4100-5152, -5153, -5154, 5155: Auxiliary Power Supply
4100-6033, -9829: Alarm Relay Card
4100-3201, -3202,-3203,-3204,-3206: Auxiliary Relay Modules
4100-0620: Basic Transponder Interface Card
4100-6043, -6044: Converter
4100-6045: Decoder Module
4100-6054: Fiber Optic Driver
4100-5115: Expansion NAC
4100-9816: Master Clock Interface
4100-6048: VESDA Interface
4100-5311,-5313,-5325,-5327: Extended Power Supply
4100-6103: Dual Class A Isolator
4100-5120, -5121, -5122: True Alert Power Supply
4081-9306, -9308: Expansion Battery Charger
4100-2140: Rack Mount Bay Mounting Kit
4100-2144 : Rack Mount PDM Mounting Kit
4100-0156: Eight Volt Converter
4100-0625: Local Mode Transponder Interface Card
4601-9100, -9108,-9109,-9110,-9111Local Mode Controller
4100-0623 : Basic Network Transponder Interface Card
4100-0621, -0622, -1341:Audio Riser Module
4100-6036, -6037,-6101,-6102 : Physical Bridge Assembly

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Fire Engineering Division

4100-9849, -9863 : TCP/IP Physical Bridge Assembly (Style 4)
4100-9850, -9864 : TCP/IP Physical Bridge Assembly (Style 7)
4100-6056 : Wired Media Card
4100-6057 : Fiber Optic Media Card
4100-9620 : Analog Audio Expansion Bay
4100-9621 : Digital Audio Expansion Bay
4100-1210 : Analog Audio Controller Card
4100-1211, -1311 : Digital Audio Controller Card
4100-1212 thru -1225, 1261, -1262 Analog Audio Amplifier
4100-1312 thru -1325, -1361, -1362 Analog Audio Amplifier
4100-1226 thru -1239, 1263, -1264 Digital Audio Amplifier
4100-1326 thru -1339, -1363, -1364 Digital Audio Amplifier
4100-1240 : Audio Input Option Card
4100-1241, -1242: Message Expansion Card
4100-1243, -1244: Microphone Module
4100-1245, -1248, -1266: Amplifier Expansion NAC
4100-1246, -1249, -1267 : Amplifier Class A Adapter
4100-1252, thru -1255 :Audio Operator Interface Module
4100-1270 : Master Telephone Assembly
4100-1271 : Remote Telephone
4100-1272 : Expansion Phone Card
4100-1273 : Telephone Class A Adapter
4100-5116 : Expansion Signal Card
4100-1259, -1260, -1268 : Constant Supervision NAC Modules
4100-1265 : Degrade Fail-Safe Microphone Module
4100-6068 : TFX Interface Module
4100-6072, 6073, 6074, 6075 : Fiber Optic Modem9402
4100-9842 : Fiber Modem Audio Expansion Board
4100-9901 thru -9926, -9930 thru -9939Retro-fit Kits
4100-7153, -7155 : Display Replacement
4100-9401, *-9403, *-9423, -9441, *-9443: Remote User Interface
4100-0640 : FUI Controller Memory Add-on Module
4100-7157 : Expanded Memory CPU Card
4100-6065 : BMUX Communication Card
2081-9046 : Coil Supervision Module
4100-6066 : TFX Loop Card
4100-5130 : TFX Voltage Regulator Module
4100-1340 : TFX Audio Interface Module
4100-1297 : TFX Phone Card
4100-1298 : TFX Master Telephone with Phone Card
4100-6069 : BACpac Ethernet Module
4100-1274 : Microphone Multiplex Module
4100-6047: Building Network Interface Card
4190-6104: Remote Service Gateway

RATING: 120, 220, 240 VAC primary; 24 VDC secondary

*Revision 10-18-16, 2016 dc

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

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Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

INSTALLATION: In accordance with listee's printed installation instructions, NFPA 72, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model/catalog number, electrical rating, and UL label.

APPROVAL: Listed as fire alarm control units suitable for use with separately listed compatible initiating and indicating devices. Also Suitable for high-rise applications. The control unit is compatible with the Model 4090-9007Signal Individual Addressable Module (CSFM Listing No. 7165-0026:318).

These control units can generate a distinctive three-pulse Temporal Pattern Fire Alarm Evacuation Signal (for total evacuation) in accordance with NFPA 72, 2002 Edition. This control unit meets the requirements of UL-864, 9th Edition Standard.

NOTE: 1. For Fire Alarm Verification feature (delay of the fire alarm signal), the maximum Retard/Reset/Restart period shall not exceed 30 seconds.
2. Combined from 7170-0026:250

*Revision 10-18-16, 2016 dc

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Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

Ron Benedetti
Antelope Valley College
Facilities Program Manager
661-429-4102 rbenedetti@avc.edu

February 20, 2018

Edward Jackson
Fire Life Safety Officer / Fire Marshall

Ed,

The current model of sprinkler head in the APL Building is a Viking M94. It is a standard response, 155 degree, chrome plated pendent type fire sprinkler. I spoke to Viking to see what the replacement model was for this item. The current model number is VK102. Attached are the specifications for the VK102. We will be specifying the VK102FB for installation throughout. If you read the specifications that indicates a model VK102 in a chrome finish with a temperature rating of 155 degrees. This is the same as we have throughout the classrooms in the APL Building.

If you have any further questions feel free to contact me at any time.

Sincerely

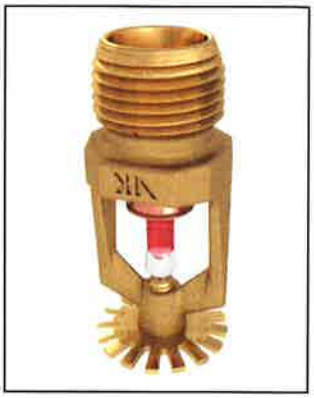
Ron Benedetti

MICROMATIC® STANDARD RESPONSE PENDENT SPRINKLER VK102 (K5.6)

TECHNICAL DATA

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com

1. DESCRIPTION



The Viking Micromatic® Standard Response Pendent VK102 Sprinkler is a small, thermosensitive, glass-bulb spray sprinkler available in several different finishes and temperature ratings to meet design requirements. The special Polyester, and Electroless Nickel PTFE (ENT) coatings can be used in decorative applications where colors are desired. In addition, these coatings have been investigated for installation in corrosive atmospheres and are listed/approved as corrosion resistant as indicated in the Approval Charts. (Note: **FM Global approves the ENT coating as corrosion resistant.** FM Global has no approval classification for Polyester coatings as corrosion resistant.)

Viking standard response sprinklers may be ordered and/or used as open sprinklers (glass bulb and pip cap assembly removed) on deluge systems. Refer to Ordering Instructions.

2. LISTINGS AND APPROVALS

cULus Listed: Category VNIV

FM Approved: Class Series 2000

VdS Approved: Certificate G414006 & G414004

LPCB Approved

CE Certified: Standard EN 12259-1, EC-certificate of conformity 0832-CPD-2021

CCCF Approved: Approved by the China Certification Center for Fire Products (CCCF)

NOTE: Other International approval certificates are available upon request.

Refer to Approval Charts and Design Criteria for listing and approval requirements that must be followed.

3. TECHNICAL DATA

Specifications:

Minimum Operating Pressure: 7 psi (0.5 bar)†
Maximum Working Pressure: 175 psi (12 bar) wwp
Factory tested hydrostatically to 500 psi (34.5 bar)
Thread size: 1/2" NPT, 15 mm BSP
Nominal K-Factor: 5.6 U.S. (80.6 metric**)
Glass-bulb fluid temperature rated to -65 °F (-55 °C)
Overall Length: 2-1/4" (57 mm)

† cULus Listing, FM Approval, and NFPA 13 installs require a minimum of 7 psi (0.5 bar). The minimum operating pressure for LPCB and CE Approvals ONLY is 5 psi (0.35 bar).

Material Standards:

Frame Casting: Brass UNS-C84400 or QM Brass
Deflector: Phosphor Bronze UNS-C51000†† or Copper UNS-C19500
Bulb: Glass, nominal 5 mm diameter
Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with PTFE Tape
Screw: Brass UNS-C36000
Pip Cap and Insert Assembly: Copper UNS-C11000 and Stainless Steel UNS-S30400
For Polyester Coated Sprinklers: Belleville Spring-Exposed
For ENT coated Sprinklers: Belleville Spring - Exposed, Screw and Pipcap - ENT plated.

††Not for FM Approval.

Ordering Information: (Also refer to the current Viking price list.)

Order Micromatic® Standard Response Pendent VK102 by first adding the appropriate suffix for the sprinkler finish and then the appropriate suffix for the temperature rating to the sprinkler base part number.

Finish Suffix: Brass = A, Chrome = F, White Polyester = M-/W, Black Polyester = M-/B, Wax Coated = C, Wax Over Polyester = V-/W, ENT = JN

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com

Temperature Suffix: 135 °F (57 °C) = A, 155 °F (68 °C) = B, 175 °F (79 °C) = D, 200 °F (93 °C) = E, 212 °F (100 °C) = M, 286 °F (141 °C) = G, 360 °F (182 °C) = H, 500 °F (260 °C) = L.

For example, sprinkler VK102 with a 1/2" thread, Brass finish and a 155 °F (68 °C) temperature rating = Part No. 12987AB

Available Finishes And Temperature Ratings: Refer to Table 1.

Accessories: (Also refer to the Viking website.)

Sprinkler Wrenches:

A. Standard Wrench: Part No. 21475M/B (available since 2017).
B. Standard Wrench for Wax Coated Sprinklers: Part No. 10896W/B (available since 2000)
C. Socket Wrench for Recessed Pendent Sprinklers: Part No. 13655W/B* (available since 2006)
D. Optional Protective Sprinkler Cap Remover/Escutcheon Installer Tool** Part No. 15915 (available since 2010.)
E. Socket Wrench for Wax Coated Sprinklers: Part No. 13577W/B* (available since 2006)

*A ½" ratchet is required (not available from Viking).

**Allows use from the floor by attaching a length of 1" diameter CPVC tubing to the tool. Ideal for sprinkler cabinets. Refer to Bulletin F_051808.

Sprinkler Cabinets:

A. Six-head capacity: Part No. 01724A (available since 1971)
B. Twelve-head capacity: Part No. 01725A (available since 1971)

4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

5. OPERATION

During fire conditions, the heat-sensitive liquid in the glass bulb expands, causing the glass to shatter, releasing the pip cap and sealing spring assembly. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to extinguish or control the fire.

6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

7. AVAILABILITY

The Viking Micromatic® Standard Response Pendent Sprinkler VK102 is available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

VIKING®

TECHNICAL DATA

MICROMATIC® STANDARD RESPONSE PENDENT SPRINKLER VK102 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com

TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES

Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating[1]	Maximum Ambient Ceiling Temperature[2]	Bulb Color
Ordinary	135 °F (57 °C)	100 °F (38 °C)	Orange
Ordinary	155 °F (68 °C)	100 °F (38 °C)	Red
Intermediate	175 °F (79 °C)	150 °F (65 °C)	Yellow
Intermediate	200 °F (93 °C)	150 °F (65 °C)	Green
High	286 °F (141 °C)	225 °F (107 °C)	Blue
Extra High	360 °F (182 °C)	300 °F (149 °C)	Mauve
Ultra High[3]	500 °F (260 °C)	465 °F (240 °C)	Black

Sprinkler Finishes: Brass, Chrome, White Polyester, Black Polyester, and ENT

Corrosion-Resistant Coatings[4]: White Polyester and Black Polyester in all temperature ratings. ENT in all temperature ratings except 135 °F (57 °C). Wax-Coated Brass and Wax over Polyester[5] for sprinklers with the following temperature ratings:

155 °F (68 °C) Lt. Brown Wax 175 °F (79 °C) Brown Wax 200 °F (93 °C) Brown Wax

212 °F (100 °C) Dk. Brown Wax[5] 286 °F (141 °C) Dk. Brown Wax[5]

Footnotes

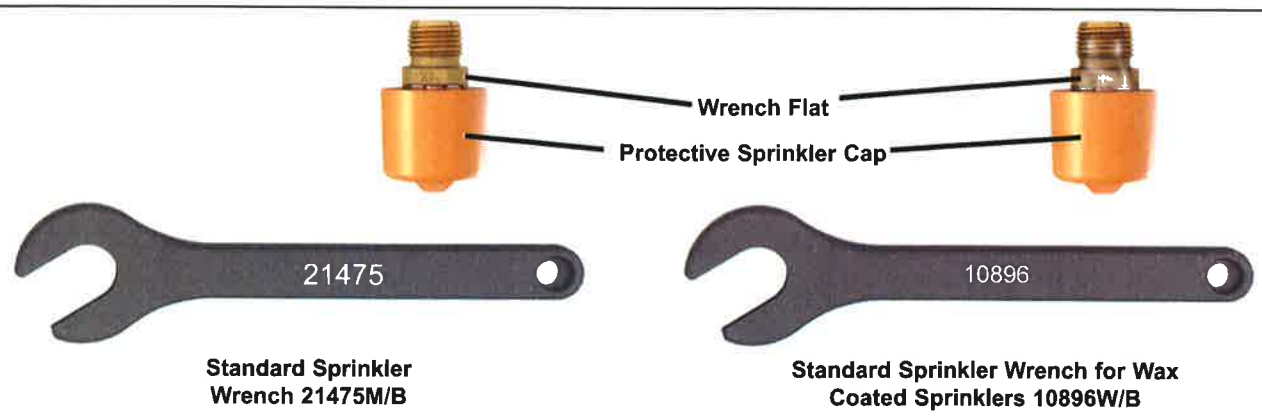
[1] The sprinkler temperature rating is stamped on the deflector.

[2] Based on NFPA-13. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

[3] Sprinklers of Ultra-High temperature rating are intended for use inside ovens, dryers, or similar enclosures with normal operating temperatures above 300 °F (149 °C). Where the ambient temperature around the Ultra-High temperature rated sprinkler is significantly reduced below 300 °F (149 °C), response time may be severely retarded.

[4] The corrosion-resistant coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Charts. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the coatings indicated are applied to the exposed exterior surfaces only. Note that the spring is exposed on sprinklers with Polyester and ENT coatings. For ENT coated automatic sprinklers, the waterway is coated.

[5] Wax melting point is 170 °F (76 °C) for 212 °F (100 °C) and 286 °F (141 °C) temperature rated sprinklers.



Standard Sprinkler Wrench 21475M/B

Standard Sprinkler Wrench for Wax Coated Sprinklers 10896W/B

Figure 1:
Standard Sprinkler Wrenches

VIKING®

TECHNICAL DATA

MICROMATIC® STANDARD RESPONSE PENDENT SPRINKLER VK102 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
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Approval Chart 1 (UL)

Micromatic® Standard Response Pendent Sprinkler VK102
Maximum 175 PSI (12 bar) WWP

KEY: A1X ← Temperature, Finish, Escutcheon (if applicable)

Sprinkler Base Part Number[1]	SIN	Thread Size		Nominal K-Factor		Overall Length		Listings and Approvals[3] (Refer also to UL Design Criteria.)					
		NPT	BSP	U.S.	metric[2]	Inches	mm	cULus[4]	VdS	LPCB	CE[8]		
Standard Orifice													
12987	VK102	1/2"	15 mm	5.6	80.6	2-1/4"	57	A1, B4, B1Y, C5, D3, E6, G6Z	A2	A2, B4, B2Y	F2, G2Y	--	--
12989	VK102	--	15 mm	5.6	80.6	2-1/4"	57	A1, B4, B1Y, C5, D3, E6, G6Z	A2	A2, B4, B2Y	F2, G2Y	--	--
19776	VK102	1/2"	--	5.6	80.6	2-1/4"	57	--	--	--	--	--	E7
20229	VK102	--	15 mm	5.6	80.6	2-1/4"	57	--	--	--	--	--	E7
NOTICE - Product Below - Limited Availability (Contact Local Viking Office)													
10139	VK102	1/2"	15 mm	5.6	80.6	2-1/4"	57	A1, B4, B1Y, C5, D3, E6, G6Z	--	--	--	--	--
10173	VK102	--	15 mm	5.6	80.6	2-1/4"	57	A1, B4, B1Y, C5, D3, E6, G6Z	A2	A2, B4, B2Y	--	--	--
18020	VK102	1/2"	15 mm	5.6	80.6	2-1/4"	57	A1, B4, B1Y, C5, D3, E6, G6Z	A2	A2, B4, B2Y	F2, G2X	F2[9, 10]	--

Approved Temperature Ratings

A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 286 °F (141 °C), and 360 °F (182 °C)

B - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C)

C - 286 °F (141 °C)

D - 500 °F (260 °C)[7]

E - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 286 °F (141 °C), 360 °F (182 °C), and 500 °F (260 °C)[7]

F - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 286 °F (141 °C), and 360 °F (182 °C)

G - 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C)

Approved Finishes

1 - Brass, Chrome, White Polyester[5,6], and Black Polyester[5,6]

2 - Brass, Chrome, White Polyester[5], and Black Polyester[6]

3 - Brass and Chrome

4 - Wax-Coated Brass and Wax Over Polyester[5]

5 - High Temperature 200 °F (93 °C) Wax Coating (corrosion resistant); maximum ambient temperature allowed at ceiling = 150 °F (65 °C)

6 - ENT[5]

7 - Chrome

Approved Escutcheons

X - Recessed with the Viking Micromatic® Model E-1, E-2, or E-3 Recessed Escutcheon

Y - Standard surface-mounted escutcheon or the Viking Microfast® Model F-1 Adjustable Escutcheon or recessed with the Viking Micromatic® Model E-1, E-2, or E-3 Recessed Escutcheon

Z - Standard surface-mounted escutcheon or recessed with the Viking Micromatic® Model E-1

Footnotes

[1] Base part number is shown. For complete part number, refer to Viking's current price schedule.

[2] Metric K-factor shown is for use when pressure is measured in bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

[3] This table shows the listings and approvals available at the time of printing. Check with the manufacturer for any additional approvals.

[4] Listed by Underwriters Laboratories Inc. for use in the U.S. and Canada.

[5] cULus Listed as corrosion resistant.

[6] Other colors are available on request with the same Listings and Approvals as the standard colors.

[7] Sprinklers of Ultra-High temperature rating are intended for use inside ovens, dryers, or similar enclosures with normal operating temperatures above 300 °F (149 °C). Where the ambient temperature around the Ultra-High temperature rated sprinkler is significantly reduced below 300 °F (149 °C), the response time of the Ultra-High temperature rated sprinkler may be severely retarded.

[8] CE Certified, Standard EN 12259-1, EC-certificate of conformity 0832-CPD-0021.

[9] MED Certified, Standard EN 12259-1, EC-certificate of conformity 0832-MED-1003 and 0832-MED-1008.

[10] MED Certified, RINA Certificate No. MED497705C5.

DESIGN CRITERIA - UL

(Also refer to Approval Chart 1.)

cULus Listing Requirements:

The Viking Micromatic® Standard Response Pendent Sprinkler VK102 is cULus Listed as indicated in Approval Chart 1 for installation in accordance with the latest edition of NFPA 13 for standard spray sprinklers.

- Designed for use in Light, Ordinary, and Extra Hazard occupancies.
- The sprinkler installation rules contained in NFPA 13 for standard spray pendent sprinklers must be followed.

IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to page F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.

VIKING®	TECHNICAL DATA	MICROMATIC® STANDARD RESPONSE PENDENT SPRINKLER VK102 (K5.6)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com

Approval Chart 2 (FM)

Micromatic® Standard Response Pendent Sprinkler VK102
Maximum 175 PSI (12 bar) WWP

KEY: A1X ← Temperature, Finish, Escutcheon (if applicable)

Sprinkler Base Part Number[1]	SIN	Thread Size		Nominal K-Factor		Overall Length		FM Approvals[3] (Refer also to Design Criteria below.)
		NPT	BSP	U.S.	metric[2]	Inches	mm	
Standard Orifice								
12987	VK102	1/2"	15 mm	5.6	80.6	2-1/4"	57	A1, B2, C3, D1, E4, G1Y, G4Z
12989	VK102	--	15 mm	5.6	80.6	2-1/4"	57	A1, B2, C3, D1, E4, G1Y, G4Z
NOTICE - Product Below - Limited Availability (Contact Local Viking Office)								
10139	VK102	1/2"	15 mm	5.6	80.6	2-1/4"	57	A1, B2, C3, D1, E4, G1Y, G4Z
10173	VK102	--	15 mm	5.6	80.6	2-1/4"	57	A1, B2, C3, D1, E4, G1Y, G4Z
18020	VK102	1/2"	15 mm	5.6	80.6	2-1/4"	57	A1, B2, C3, D1, G1Y

Approved Temperature Ratings

A - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 212 °F (100 °C), 286 °F (141 °C), and 360 °F (182 °C)

B - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), and 212 °F (100 °C)

C - 286 °F (141 °C)

D - 500 °F (260 °C)[5]

E - 155 °F (68 °C), 175 °F (79 °C), 200 °F (93 °C), 286 °F (141 °C), 360 °F (182 °C), and 500 °F (260 °C)[5]

F - 135 °F (57 °C), 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C)

G - 155 °F (68 °C), 175 °F (79 °C), and 200 °F (93 °C)

Approved Finishes

1 - Brass, Chrome, White Polyester[4], and Black Polyester[4]

2 - Wax-Coated Brass (corrosion resistant)

3 - High Temperature 200 °F (93 °C) Wax Coating (corrosion resistant); maximum ambient temperature allowed at the ceiling = 150 °F (65 °C)

4- ENT[6]

Approved Escutcheons

Y - Standard surface-mounted escutcheon or the Viking Microfast® Model F-1 Adjustable Escutcheon or recessed with the Viking Micromatic® Model E-1, E-2, or E-3 Recessed Escutcheon

Z - Standard surface-mounted escutcheon or re- cessed with the Viking Micromatic® Model E-1

Footnotes

[1] Base part number is shown. For complete part number, refer to Viking's current price schedule.
[2] Metric K-factor shown is for use when pressure is measured in bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.
[3] This table shows the listings and approvals available at the time of printing. Check with the manufacturer for any additional approvals.
[4] Other colors are available on request with the same Approvals as the standard colors.
[5] Sprinklers of Ultra-High temperature rating are intended for use inside ovens, dryers, or similar enclosures with normal operating temperatures above 300 °F (149 °C). Where the ambient temperature around the Ultra-High temperature rated sprinkler is significantly reduced below 300 °F (149 °C), the response time of the Ultra-High temperature rated sprinkler may be severely retarded.
[6] FM approved as corrosion resistant.

DESIGN CRITERIA - FM

(Also refer to Approval Chart 2.)

FM Approval Requirements:

The Viking Micromatic® Standard Response Pendent Sprinkler VK102 is is FM Approved as standard response **Non-Storage** pendent sprinkler as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2-0). FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.

NOTE: The FM installation guidelines may differ from cULus and/or NFPA criteria.

IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to page F_080614 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, FM Global, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.

VIKING®

TECHNICAL DATA

MICROMATIC® STANDARD RESPONSE PENDENT SPRINKLER VK102 (K5.6)

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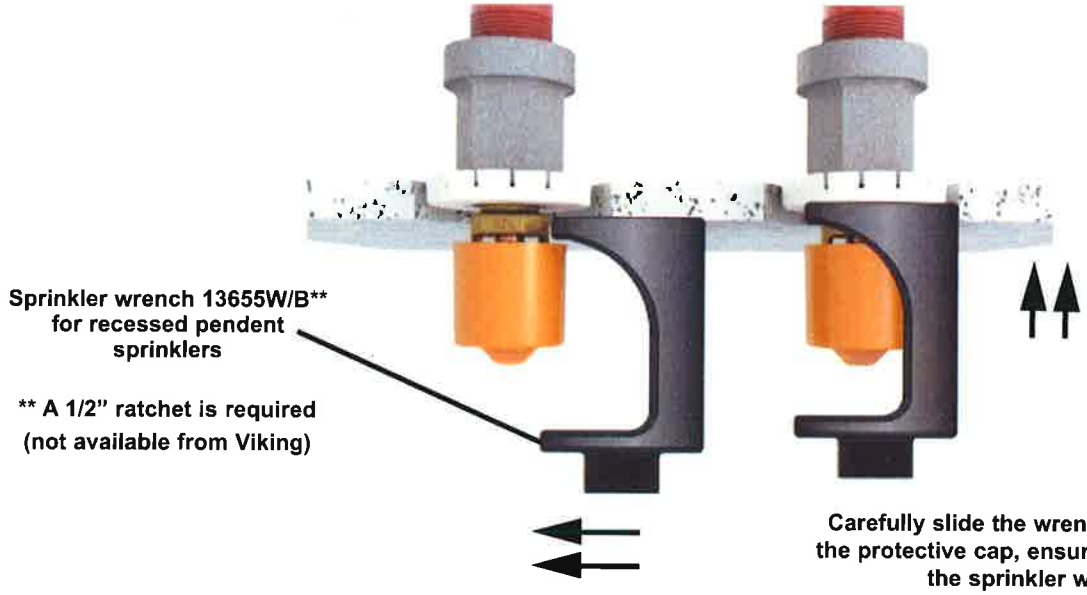

Figure 2: Wrench 13655W/B for Recessed Pendent Sprinklers

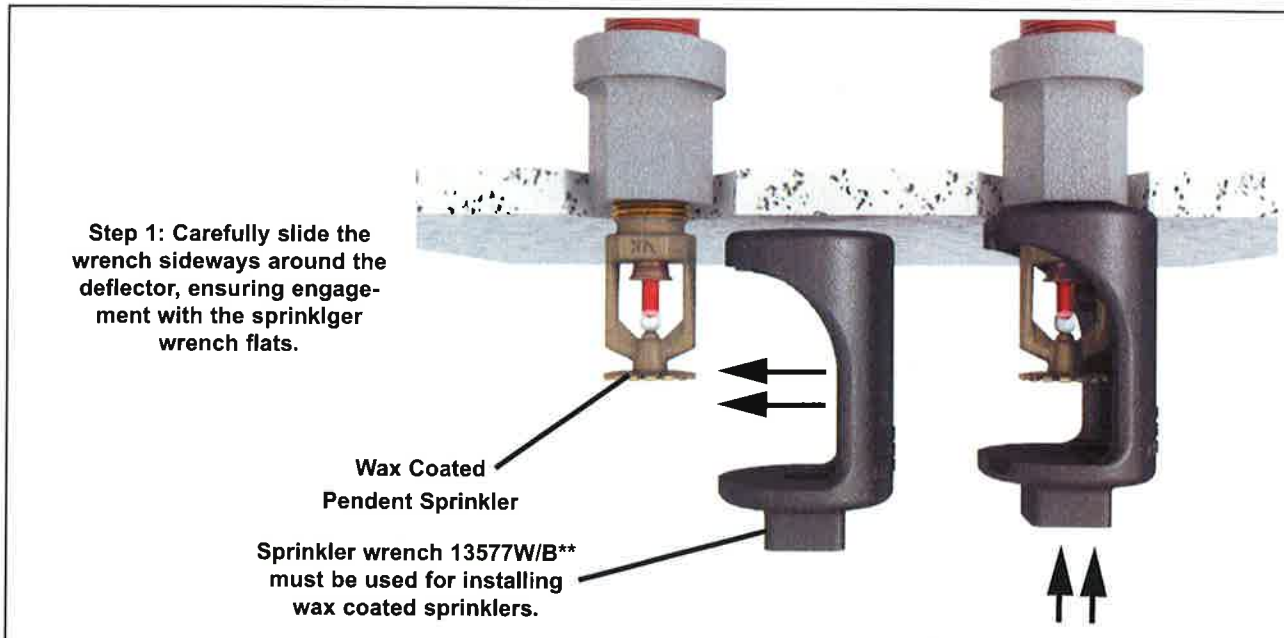

Figure 3: Socket Wrench for Wax Coated Sprinklers 13577W/B

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TECHNICAL DATA

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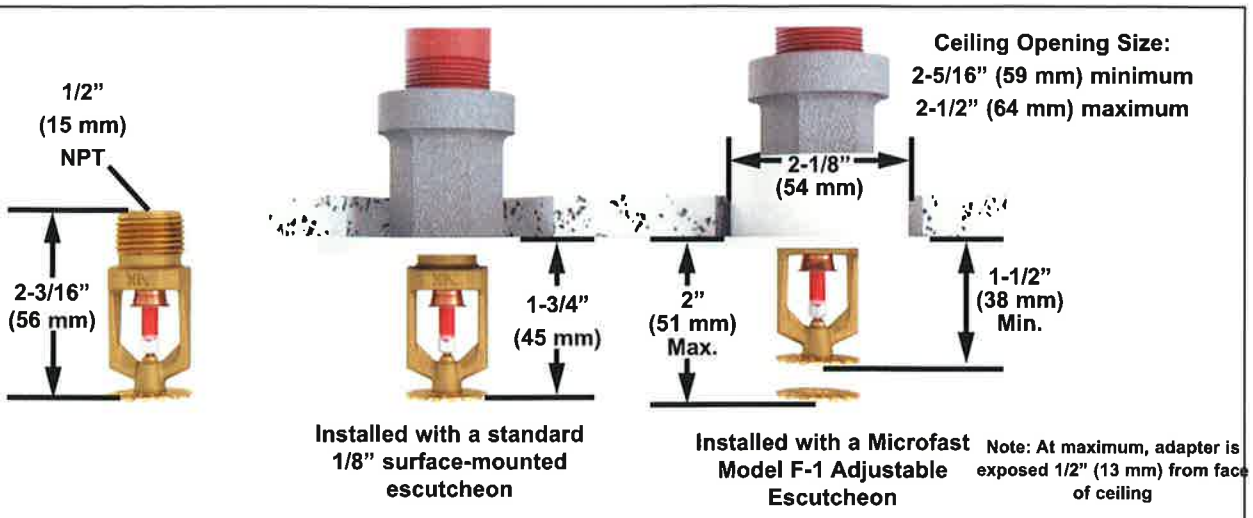

Figure 4: Sprinkler Dimensions with a Standard Escutcheon and the Model F-1 Adjustable Escutcheon

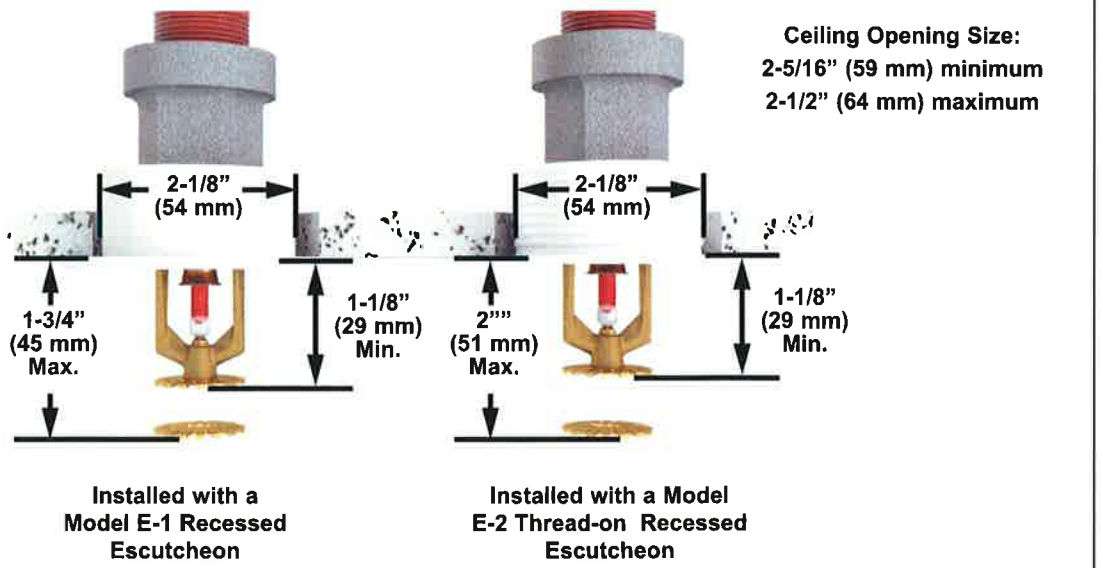

Figure 5: Sprinkler Dimensions with the Model E-1 and E-2 Recessed Escutcheons