

BC1 - BACKCHECK 1 - 12.13.2024

- SECTION 082000 - REVISIONS MADE
- APPENDIX B&C - ADDED



**Natividad Medical Center
Medical Surgery
Department**

Project Manual

Volume 1 of 1
Divisions 00 thru 11

HCAI Record Number: S240593-27-00

**Construction Documents
April 16, 2024**



HGA

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SECTION 000105
CERTIFICATIONS PAGE

1.1 ARCHITECTURAL

I hereby certify that the plans and specifications for Architectural Work were prepared by me or under my direct supervision and that I am a duly licensed Architect under the laws of the State of California.

Anna R. Kempf

No. C-39256



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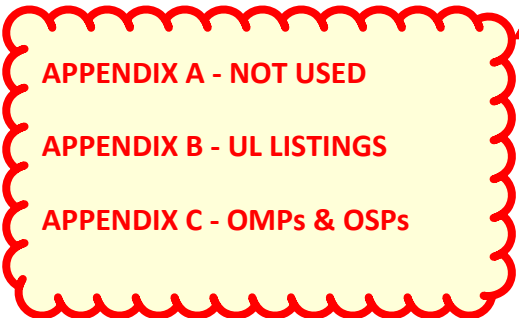
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SECTION 011100 SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Description of construction delivered under a single contract.
 - 2. Restrictions that affect construction operations.
 - 3. Use of buildings, premises and site.

1.2 GENERAL SUMMARY OF WORK AND ADDITIONAL DEFINITIONS

- A. Owner: Natividad Medical Center
- B. Project Location: 1441 Constitution Boulevard, Salinas, CA 93906.
- C. General Scope: Project consists of upgrading existing Medical-Surgical Inpatient Unit.
 - 1. Level 3 of Natividad Medical Center Hospital, bringing unit up to other recently upgraded units, as follows:
 - a. Adding charting stations to each patient room and hallway stations, (2).
 - b. Converting select group of private rooms to semi-privates.
 - c. Upgrading lighting at patient headwalls (to support #2).
 - d. Upgrading finishes at toilet rooms (including making three toilet-shower rooms accessible).
 - e. Upgrading finishes to patient rooms and select portions of public corridors as described within scope of Contract Documents.
 - 2. Work Included: Provide labor, materials, articles, equipment, incidentals, items, tools, services, supplies, methods, operations, skills in such quantities as may be necessary to complete Project within intent of Contract Documents.
 - 3. Singular notations shall be considered plural where plural application is reasonably inferable. Mention or indication of extent of work under work division or specification section is done only for convenience of Contractor and shall not be construed as describing all work required under that Division or Section.
- D. Construction Contract: Construction will be accomplished under a single Prime Contract including General Construction, Mechanical and Electrical work.
- E. Construction Limits: Except as specifically indicated or as may be necessary to complete the Work under the Contract, activities of the Contract shall be limited to within the limits designated on Drawings.

1.3 PROJECT DELIVERY

- A. Negotiated Contract:
 - 1. Pre-Construction: Owner has entered into a negotiated agreement with General Contractor to complete pre-construction services consisting of cost estimating, scheduling, evaluation and recommendations for construction systems.
 - 2. Construction: Construction will be accomplished under a single Prime Contract. It is anticipated that following completion of Construction Documents, the Owner will contract with General Contractor for the completion of construction. Subcontracts will be competitively bid.
- B. Bidding Method: Project will be competitively bid to invited prime contract bidders for a single stipulated sum contract.
- C. Bidding Method: Owner and preselected prime contractor will competitively bid contracts and subcontracts for the complete work.
 - 1. Multiple subcontractors will be invited to submit competitive bids.

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- D. Bidding Method: Project will be negotiated with prime General Contractor and award will be based on a guaranteed maximum price (GMP).
 - 1. Multiple subcontractors will be invited to submit competitive bids.
 - E. Bidding Method: Multiple Prime contracts administered by Construction Manager.
 - F. Construction Manager (Advisor): Construction Manager has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for construction between Owner and[**each**] Contractor, according to a separate contract between Owner and Construction Manager.
 - 1. Construction Manager also serves as Project coordinator, as defined in Section 011200 "Multiple Contract Summary."
 - G. Construction Manager (at Risk): Construction Manager for this Project is Project's constructor. In these Construction Documents, the terms "Construction Manager" and "Contractor" are synonymous.
 - H. Construction Contract: Construction will be accomplished under a **single Prime Contract**.
 - I. Negotiated Contract for Construction: Construction will be accomplished under a **single Prime Contract**. Subcontracts will be competitively bid.

1.4 SUBCONTRACTORS

- A. Do not award work to Subcontractor without prior approval of Owner and Architect. Approval will not be given until Contractor submits List of Subcontractors containing such information as Owner and Architect may require concerning the proposed Subcontractor and scope of subcontract. Refer to Section 013300 - Submittals.

1.5 USE BY OWNER

- A. Owner reserves the right to let other contracts in connection with this Project or in connection with existing buildings. This Contractor must afford other contractors reasonable opportunity for the introduction and storage of their materials and execution of their work, and shall properly connect and coordinate the contractor's work with theirs.
- B. Owner reserves the right to jointly occupy the premises with Contractor in performance of Owner's duties and functions. Owner also reserves the right to: enter into the Project and premises; make installations of materials and equipment at appropriate times as the Work progresses; install equipment, furniture and furnishings when spaces are at appropriate stages of completion. Coordinate work with Owner and cooperate with Owner to minimize undue interferences.
- C. If any part, unit, phase, or the entire Project is substantially complete or ready for occupancy, Owner may, upon notice to Contractor, and without prejudice to rights of Owner or Contractors, enter into and make use of work that is substantially complete.

1.6 MAINTAINING SERVICES AND FUNCTIONS

- A. General: It is essential that full Owner's services and functions are maintained throughout construction period, with minimum disturbance and disruption to Owner's operations. Contractor and Subcontractors shall be aware of these requirements and objectives. Contractor must conduct work and develop a detailed schedule to meet these requirements and objectives.
- B. Work at Occupied Facilities: After Owner's occupancy (full or partial) of Project or unit, stage, phase or area, work remaining to be accomplished in the occupied spaces shall be done in cooperation with, and approval by, Owner and scheduled in advance with Owner. In general, work in occupied spaces shall be done when the space is not in use, such as after hours in administrative areas or public spaces when public use hours are over for the day, unless specifically approved by Owner. Where necessary, overtime shall be used if work cannot reasonably be accomplished during normal work periods, at no extra cost to Owner. Perform work in occupied areas in a manner and at such time as will not significantly interfere with, hamper or inconvenience Owner's program or functions.

1.7 PERFORMANCE/PAYMENT BOND

- A. Owner reserves the right to require a bond in accordance with General Conditions and Supplementary Conditions. Provide on form specified.
 - 1. AIA A311.
 - 2. (Miller/Davis Bond Form) (public work only)
 - 3. Provide and pay for bond.

1.8 OTHER BONDS, PERMITS, FEES

- A. Performance/Payment Bond: Owner reserves the right to require a bond in accordance with General Conditions and Supplementary Conditions. Pay for bond and provide on form AIA A311 or other form as required by Owner.
- B. Other Bonds, Permits, Fees: Provide and pay for bonds, fees and permits that may be required, including bonds, permits and fees required by local authorities to directly accomplish work under this project.
- C. Submit copies of required permits to [Owner] [Owner's Representative] prior to the start of that work.
- D. Request proper authorities to apply for permits and fees for sewer availability charge (SAC) and water availability charge (WAC). Owner will pay sewer and water availability charges.

1.9 WARRANTIES

- A. In the event of conflict, inconsistency, or difference between a warranty issued by a supplier or contractor and terms of specifications, Owner, if it becomes necessary to enforce terms and provisions of warranty or specifications, may elect to enforce either submitted warranty or specifications.

1.10 ELECTRONIC FILES

- A. Upon request, one copy of electronic files in Architect's current file format, including applicable layers, for each issue (bid packages, construction packages, addenda, etc.) will be provided via e-mail, CD, or website posting at Architect's option to General Contractor at no charge for:
 - 1. Architectural floor plans
 - 2. Reflected ceiling plans
 - 3. Structural framing plans
 - 4. HVAC plans
 - 5. Plumbing plans
 - 6. Lighting plans
 - 7. Signal/System plans
 - 8. Power plans.
- B. Additional documents not listed or additional copies of electronic files are available upon request with advance payment of applicable fee(s) and subject to conditions of use. Contact Architect for schedules of fees and additional details about conditions. Subcontractors and others can obtain copies of electronic files from General Contractor.
- C. Electronic files and information therein are instruments of service and works in progress created for this Project and not to be used for other projects, additions to this project or completion of this Project by others.
- D. Signed and sealed original hard copy Drawings, Specifications and other documents as defined by General Conditions are Contract Documents. Electronic files are not Contract Documents and may be subject to manipulation beyond Architect's control. Therefore, Architect cannot verify that electronic files accurately or completely reflect Contract Documents, actual construction or field conditions. Each user of electronic files must determine accuracy, completeness and suitability for its intended use.

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- E. Electronic files are subject to discrepancies as a result of numerous factors including but not limited to transmission and translation errors resulting from differences in software, hardware and other equipment related problems, disc or server malfunctions, data corruption during transmission through website or email and user error. Neither Architect nor Owner shall be responsible for such discrepancies.
 - F. Architect makes no representation regarding accuracy, completeness or permanence of electronic files. Changes to Contract Documents may not be incorporated into electronic files including without limitation, Addenda information or revisions made after date indicated on electronic files.
 - G. By accepting electronic files, user covenants not to sue, and agrees to indemnify and hold harmless Architect and Owner from costs (including attorneys' fees), claims or causes of action be it tort, breach of contract or otherwise that result from the use of electronic files, and waives claims for consequential and/or liquidated damages against Architect and Owner.
 - H. Architect and Owner provide no warranties, express or implied with respect to electronic files, including but not limited to, Spearin type warranties, warranties of merchantability and/or fitness for a particular purpose.
 - I. Use of electronic files provided by Architect does not obviate Contractor, subcontractor/installer or supplier from responsibility for proper checking and coordination of dimensions, details, member sizes, quantities and other requirements to facilitate complete and accurate fabrication, installation and completion of Work.
 - J. Providing electronic files by Architect is not to be construed to be in derogation of reserved or intellectual property rights.

1.11 CONSTRUCTION DOCUMENTS

- A. Specifications: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Singular notations shall be considered plural where plural application is reasonably inferable.
 - 3. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
 - 4. Indication of extent of work by division or specification section is done only for convenience of Contractor and shall not be construed as describing all work required under that Division or Section.
 - 5. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
 - 6. Basis of Design Product Specification: Where Specifications name a product, or refer to a product indicated on Drawings, provide the specified or indicated product or equivalent product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.
- B. Drawings: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Material Identification Codes and Abbreviations: Materials and products are identified by abbreviation codes referencing Specification Section numbers found in this Project Manual.
 - 2. Other Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections

1.12 COPIES OF DRAWINGS AND SPECIFICATIONS

- A. Drawings and Specifications will be made available to Contractor via an electronic distribution service. Subcontractors obtain documents from Contractor. Subcontractors are responsible for costs associated with hard copy printing drawings from this service. Provide one set for the on-site set to record changes as Record Set.

1.13 USE OF PREMISES - SPECIAL CONSIDERATIONS, REQUIREMENTS AND CONSTRAINTS

- A. Work Over Finished Floors: Where work is performed over finished floors (i.e. ceramic tile, concrete, VCT) or where area is used as a passage, provide hardboard or plywood cover to protect against damage or stains. Covering to be provided by General Contractor.
- B. Work Over Carpeting: Certain finishing operations may occur over installed carpet areas. Maintain carpet covering free from holes or gaps. At hard use areas, such as passages, also provide hardboard or plywood surfacing to prevent damage. Use extreme care in working over carpeting and its covering.
- C. Safety Program: Develop a safety program and provide first aid kits in several accessible locations on site for temporary on-site first aid. Contractor is responsible for safety of persons and property and compliance with applicable statutes, rules, regulations, and orders for work under this Contract.
- D. Temporary Plywood Enclosures, General: Supported, sound plywood of appearance acceptable to Architect. Insulate enclosures at building openings where temporary enclosure serves as building exterior wall.
- E. Accomplish work in streets in conformance with Municipality requirements and to a schedule as Municipality may require. Contractor must make arrangements with Municipality.
- F. Snow Removal: Remove snow from the building work areas, storage areas, and access routes after each period of snowfall to prevent the accumulation of snow and ice from impeding job progress or creating unsafe conditions.
 - 1. Provide covered walkways at public sidewalks, fire exit as required to maintain public safety, and as may be required by the Municipality. Refer to Section 015000 for further requirements.

1.14 USE OF PREMISES - BROKEN GLASS

- A. Contractor is responsible for glass of the new building and glass in existing adjacent buildings in the vicinity of this Project. Provide protection for glass, except Subcontractors shall protect their own glass.
- B. Near completion of Project, Contractor must replace broken, cracked, scratched or otherwise damaged or faulty glass, without additional reimbursement. Replace glass damaged by welding splatter. Cost of replacing glass broken or damaged by Subcontractors shall be paid for by party causing damage.

1.15 USE OF PREMISES - CLEAN CONDITIONS

- A. References: Refer to General Conditions for general cleaning requirements, Section 017700 for Project Closeout Clean-up and Section 015000 for additional temporary closure requirements.
- B. General: Contractor and subcontractors shall maintain clean conditions in areas of existing buildings and where new construction interfaces with existing buildings. Maintain areas free of accumulations of combustible materials. Provide good housekeeping and regular cleaning to maintain areas clean and free of debris. Provide proper closures between areas under construction including closures and measures to prevent spread of dust or other contamination.

1.16 HAZARDOUS SUBSTANCES AND HARMFUL PHYSICAL AGENTS

- A. Where work of this project involves possible hazardous substances or harmful physical agents, exercise extreme care to avoid damage and preserve safety of personnel.

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- B. Regulations concerning availability of information and employee training in use and handling of "hazardous substances" and "harmful physical agents" are governed by Employee Right-to-Know Act of (1983 unless otherwise revised or updated; or amended by local jurisdictions).
 - C. Regulations governing handling of asbestos-containing materials and disposal of asbestos-containing debris are:
 - 1. Code of Federal Regulations, Title 29, U.S. Department of Labor - Occupational Safety and Health Administration (OSHA), Section 1910.1001 - Asbestos.
 - 2. Local pollution control agency Rules for Emission Standards for Asbestos.

1.17 GENERAL PROTECTION AND SAFETY

- A. References: Refer to General Conditions of the Contract for general requirements.
- B. General: In accordance with best construction practices, Contractor is solely and completely responsible for conditions of job site, including safety of persons and property affected directly or indirectly by contractor's operations during performance of Work. This requirement shall apply continuously 24 hours per day until acceptance of Work by Owner and shall not be limited to normal working hours.

1.18 SAFETY DIRECTOR - FIRE AND ACCIDENT

- A. Safety Director: Appoint a responsible employee to act as Safety Director (fire and accident or separate individuals for each) whose duty it shall be to prevent accidents and minimize fire hazards and to enforce safety precautions. Safety Director shall develop procedures and regulations to guide Contractor, subcontractors and workers. With particular respect to existing buildings, facilities, and Owner's staff, Safety Director shall consult with and be guided by directions of Owner.
- B. Compliance: Contractor and Subcontractors shall conform to and abide by requirements of Safety Director.
- C. Inspection: Safety Director shall periodically inspect spaces of work under this Contract and operations of Contractor and list hazards to be removed or corrected. These shall be reported to Owner, Contractor and responsible subcontractors, who shall promptly remove or correct hazards.
- D. Site Meetings: Safety Director shall hold accident and fire prevention meetings at least once a month with representatives of various trades employed to insure employees understand and comply with programs.

1.19 FIRE SAFETY PRECAUTIONS

- A. Reference: Refer to General Conditions for general requirements.
- B. General: Contractor and Safety Director shall recognize the utmost importance of extraordinary precautions to prevent a fire in or adjacent to functioning and occupied building. Contractor, subcontractors and workers shall exercise extreme care to maintain and exercise fire safety precautions through work. This shall include providing sufficient fire fighting devices, watchmen, standby helpers or other precautions during construction, in use of temporary heat, welding, bracing, sweating, testing or other phases of work. Refer to Section 015000 for temporary fire fighting devices to be provided under Contract.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

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SECTION 012600 CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for handling and processing Contract modifications.
 - 1. Supplemental Instructions.
 - 2. Proposal Requests.
 - 3. Change Orders.
 - 4. Construction Change Directive.
- B. Related Requirements:
 - 1. Section 016000 - Product Requirements & Substitution Procedures: For administrative procedures for handling requests for substitutions made after the Contract award.

1.2 SUPPLEMENTAL INSTRUCTIONS

- A. Supplemental Instructions (SI): Architect will issue[**through Construction Manager**] supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: [**Architect**] [**Construction Manager**] will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by [**Architect**] [**Construction Manager**] are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to [**Architect**] [**Construction Manager**].
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

-
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.4 CHANGE ORDER PROCEDURES

- A. Change Order: On Owner's approval of a Work Changes Proposal Request, **[Architect]** **[Construction Manager]** will issue a Change Order for signatures of Owner and Contractor.
- B. Allowance Adjustment: See Section 012100 - Allowances for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- C. Unit-Price Adjustment: See Section 012200 - Unit Prices for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive (CCD): **[Architect]** **[Construction Manager]** may issue a Construction Change Directive instructing Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Construction Change Directive contains a complete description of change in the Work, and designates method to be followed to determine change in the Contract Sum or the Contract Time.
 2. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 3. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 012613 REQUESTS FOR INTERPRETATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Requests for Interpretation (RFIs).

1.2 REQUESTS FOR INFORMATION (RFI'S)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: **[AIA Document G716] [Form bound in Project Manual] [Software-generated form with substantially the same content as indicated above, acceptable to Architect].**
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.

-
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within **[10]** days of receipt of the RFI response.
 - E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. **[Use CSI Log Form 13.2B.] [Use software log that is part of Project Web site.] [Include the following:] [Software log with not less than the following:]**
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 - F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within **[seven]** days if Contractor disagrees with response.
 1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 012900 PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Procedures for preparation and submitting Schedule of Values and applications for payment.
- B. Related Sections:
 - 1. General and Supplementary Conditions of the Contract for Construction.
 - 2. Section 013200 - Construction Progress Documentation: Administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
 - 3. Section 013300 - Submittal Procedures: Other submittals.
 - 4. Section 017700 - Closeout Procedures: Related closeout procedures.

1.2 SCHEDULE OF VALUES

- A. Schedule of Values: Prepare and submit Schedule of Values to Architect at earliest possible date but no later than 7 days before scheduled submittal of initial Application for Payment. Coordinate with Contractor's Construction Schedule.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Project Identification:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of Labor, Materials and Equipment, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports, including individual line items as follows:
 - a. Stored Materials: Provide a separate line item for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
 - b. Provide separate line items for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 - c. Allowances: Indicated as the sum of the unit-cost multiplied by quantity.
 - d. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - 1) Temporary Facilities: Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

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- C. Periodic Payment Estimate: When required by the Owner, provide schedule indicating estimate of anticipated amounts for each periodic monthly payment. Indicate retainage amount totaling 5 percent of completed value of Work, anticipated job progress and materials delivery. The schedule will be deemed an estimate only, and the Contractor shall not be bound to conform to the schedule.
 - D. Schedule Updating: Update and resubmit the Schedule of Values before the next Application for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Applications for Payment: Comply with requirements of General and Supplementary Conditions of the Contract for Construction for Applications for Payment for completed portions of the Work and for materials and equipment suitably stored and protected.
 - 1. Payment Application Times: Submit to Architect at least 10 days prior to progress payment date as established by Owner, and at a frequency no more than once per month.
 - a. Draft Application: Submit draft copy of Application for Payment 10 days prior to due date for review by Architect.
 - 2. Include transmittal form listing attachments and recording appropriate information about application
 - 3. Include revised progress schedule, consistent with previous applications and payments as certified by Architect and paid for by Owner.
- B. Retainage: Unless otherwise stipulated by the agreement between Owner and Contractor, 5 percent of the value of completed Work and site stored materials will be retained by the Owner until the Work is fully completed.
 - 1. Remaining retained percentage may be requested after Final Completion of the Work of the Contract when the Work is fully complete and acceptable to Architect and Owner. Final payment will be made within 30 days thereafter.
 - 2. In event of a very minor amount of work incomplete or not corrected due to weather, unsuitable conditions for testing or similar conditions preventing Contractor from proceeding, retained amount may be reduced to three times the value of incomplete work upon recommendation of Architect and approval of Owner.
- C. Application Preparation: Architect will provide payment application form. Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the Schedule of Values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- D. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of values.
 - 3. Sustainable design submittal for project materials cost data.
 - 4. Contractor's construction schedule (preliminary if not final).
 - 5. Products list (preliminary if not final).
 - 6. Sustainable design action plans.
 - 7. Schedule of unit prices.
 - 8. Submittal schedule (preliminary if not final).
 - 9. List of Contractor's staff assignments.
 - 10. List of Contractor's principal consultants.

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11. Copies of building permits.
 12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 13. Initial progress report.
 14. Report of preconstruction conference.
- E. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- F. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 013100 PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. Project meetings.
 - 5. Utilities Shutdown Request Form.

1.2 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Submit in accordance with Section 013300, and as specified herein.
- B. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

1.3 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

1.4 SCHEDULE COORDINATION

- A. Prime Coordinator: The Contractor is the Prime Coordinator for the Project and shall establish the overall schedule for the progress of the Project, the sequence of completion and general use of the site.
 - 1. Contractor's job superintendent shall be on the job continuously.
 - 2. Coordinate the Work and do not delegate responsibility for coordination to any Subcontractor.
 - 3. Anticipate the interrelationship of all Subcontractors, Owner's separate contracts, and their relationship with the Work.
 - 4. Resolve differences or disputes between Subcontractors concerning coordination, interference, or extent of Work between Sections.
- B. Coordinate scheduling, work activities, submittals, including deferred approvals (if any), Owner's separate contracts (if any), Owner's material/product direct purchase (if any), and work of the various sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.
 - 1. Give adequate and timely notice of various work phases and operations which will affect the work of, or will require installations or other action by others.

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- a. After timely notification by the Contractor of the need to accomplish a particular phase or element of the Work, the Subcontractors shall, within a reasonable time, perform their work as not to delay or impede others or the progress of the Project.
 2. Set up control procedures so that approved schedules are adhered to. Contractor's responsibility is to properly notify Owner's Representative of anticipated and actual time delays.
 3. Coordinate sequence of Work to accommodate any Owner's separate contracts and Owner Occupancy as specified in Section 011100.
- C. Schedule Coordination: Special coordination and cooperation efforts are required for certain interrelated phases of the work, such as:
1. Sequencing of remodeling work.
 2. Construction of temporary spaces and facilities;
 3. Removals and relocations of existing services and facilities;
 4. Ceiling work; connecting the Owner's equipment;
 5. Installation of and connections to new utilities;
 6. Connections to existing buildings;
 7. Demolition work;
 8. Providing and maintaining temporary heat and other temporary facilities; and similar work.
 9. Equipment Coordination.
 10. Mechanical/Electrical Requirements of General Work.
 11. Service Connections.
 12. Interruption of Services and Service Shutdowns: Plan shutdowns so as to minimize shutdown time of any service. Request approval of a shutdown in writing to the Owner's Representative not less than **[14] <Insert number>** calendar days before the time that the shutdown is desired.
 13. Field Measurements: Verify location of utilities and existing conditions. Notify Architect and Civil Engineer of conditions differing from those indicated on the Drawings.

1.5 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Owner name.
 3. Owner's Project number.
 4. Name of Architect **[and Construction Manager or Contractor]**.
 5. Architect's Project number.
 6. Date.
 7. Name of Contractor.
 8. RFI number, numbered sequentially.
 9. RFI subject.
 10. Specification Section number and title and related paragraphs, as appropriate.
 11. Drawing number and detail references, as appropriate.
 12. Field dimensions and conditions, as appropriate.
 13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 14. Contractor's signature.
 15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

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- a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
 - C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
 - 1. Attachments shall be electronic files in PDF format.
 - D. Architect's[**and Construction Manager's**] Action: Architect[**and Construction Manager**] will review each RFI, determine action required, and respond. Allow [seven] <Insert number> days for Architect's response for each RFI. RFIs received by Architect[**or Construction Manager**] after 1:00 p.m. will be considered as received the following working day.
 - 1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 - 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect [**or Construction Manager**] of additional information.
 - 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect[**and Construction Manager**] in writing within [5] <Insert number> days of receipt of the RFI response.
 - E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log [weekly] <Insert time>. [Use software log that is part of web-based Project management software.] [Include the following:] [Software log with not less than the following:]
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect[**and Construction Manager**].
 - 4. RFI number, including RFIs that were returned without action or withdrawn.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's[**and Construction Manager's**] response was received.
 - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 - F. On receipt of Architect's[**and Construction Manager's**] action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect[**and Construction Manager**] within three <Insert number> days if Contractor disagrees with response.

1.6 PROJECT MEETINGS

- A. Pre-Construction Meeting: After award of contract, at time designated by the Owner or the Architect, the Contractor and mechanical and electrical subcontractors shall attend a Pre-Construction Meeting.
 - 1. Procedures to be followed, critical work sequencing and phasing, coordination efforts and similar matters will be reviewed.
- B. Progress Meetings: During construction, periodic site meetings will be held with the Contractor, major Subcontractors, Owner, and Architect.
 - 1. These meetings will be held biweekly (unless job conditions do not warrant) and may be held more frequently if job progress and needs indicate.
 - 2. Contractor and major Subcontractors shall have one or more responsible representatives in attendance.

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3. Contractor to keep the "minutes" of the meeting and distribute the "minutes" to all concerned within 3 days of the meeting.
 - C. Schedule Coordination Meetings: Conduct weekly (unless job conditions do not warrant) and more frequently if job progress and needs indicate.
 - D. In addition to progress meetings specified herein, hold coordination meetings and preinstallation conferences with requisite personnel to assure coordination of Work.
 - E. Sustainable Design Requirements Coordination Conference: **[Owner will schedule and conduct]** **[Construction Manager will schedule and conduct]** a sustainable design coordination conference before starting construction, at a time convenient to Owner[, **Construction Manager,**] Architect, and Contractor.
 1. Attendees: Authorized representatives of Owner, **[Owner's Commissioning Authority,]** **[Construction Manager,]** Architect, and their consultants; Contractor and its superintendent and sustainable design coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect meeting sustainable design requirements, including the following:
 - a. Sustainable design Project checklist.
 - b. General requirements for sustainable design-related procurement and documentation.
 - c. Project closeout requirements and sustainable design certification procedures.
 - d. Role of sustainable design coordinator.
 - e. Construction waste management.
 - f. Construction operations and sustainable design requirements and restrictions.
 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 COORDINATION

- A. Coordination: The Project will require close cooperation and coordination with Owner and Contractor and Subcontractors. The Contractor must:
 1. Consider such coordination in the work.
 2. Schedule the Work with the subcontractors and the Owner particularly near the end of the Project.
 3. Keep the Owner, and Architect advised of the schedule to complete the Work.
- B. The Prime Contractor shall be Project Coordinator and shall coordinate and schedule all work, including with the Owner where the work of the Contract may involve or disrupt the Owner's normal functions.
 1. The Contractor and Subcontractors shall work closely in the coordination of the documents and in the timing of operations.
- C. Prime Contractor must provide full-time supervisor on Project at all times during work.
- D. Mechanical/Electrical Requirements of General Work: Comply with applicable requirements of Division 23 Sections for Mechanical Provisions within units of General Work, and comply with applicable requirements of Division 26 for Electrical provisions within units of General Work.
- E. Service Connections: Except as otherwise indicated, final connection of mechanical services to general work is defined as being mechanical work, and final connection of electrical services to general work is defined as electrical work.

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- F. Service Shutdowns: Plan shutdowns so as to minimize shutdown time of any service. Request approval of a shutdown in writing to the Owner's Representative not less than fourteen (14) calendar days before the time that the shutdown is desired.

3.2 SHUT DOWN PROCEDURES

- A. A shutdown is any interruption of services provided by the Owner to its clients and staff. Ensure that an inspector has been assigned to coordinate shutdown in the field. Assist the inspector in preparing a shutdown script.
- B. Determine if all proper and appropriate coordination and notification has been completed, before the shutdown.
- C. Shutdown Request: Attached to the end of this section is a copy of the shutdown request form.
- D. Write a final report to the Contractor and Architect, in event of an unexpected incident that occurs during the course of a planned shutdown, resulting in a significant disruption or discontinuance of operations.
- E. Interruption of Services: Adequate advance written notice (a minimum of fourteen (14) calendar days) shall be given to the Contractor and Owner's Construction Administrator when interruptions of services, or interferences with the use of existing buildings and roads are anticipated. Contractor's assigned subcontractor must not interrupt any service without written notice.
- F. Planned service shutdowns shall be accomplished during periods of minimum usage. In some cases, this may require work outside of normal 8:00 am to 5:00 pm work hours, at no additional cost to the Owner.
 - 1. The Contractor or assigned subcontractor must program the work so that service will be restored in the minimum possible time, and shall cooperate with the Owner in reducing shutdowns of system.
 - 2. At least fourteen (14) calendar days advance written notice shall be given to the Owner's Representative before interruptions to service and other interferences to the use of, or access to existing buildings and facilities.
 - 3. Required access ways shall be kept open at all times; the use of one way traffic and detours shall be held to a minimum.

3.3 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
- B. Coordination Drawings are not Shop Drawings and do not require Architect's responsive action. Furnish Coordination Drawings to Architect and make Coordination Drawings available at Contractor's field office for Architect's review upon request.
- C. Format:
 - 1. Use scale not less than 1/4" = 1'-0" (1:50).
 - 2. Detail complex areas at larger scale than typical floor plans.
- D. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - 1. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - 2. Coordinate the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - 3. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

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4. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 5. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 6. Indicate required installation sequences.
 7. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

E. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. **[Include food service Work,] [shielding Work] [and] [medical equipment Work.]** Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
9. Food Service Work Information Required on Coordination Drawings: Locations and dimensions of food service equipment, including access panels and hatchways.
10. Shielding Information Required on Coordination Drawings:
 - a. Show extent of radiation protection, and RF shielding and magnetic shielding.
 - b. Show interfaces and details between protection and shielding systems, and mechanical, plumbing, fire protection, fire alarm, electrical, and building automation systems.
11. Medical Equipment Information Required on Coordination Drawings:
 - a. General: Integrate connections, supports, assemblies, and other components indicated on approved medical equipment vendors' installation drawings.
 - b. Medical equipment indicated to be attached to building construction and served by fixed, mechanical, plumbing, or electrical connections.
 - c. Utility connections.
 - d. Pits.
 - e. Trenches.
 - f. Anchor rails.
 - g. Supports.
 - h. Vibration isolation.

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- i. Cable trays.
 12. Architect's Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
 13. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 - Submittal Procedures.

3.4 CLASH DETECTION

- A. Clash Detection Reports: At Contractor's option, clash detection reports may be provided in lieu of Coordination Drawings. Prepare clash detection reports according to the following and requirements of individual Sections:
 1. Report file format: PDF (portable document format). 3D or BIM submittals are not acceptable.
 2. Content: Model in three dimensions (3D), content required for Coordination Drawings at Level of Development (LOD) 400, in accordance with requirements of "Level of Development (LOD) Specification" by BIMForum. **[Refer to Project BEP for additional requirements related to Clash Detection reports.]**
 - a. Include documentation of architectural, structural, mechanical, plumbing, fire-protection, fire-alarm, electrical and other systems as required to completely document the Work. Clash detection reports will be considered incomplete if content from applicable disciplines is not included.
 - b. Indicate the following:
 - 1) System models used in clash detection report.
 - 2) Identification and definition of system clash tests used to document results.
 - 3) Identification of remaining clashes by system and by level.
 3. Written description of remaining clashes and proposed method of resolution.

3.5 CONSTRUCTION CYBERSECURITY RISK MITIGATION

- A. Refer to the manufacturer hardening guides and apply the most stringent manufacturer recommendations.
- B. Coordinate with Owner's IT Department to restrict external network access to Internet connected system through virtual private network (VPN) connections only.
- C. Disable any protocols for remote connectivity, unless constantly required for day-to-day operations. Secure VPN connections shall be the only acceptable form of remote connectivity unless otherwise approved by the Owner and Engineer.
- D. Protect data in transit and at rest. All external transport data shall be routed through encrypted channels using Transport Layer Security (TLS 1.2).
- E. Coordinate with Owner's IT Department to implement a Web server-based human machine interface (HMI) that relies on IT technologies to secure access and restrict ports that can be opened on the firewall. Coordinate with Owner's IT Department to restrict access to known IP addresses only.
- F. Where building system networks are not physically separate from IT business networks, coordinate with Owner's IT Department to segregate networked and Internet connected systems from the IT business network using virtual local area network (VLAN) IT technologies to restrict internal attacks/breakdowns.
- G. Set unique, strong passwords for administrator and user accounts. Default passwords must be changed before systems and devices are connected to the Owner's network.
- H. Collect only the data that is necessary for analytics, optimization, and trending.
- I. Adhere to the following compliance requirements:
 1. ISO/IEC 27001
 2. IEC 62443: Industrial Network and System Security
 3. SOC-2 (for hosted services)

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- J. Abide by best practices outlined in the following references:
1. NIST Special Publication 800-14 – Generally Accepted Principles and Practices for Securing Information Technology Systems.
 2. NIST Special Publication 800-54 Revisions 4 – Security and Privacy Controls for Federal Information Systems and Organizations.
 3. Defense Security Service Office of the Designated Approving Authority – Master System Security Plan (MSSP) Template for Peer-to-Peer Networks (June 2011, Version 3.0).

3.6 EQUIPMENT COORDINATION

- A. Install equipment in accordance with manufacturers recommendations and instructions.
1. Refer to Section 016400 - Owner-Furnished Products.
- B. Equipment Coordination: With respect to mechanical and electrical features of Contractor and Owner supplied equipment, complete data must be exchanged directly between the Contractor and those vendors and subcontractors involved as the progress of the Project requires.
1. The person requesting the information shall advise when it will be required.
 2. Examine Owner's existing equipment and determine the rough-in data. Owner will furnish data for equipment purchased by Owner. Owner will disconnect equipment and relocate to new space for connections by Contractor.
 3. Consult Owner to verify status of rough-in data.
 4. If rough-in details are not available at the time service systems are being installed, postpone final rough-in until data is available.
- C. Subcontractors for casework and equipment are expressly required to provide large scale layout drawings for casework and equipment showing the required rough-in locations of all services (dimensioned from building features) service characteristics, and locations of studs where the location is critical to mounting or otherwise installing equipment and casework.
1. Furnish sizes and spacing required for mechanical and electrical cutouts, and a complete brochure of fittings, sinks, outlets, or other information to provide complete data on the items and accessories being furnished.
- D. In the event of incorrect, incomplete, delayed or improperly identified information, the entity causing the delay or error shall be responsible and pay for any modifications or replacements necessary to provide a correct, proper and new installation, including relocations required.

3.7 SLEEVING

- A. Services: Rough-in sleeves for waste and other services passing through the floor shall be installed prior to pouring the floors if data is available.
1. Core drilling for holes may be done to facilitate job progress or to more accurately locate holes with permission of the Architect, without additional reimbursement.
- B. Sleeves are required at core drilled holes. Where permission is obtained to omit sleeve, drill hole one inch larger than the outside diameter of the pipe or conduit, or one inch larger than outside diameter of insulation, where insulated.
1. Refer to Section 017324 - Anchorage and Sleeving.
- C. At Noise-Critical Spaces: Coordinate sleeving and sealing of penetrations through partitions and slabs at noise critical spaces and at mechanical and electrical rooms.
1. Duct, pipe and conduit penetrations at noise critical spaces shall be sleeved, packed and sealed airtight with flexible non-hardening sealant.
 2. Provide 1-inch flexible joint around penetrating elements, unless otherwise indicated in the Construction Documents.

3.8 FIELD DIMENSIONS FOR CASEWORK AND EQUIPMENT

- A. Accurate field dimensions are required in ample time to permit fabrication of casework and equipment for delivery and installation in accordance with the schedule.

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1. To obtain dimensions and to prevent fabrication delay, cooperate in completing work phases to accommodate the schedule.
 - B. Be responsible for obtaining correct field dimensions and informing the various fabricators before start of construction.
 1. Refer to Section 016400 - Owner Furnished Equipment.

3.9 FLOORING COORDINATION

- A. Hold a finish flooring coordination meeting. Invite suppliers and installers for concrete of each finish flooring. The purpose for this meeting is to coordinate concrete finishing, admixtures, curing compounds, moisture control and compatibility with finish flooring and adhesives.

3.10 COORDINATION OF SPACE

- A. Coordinate use of Project space and sequence of installation of mechanical and electrical work which is indicated diagrammatically on Drawings.
 1. Follow routings shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building.
 2. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- B. In finished areas, except as otherwise shown, conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.
- C. Off-Site Fabrication: Off-site fabrication is encouraged as much as possible and deliveries scheduled so materials and equipment can be installed immediately after delivery.
 1. Alert and advise others of the need to hold deliveries until they are notified the materials are required on the site.
- D. Notice: Give adequate and timely notice of various work phases and operations which will affect the work of, or will require installations or other action by others.
 1. After timely notification by the Contractor of the need to accomplish a particular phase or element of the Work, the Subcontractors shall, within a reasonable time, perform their work as not to delay or impede others or the progress of the Project.
- E. Coordination of phases of the work: Special coordination and cooperation efforts are required for certain interrelated phases of the work, such as:
 1. Sequencing of remodeling work; construction of temporary spaces and facilities; removals and relocations of existing services and facilities; ceiling work; connecting the Owner's equipment; installation of and connections to new utilities; connections to existing buildings; demolition work; providing and maintaining temporary heat and other temporary facilities; and similar work.

3.11 COORDINATION OF CLOSEOUT PROCEDURES

- A. Coordinate completion and cleanup of work of separate trades in preparation for Owner occupancy.
- B. After Owner occupancy of premises, coordinate access to site by various trades for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
- C. Assemble and coordinate closeout submittals as specified in Section 017800.

END OF SECTION

UTILITIES SHUTDOWN REQUEST FORM

To: _____

Phone: _____

Date: _____

Project Name: _____

Project Number: _____

Project Superintendent: _____

Contractor Requiring Shutdown: _____

Contact Person: _____

Contact Phone: _____

Cell Phone: _____

Type Of Utility Service:

- ☐ Electrical
- ☐ Fire Alarm
- ☐ HVAC
- ☐ Hot Water Heating
- ☐ Steam
- ☐ Condensate
- ☐ Medical Gas

- ☐ Deionized Water
- ☐ Domestic Hot Water
- ☐ Domestic Cold Water
- ☐ Sanitary Sewer
- ☐ Natural Gas
- ☐ Fire Protection
- ☐ Other _____

Work Area Location: _____

Tentative Shutdown Start Time: _____

Month, Day, Year: _____

Approximate Length of Downtime: _____

Reason for Shutdown: _____

SECTION 013150 PROJECT DATA BASE ADMINISTRATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Project Data Base Management: Administrative provisions for organization and use of the 3D Data Base, in relation to the Contract Documents.
 - 2. Project Data Use and Management:
 - a. Extraction and Translation.
 - b. Transmission and Exchange.
 - c. Revisions and Change Tracking.
- B. Related Documents: Drawings, 3D Project Data Base electronic data, and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 011100 - Summary of Work.

1.2 DEFINITIONS

- A. Contract Documents: As defined in the Owner / Contractor Agreement, which includes the Drawings, Specifications, and the 3D Project Data Base for the narrowly defined scopes of work.
- B. Work: In addition to definition in General Conditions, the term "Work" refers to and means that work indicated on the Contract Documents as specifically identified in the Owner/Contractor Contract.
- C. 3D Data Base: Three-dimensional electronic models provided in Rhinoceros .3DM software format, as well as supplemental files such as transmittals and instructions for use of data base.
- D. Computer Distribution Media: Architect's Data Transfer Website and may include physical distribution media.

1.3 PROJECT DATABASE

- A. Ownership of Data: 3D Project Data Base and drawings, electronic media, electronic forms and other similar terms are subject to the Terms and Conditions for use of the Architect's documents contained in the Owner/Contractor Agreement and as listed below, and as defined in the Owner/Architect Agreement.
 - 1. Contractor shall notify the Architect of discrepancies or conflicts between the 3D Data Base and other portions of the Contract Documents to the extent they are identified.
 - 2. Contractor must pay particular attention to coordination conflicts between the contract documents and the 3D Project Data Base where the two scopes of work intersect. This includes identifying and verifying the location of 3D workpoints, and the coordination of concrete profiles expressed in two dimensional geometry.
- B. The Drawings, 3D Project Data Base, Specifications and other Contract Documents are complementary and together define the scope, design intent, and other project requirements.
- C. The project utilizes the 3D Project Data Base as defined in the computer notes contained on the drawings, and specifications.
- D. The 3D Data Base for the Project is divided into a number of "Parts" or individual models. All parts together comprise the project master 3D data base.
 - 1. Certain portions of the model are identified 'for visual reference only'.
 - 2. Limited portions of the model are identified 'as the primary source of dimensional control'.

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- E. The 3D Project Data Base is not a comprehensive virtual model for the Project. Portions of the Project have been selectively modeled to provide an efficient means to describe the Project, and document the geometry for dimensional control. The project utilizes the 3D Data Base as defined below:
1. For portions of the 3D Project Data Base identified 'for visual reference only' the Architect only intends the model to be used for basic navigation and coordination as follows:
 - a. To be used for verification and coordination with the 2D Drawings – however the dimensional accuracy of represented elements may be incomplete or out of date in relation to the Contract Documents.
 - b. The final location of elements shall be dictated by the 2D Drawings and Specifications.
 2. For portions of the 3D Project Data Base identified 'as the primary source of dimensional control' the Architect intends the model to be used as follows:
 - a. To establish the location, exterior profile and joint location of the metal panel surface
 - b. To describe the location of the aluminum backing purlin along the ruling lines of the surface.
 - c. To establish the path of the structural backing steel in relation to a wire line – the rotation of the steel element and approximate anticipated size of the element is indicated by the location profile shape as it hangs on the wire.
 - d. All other information is contained in the 2D Drawing and Specifications.
- F. By using any such Project Data Base, Contractor agrees to the following Additional Terms and Conditions for Use of the Architect's Documents:
1. Authorized Use of Project Data Base: The Architect grants the Contractor the non-exclusive right to use the Project Data Base in accordance with the Terms and Conditions set forth in the Owner/Architect Agreement and herein.
 - a. The 3D Data Base shall be used for establishing three-dimensional geometries of represented surfaces and elements and their relationship to work points established in other Contract Documents.
 - b. The Contractor, their respective subcontractors, agents, or representatives shall not be entitled to rely on the detail or specifications contained in the Project Data Base for any other purposes.
 - c. The Contractor acknowledges the data in the 3D Data Base is intended to compliment and supplement but not necessarily supersede other Contract Documents, and understands that the 3D Data Base is not for erection or fabrication purposes in the form provided.
 2. Unauthorized Use of Project Data Base: The Project Data Base shall not be used by Contractor, or transferred to any other party, for use in other projects, additions to the current project, without the Architect's express written permission.
 - a. Any unauthorized modification or reuse of the material shall be at the Contractor's sole risk, and Contractor shall cause their Subcontractors having access to the Project Data Base to agree to defend, indemnify, and hold the Architect harmless, from all claims, injuries, damages, losses, expenses, and attorney's fees arising out of such unauthorized modification or use of these materials.
 - b. Project Data Base as prepared by the Architect is provided solely as an instrument of the Architect's service and is protected by applicable laws and conventions. By delivering the Project Data Base to the Contractor, the Architect and Contractor shall not expand in any manner the scope of services for which each was engaged pursuant to its Agreements with the Owner, or in any manner alter the division of responsibilities between the Architect, the Contractor and the Owner as defined in their respective Agreements.
- G. Contractor's Coordination Requirements: Before using the geometry control information contained in 3D Data Base for the development of Contractor's engineering and shop drawings, the Contractor shall:
1. Exercising the professional skill, care and judgment which can reasonably be expected from other contractors in like circumstances, review and verify existing conditions, dimensions and coordinate with information in the Contract Documents prior to the development of shop fabrication drawings, layout drawings, numerically controlled fabrication equipment, or other applications which define, control, and/or regulate the fabrication and erection of any component of the Project;
 2. Read and abide by any provisions contained in electronic files that may be issued with each version of Project Data Base released by Architect.

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3. Take all reasonable measures to prevent unauthorized access to or loss of the Project Data Base;
 4. Maintain an independent record of all modifications of this Project Data Base which may be processed by Contractor, its Subcontractors, their employees and agents;
 5. Cause its subcontractors to be solely and exclusively responsible for the accuracy and adequacy of all subsequent data, computer models or other electronic media developed by such subcontractors. The Architect is not party to and has no control over the use of such subcontractor-generated media;
 6. Take appropriate action, by way of instruction or otherwise, with its subcontractors, employees and agents who have access to the Project Data Base, to insure compliance with these Conditions;
 7. Submit copies of Contractor or subcontractor generated data, computer models or other electronic media to the Architect for review prior to beginning fabrication operations. The Architect may review and comment on such media at its option. This information is in addition to required shop drawing submittals.
- H. Contractor also agrees to the following provisions:
1. Verify locations of critical elements during and after installation, such as connection points between different materials and systems. Report items that vary from the Contract Documents. Notify and coordinate other subcontractors that are affected by mislocated elements.
 2. Import data for control points, surfaces and lines of fabricated and installed Work into the 3D Data Base, and place on separate levels as required with and by the Architect.
 3. Copy data files to the Architect at Substantial Performance of the Work. Coordinate with Section 01781 Project Record Documents.
 4. Upon the Architect's request, return original Project Data Base and all other papers, documents, materials and other property of the Architect held by the Contractor, subcontractors, employees, and their agents in connection with the Project.
- I. Because the information stored in the Project Data Base can be modified by other parties, intentionally or otherwise, without notice or indication of said modification, the Architect reserves the right to remove all indicia of its ownership and/or involvement in the Project Data Base from each electronic medium not held in its possession. The Architect does not convey, nor does the Contractor obtain any ownership right, title, or interest in the Project Data Base or any computer programs, specifications, or data furnished or developed by the Architect.
- J. Contractor recognizes that designs, plans, and data stored on electronic media, such as computer disk and magnetic tape, may be subject to undetectable alterations or uncontrollable or undetectable deterioration. Contractor therefore agrees that the Architect shall not be liable for the completeness or accuracy of any materials provided on electronic media as caused by undetectable alterations or uncontrollable or undetectable deterioration. Project Data Base and other Contract Documents are intended to be complementary to each other, and do not necessarily supersede information contained elsewhere in the Contract Documents.

1.4 CONTRACTOR RESPONSIBILITIES

- A. Contractor is a user and distributor of information and data contained in the Project Data Base. Contractor shall distribute information to subcontractors, sub-subcontractors and vendors that may not have direct access to Project Data Base. This responsibility may include any of the following tasks:
1. Bidding: Material take-offs for quantity, dimensions and geometry of component elements of building for subcontractors and vendors who do not have 3D Data Base use capability.
 2. Shop Drawings: Providing extractions and translations from Project Data Base for use by subcontractors in preparation of shop drawings.
 3. Coordination: Coordinating information from subcontractors including shop drawings and product data into coordination drawings required in Section 013300 - Submittal Procedures and Section 017700 - Closeout Procedures.

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- 4. FTP Site: Contractor shall distribute the Project Data Base electronic data to, the Architect, subcontractors, and others through Contractor's FTP Site, physical distribution media, or other acceptable means.. The Architect will issue Contract Documents to the Contractor through the Architect's Architect's Data Transfer Web Site, physical distribution media, or other acceptable means.
 - B. Maintaining Data: Contractor shall maintain electronic copies of the Project Data Base as required for record Contract Documents.

1.5 3D DATA BASE ORGANIZATION

- A. Organization of and contents of the 3D Data Base is as noted in the drawings, described, and listed within and in files attached to the 3D Data Base.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.1 DATA EXTRACTION

- A. The 3D Computer Data Base identified 'for visual reference only' shall be used for basic navigation and coordination. Data extraction from the Data Base for use as a visual reference tool shall be the sole responsibility of the General Contractor.
- B. The 3D Computer Data Base identified 'as the primary source of dimensional control' shall be used in conjunction with the 2D Drawing and Contract Documents to describe and fabricate the related assemblies. Data extraction from the 3D Data Base, including all required dimensional information for these components of the work, shall be the sole responsibility of the General Contractor.
- C. The contractor is responsible for determining what data is needed and extracting that data accurately.

3.2 DATA TRANSMISSION AND EXCHANGE

- A. Project Data Base issued to the Contractor will be distributed through the Architect FTP site i-share or by physical distribution media, if appropriate. An excel spreadsheet titled "3D Data Base Distribution Matrix" will be issued with all 3D Data Base file transfers. This document lists all current 3D Data Base file revision levels. The Contractor shall distribute Project Data Base and other Contract Documents to bidders, subcontractors and all other entities on a need to know basis through a Contractor FTP site or other means.
- B. All 3D Data Base information exchanged with the Architect shall be delivered to the Architect in the Rhinoceros .3DM software format or in a format acceptable to the Architect.
- C. All 2D information exchanged with the Architect, if requested as electronic format, shall be delivered to the Architect in the AutoCad 2010 software format.

3.3 REVISION AND CHANGE TRACKING

- A. 3D Data Base files will be tracked by date and revision numbers contained in the filename. Current revision levels are documented in the "3D Data Base Distribution Matrix"; if any discrepancies are found please confirm latest revision level(s) with Architect. Model objects that are new or have been revised since the previous issue will be indicated by "Attributes" in the electronic files. A complete list of part files included in the contract documents is included in the drawings.

3.4 TRANSLATIONS

- A. The 3D Data Base will be issued to the General Contractor in Rhinoceros .3DM software format.

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- B. Translations of the Architect's 3D Data Base into other software formats shall be the sole responsibility of the Contractor, and verification of the accuracy of the translations shall be the sole responsibility of the Contractor.
 - C. 3D Models submitted to the Architect as required by various sections of the Project Manual shall be in the Rhinoceros .3DM software format or in a format acceptable to the Architect.

END OF SECTION

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SECTION 013200 CONSTRUCTION PROGRESS SCHEDULES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's construction schedule.
 - 3. Construction schedule updating progress.
 - 4. Commencement, completion and timing of work.

1.2 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: PDF electronic file.
- B. Startup Construction Schedule.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- E. Construction Schedule Updating Reports: Monthly.

1.3 CONFERENCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 - Project Management & Coordination. Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - 1. .
 - 2. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
 - 3. Review delivery dates for Owner-furnished products.
 - 4. Review schedule for work of Owner's separate contracts.
 - 5. Review submittal requirements and procedures.
 - 6. Review time required for review of submittals and resubmittals.
 - 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 8. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
 - 9. Review and finalize list of construction activities to be included in schedule.

1.4 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. General: Refer to Article 3.10 of the General Conditions of the Contract. Location and nature of Project, requirement to maintain operation, functions and services of Owner dictate careful planning, scheduling and close cooperation with Owner, with close coordination by Contractor, subcontractors and Owner.
 - 1. Keep Owner advised of intended operations and schedule and be guided by other constraints or timing of work that may develop during construction, as instructed by Owner.
 - 2. It is intent of Owner to cooperate as far as possible to minimize hampering of operations and Contractor may suggest schedules and timing which will facilitate progress.
- B. Construction Schedule: Within 21 days after award of Contract, prepare proposed initial detailed Construction Progress Schedule for review with Owner and Architect.
 - 1. In general, schedule shall indicate various phases of work coordinated and integrated time-wise with other work.
 - 2. The schedule shall also indicate various activities of each area, stage and phase of work, with integrated and coordinated commencement and completion times.
 - 3. After review by Owner, including revised sequencing proposed by Contractor or Owner to improve progress or minimize disruption of Owner's functions, revise schedule as "final" schedule, which will provide planning information for Owner's relocations and other operations.
 - 4. Sequencing: Work sequences by various phases or areas form the basis for the logic of Contractor's construction schedule. Sequencing has been developed with Owner to permit new construction and remodeling to be accomplished while maintaining services and functions with a minimum of disturbance.
 - a. It shall be recognized that unanticipated difficulties may arise, unanticipated conflicts in timing may occur or that Contractor will be able to develop alternatives which will benefit Project, timing of Work or Owner.
 - b. In such event, propose or develop with Owner, alternatives for acceptance by Owner in advance, which will improve Project and its progress.
- C. Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
 - 4. Schedule Revisions: If necessary during construction due to additional proposed improvements, unanticipated conflicts or other conditions, revise schedule as often as may be required in a manner approved by Owner, to keep Owner constantly advised as to dates of various activities.
 - a. Copies of revised schedules shall be provided Owner and Architect.
- D. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion and final completion.
 - 1. Completion Date: Contract completion date shall not be changed by submission of a schedule that shows a change in completion date, unless specifically authorized by Change Order.
- E. Constraints: Include scheduling constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.
 - 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 4. Products Ordered in Advance: Include a separate activity for each product.
 - 5. Work Restrictions:

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- F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
 - G. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 - 1. See Section 012900 - Payment Procedures for cost reporting and payment procedures.
 - H. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and Contract Time.
 - I. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
 - J. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - K. Startup Construction Schedule: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
 - L. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

3.2 EXECUTION OF WORK

- A. Commencement of Work:
 - 1. No work shall commence at the site until required bond and insurance evidence has been submitted.
 - 2. Commence work within 14 days of Notice to Proceed as specified.
- B. Execute Work regularly, diligently, without interruption or shutdown (except for temporary suspension while waiting for Owner to relocate departments or facilities, prior to proceeding) and at such rate of progress as will provide Substantial and Final Completion within Contract Time.
- C. Contractor and Subcontractors shall analyze Project, materials and methods involved, systems of the building, availability of qualified mechanics and unskilled labor, restrictions of site, constraints imposed, contractor's work load and capacity to perform Work and indicate agreement that specified completion, and proposed Project completion times are reasonable considering Project conditions, usual industrial conditions, climatic conditions prevailing in locality of Project, and other factors, with reasonable allowance for variations from average, typical or ideal conditions.

3.3 COMPLETION OF THE WORK

- A. Substantial Completion Date: As agreed upon between Owner and Contractor and entered into Agreement.
- B. Completion of Areas: At space or area specified, or later scheduled, to be occupied or used by Owner before entire Project is complete, elements and systems of Work shall be substantially complete by scheduled time.
 - 1. Systems shall be tested, balanced or otherwise placed in full and proper operating condition.

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2. Individual Areas: Certain areas and phases of Project are required by Owner to be substantially completed before entire Project is complete, and have more critical requirements for use or occupancy by Owner, to accommodate other phases of Work, to accommodate Owner's services and functions, to provide passages to various adjacent buildings, to maintain services and functions of various departments and to coordinate with other construction.
 3. The sub-completion times for various areas or phases, as specified or as later developed in Contractor's Construction Schedule, shall be essential conditions of Contract, as well as completion of entire Project.
- C. Time Set by Schedule: Where constraints, completion and timing of Work specified in this or other Sections do not have specific dates or time imposed by Contract Documents, they shall be considered and incorporated as established dates in final Construction Schedule of Contractor.
1. Where the activity affects Owner, time or dates established in Construction Schedule shall be maintained, as Owner will plan activities accordingly.
- D. Other Considerations: In addition to time of commencement, substantial completion and final completion dates, other events, factors, and constraints shall be carefully considered in establishing work progress and schedule for Project.
1. Contractor and subcontractors shall work closely in timing of operations and shall have materials, equipment and other elements ready to be able to immediately fulfill their obligations in the overall schedule.
- E. Final Completion: Within 30 days after Substantial Completion date.

END OF SECTION

SECTION 013230 PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preconstruction photographs.
 - 2. Periodic construction photographs.
 - 3. Final completion construction photographs.
 - 4. Preconstruction video recordings.
 - 5. Periodic construction video recordings.
 - 6. Construction webcam.
- B. Related Sections:
 - 1. Section 003100 - Available Project Information.
 - 2. Section 013300 - Submittal Procedures.
 - 3. Section 017132 - Vibration Monitoring
 - 4. Section 017800 - Closeout Submittals.
 - 5. Section 022214 - Existing Conditions Assessment.

1.2 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Digital Camera: Minimum sensor resolution of 8 megapixels.
 - 2. Format: Provide images in JPG format, image resolution of not less than 1600 by 1200 pixels and 400 dpi, in unaltered original files, with same aspect ratio as the sensor, uncropped, date- and time- stamped, in folder named by date of photograph, accompanied by key plan file.
 - 3. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Names of Architect, [**Construction Manager**] and Contractor.
 - d. Date photograph was taken.
 - e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - f. Unique sequential identifier keyed to accompanying key plan.
- C. Video Recordings: Submit video recordings within [**seven**] days of recording.
 - 1. Format: Submit video recordings [**on CD-ROM or thumb drive**] [**by uploading to web-based project software site**]. Include copy of key plan indicating each video's location and direction.
 - 2. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of [**12**] megapixels and capable of recording in full high-definition mode[**with vibration-reduction technology**]. Provide supplemental lighting in low light levels or backlit conditions.
 - 3. Identification: With each submittal, provide the following information [**in file metadata tag**] [**on web-based project software site**]:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Names of Architect, [**Construction Manager**] and Contractor.
 - d. Date video recording was recorded.
 - e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

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4. Written Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in three-ring binders. Provide label on front and spine. Include a cover sheet with label information. Include name of Project and date of video recording on each page.
- D. Time-Lapse Video: Submit time-lapse sequence video recordings **within <Insert number> days of recording**.
1. Submit time-lapse sequence video recordings [**monthly**] [**on CD-ROM or thumb drive**] [**by uploading to web-based project software site**].
 2. Identification: For each recording, provide the following information [**in file metadata tag**] [**on web-based project software site**]:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Names of Architect, [**Construction Manager**] and Contractor.
 - d. Dates and times video recording was recorded.
 - e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.3 COORDINATION

- A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including temporary lighting required to produce clear, well-lit photographs.

1.4 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

1.5 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
1. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
1. Date and Time: Include date and time in file name for each image.
 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.
- D. Preconstruction Photographs: Before commencement of excavation and demolition, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
1. Flag excavation areas and construction limits before taking construction photographs.
 2. Take photographs to show existing conditions adjacent to property before starting the Work.
 3. Take photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- E. Architect-Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

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- F. Final Completion Construction Photographs: Take color photographs after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.
- G. Additional Photographs: Architect may request photographs in addition to periodic photographs specified.
1. Three days' notice will be given, where feasible.
 2. In emergency situations, take additional photographs within 24 hours of request.
 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow-up when on-site events result in construction damage or losses.
 - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
 - d. Substantial Completion of a major phase or component of the Work.
 - e. Extra record photographs at time of final acceptance.
 - f. Owner's request for special publicity photographs.

1.6 CONSTRUCTION VIDEO RECORDINGS

- A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.
- B. Narration: Describe scenes on video recording by **[audio narration by microphone while]** **[or]** **[dubbing audio narration off-site after]** video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
1. Confirm date and time at beginning and end of recording.
 2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.
- C. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video recording opposite the corresponding narration segment.
- D. Preconstruction Video Recording: Before starting **[excavation]** **[demolition]** **[construction]**, record video recording of Project site and surrounding properties from different vantage points, as directed by **[Architect]** **[Construction Manager]**.
1. Flag **[excavation areas]** **[construction limits]** before recording construction video recordings.
 2. Show existing conditions adjacent to Project site before starting the Work.
 3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of **[excavation]** **[demolition]** **[construction]**.
 4. Show protection efforts by Contractor.
- E. Periodic Construction Video Recordings: Record video recording **[monthly]** **[weekly]** **<Insert time interval>** **[coinciding with the cutoff date associated with each Application for Payment]**. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be **[30]** **<Insert number>** minutes(s).
- F. Time-Lapse Sequence Construction Video Recordings: Record video recording to show status of construction and progress.
1. Frequency: During each of the following construction phases, set up video recorder to automatically record one frame of video recording every **[five]** **<Insert time>** minutes, from same vantage point each time, to create a time-lapse sequence of **[30 minutes]** **<Insert time>** in length as follows:
 - a. Commencement of the Work, through completion of subgrade construction.
 - b. Above-grade structural framing.
 - c. Exterior building enclosure.
 - d. **<Insert construction phase>**.
 2. Timer: Provide timer to automatically start and stop video recorder so recording occurs only during **[daylight]** **[construction work]** hours.

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3. Vantage Points: Following suggestions by [Architect] [Construction Manager] and Contractor, photographer shall select vantage points.

1.7 CONSTRUCTION WEBCAM

- A. Webcam: Provide [one] [two] <Insert number> fixed-location camera(s) with weatherproof housing, mounted to provide unobstructed view of construction site from location approved by Architect, with the following characteristics:
 1. Construction Webcam Service Provider: A firm specializing in providing photographic equipment, web-based software, and related services for construction projects, with record of providing satisfactory services similar to those required for Project.
 2. [Static view] [Remotely controllable view with mouse-click user navigation for horizontal pan, vertical tilt, and optical zoom of 500 percent minimum].
 3. Capable of producing minimum [8] [12] <Insert number> megapixel images.
 4. Provide power supply, active high-speed data connection to service provider's network, and static public IP address for each camera.
- B. Live Streaming Images: Provide web-accessible image of current site image, updated at [five] [15] <Insert number>-minute intervals [during daytime operation] [when construction is underway].
- C. Web-Based Interface: Provide online interface to allow viewing of each high-definition digital still image captured and stored during construction, from the Internet.
 1. Access Control: Provide password-protected access for Project team administered by Contractor, providing current image access and archival image access by date and time, with images downloadable to viewer's device.
 2. Storage: Maintain images on the website for reference during entire construction period, and for not less than 30 days after final completion. Provide sufficient memory on remote server to store all Project images.
 3. Online Interface: Provide website interface with Project and client information and logos; calendar-based navigation interface for selecting images; pan and zoom capability within high-definition images.
 4. Forward and Reverse: Provide capability to browse through images, moving forward and backward in time by individual image and by day.
 5. Slideshow: Provide capability to automatically display current images from sites when there are three or more cameras used.
 6. Time-Lapse: Provide capability for online display of project time-lapse.
 7. Dashboard: Provide capability to view thumbnails of all cameras on one screen.
 8. Weather: Provide corresponding weather data for each image captured.
 9. Provide public viewer open access[to most recent Project camera image].
- D. Maintain cameras and web-based access in good working order according to web-based construction photographic documentation service provider's written instructions until final completion. Provide for service of cameras and related networking devices and software.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 013300 SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Administrative and procedural requirements for Submittals.
 - 2. Submittal Schedule.

1.2 DEFINITIONS

- A. Required submittals are specified in each technical specification Section and identified as either Action Submittals, Informational Submittals, Sustainability Submittals or Closeout Submittals.
 - 1. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.
 - 2. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.
 - 3. Closeout Submittals: Operation and maintenance manuals, warranties, and project record documents required at project closeout.
- B. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- C. Newforma: Proprietary internet-based project information management software.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order and coordinated with Construction Schedule, List of Subcontracts, Schedule of Values, and with performance of construction activities.
 - 1. Preparation: Prepare and submit Submittal Schedule within 10 working days after award of Contract, and prior to execution of Contract.
 - 2. Format: Arrange the following information in a tabular format:
 - a. Specification Section number and title.
 - b. Submittal Type: Product Data, Shop Drawing, Sample, or other.
 - c. Submittal Category: Action, Informational, Closeout, Sustainable Design.
 - d. Scheduled date for first submittal.
 - e. Scheduled date for Architect's final release or approval.
 - f. Name of subcontractor.
 - g. Description of the Work covered.
 - 3. Grouping: Schedule transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination. Identify and schedule groups of related items, including but not limited to:
 - a. Submittal schedule, list of materials, list of subcontractors, schedule of values
 - b. Air barrier system.
 - c. Glazing systems and glass.
 - d. Doors, hardware and electronic access.
 - e. Custom fabrications.
 - f. Integrated systems.
 - g. Prefabricated assemblies involving components from multiple specification Sections.

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- h. Submittals that need to be routed to multiple disciplines and consultants.
 - i. Other submittals identified by Architect.
 - 4. Review and Processing Time: Allow at least **[10]** working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
 - a. Include additional time for making corrections or revisions to submittals noted by Architect and for handling and reviewing submittals required by those corrections.
 - b. Allow extra review time for large groups of related submittals transmitted at one time, and for submittals requiring sequential review by multiple parties such as Architect's consultants or Owner.
 - c. Resubmittal Review: Allow **[10]** working days for review of resubmittal.

1.4 SUBMITTAL ADMINISTRATIVE PROCEDURES

- A. Submittal Procedures, General: Refer to General Conditions for scope of submittal review and acceptance.
 - 1. Substitutions or Contract modifications shall not be made in submittals.
 - a. Exceptions and variations must be clearly noted on submittal and accompanied by the appropriate supporting forms.
 - b. Follow documented procedures for substitutions or Contract modifications and send with submittal if a change is being proposed.
 - c. Approval of a submittal with substitutions or modifications included but that have not been specifically and individually approved does not constitute acceptance of the substitution and Contractor will be responsible for exception or variations not in compliance with Contract Documents.
 - 2. The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.
 - 3. Partial Submittals: Partial submittals for only a portion of the Work will be reviewed with prior approval from Architect.
 - 4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
- B. Submittal Coordination: Submit Shop Drawings, Product Data, Samples, and Informational Submittals as individual packages, each with its own transmittal. Send all required submittals of a single specification Section concurrently, but as separate packages under separate transmittals.
- C. Electronic Submittals: Prepare and submit submittals as specified in individual Specification Sections, and as follows:
 - 1. Post electronic submittals as PDF electronic files directly using Architect's internet-based project information management software, Newforma.
 - a. Architect will return stamped and annotated PDF file using the same software.
 - 2. File Format: Assemble each submittal package into a single PDF file including submittals of a single specification Section.
 - a. Filename: Incorporate submittal number or other unique identifier, including revision identifier.
 - b. Submit unlocked, editable PDF file to accommodate electronic annotation and stamps.
 - c. Index PDF file with bookmarks enabling navigation to each item requiring Architect's action.
 - 3. Transmittal Form: Include completed transmittal form attached to the end of this Section. Submittals sent without completed Submittal Transmittal Form will be considered incomplete, marked NOT ACCEPTED, and returned without review.
 - 4. Stamp Page: Include a page specifically intended for Contractor and Architect stamps.
 - 5. Signatures for Electronic Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Digital Signature: Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Notarized Certificates: Provide a notarized statement on original paper copy certificates and certifications where indicated.

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- D. Contractor's Review: Prior to submitting to Architect, review each submittal for clarity, coordination with other Work and compliance with the Contract Documents; note corrections, clarifications and field dimensions and insert Contractor's approval stamp.
1. Contractor's Approval Stamp: Stamp each submittal with a uniform approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 2. Architect will not review received submittals that do not have Contractor's review and approval.
- E. Architect's Review:
1. Architect will review each submittal, annotate to indicate required corrections or revisions, insert action stamp and mark stamp appropriately to indicate action, as follows:
 - a. APPROVED: Submittal has no exceptions noted.
 - b. CONDITIONALLY APPROVED: Submittal has exceptions noted, but resubmission is not required.
 - c. NOT APPROVED: Submittal is incomplete and/or need corrections. Complete and/or correct and resubmit until final acceptance is obtained.
 - d. RECEIVED: Submittal is for information only.
 - e. NOT REVIEWED: Submittal was not required and has not been reviewed.
 2. Architect will advise Contractor when a submittal being processed must be delayed for coordination. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- F. Final Submittals: Stamped APPROVED or CONDITIONALLY APPROVED.
1. Distribute final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for coordination and performance of construction activities. Show distribution on transmittal forms. Provide copies to Owner if Owner requests copies during construction.
 2. Use for Construction: Retain copies of submittals Record Set on Project site.

1.5 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of material, product or equipment, describing product properties and performance, and indicating compliance with Contract Documents.
1. Identifying Information:
 - a. Include Architect's material identification abbreviation or equipment number as indicated in the Contract Documents.
 - b. Indicate products and options applicable to Project.
 - c. Indicate options requiring Architect's selection.
 - d. Description of intended use, application, or location for Project.
 2. Technical Information:
 - a. Manufacturer's catalog cuts.
 - b. Statement of compliance with specified referenced standards.
 - c. Testing reports by recognized testing agency.
 - d. Application of testing agency labels and seals.
 - e. Coordination requirements.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - j. Where color charts are required in lieu of color samples, provide original hard copy color charts.
 3. Not Acceptable as Product Data Submittal: The following types of data are not suitable for technical review and will be marked NOT APPROVED or NOT REVIEWED, and returned. Unless indicated otherwise in technical specification Sections, do not submit the following:
 - a. Product Data not reviewed by Contractor, or without Contractor's stamped approval.

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- b. PDF's with internet hyperlinks requiring Architect to navigate websites for information or to download documents.
 - c. Manufacturer's non-technical marketing literature, or other documents that are inadequate as technical information.
 - d. Illegible scans of hard copies.
 - e. Product Safety Data Sheets (SDS) or Material Safety Data Sheets (MSDS), unless otherwise required as part of a sustainability documentation requirement.
 - f. Electronic color chart files, scanned PDF of color chart, or photocopied hard copies of color charts.
- B. Shop Drawings: Submit in PDF electronic file format. Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
- 1. Use of Architect's Drawings: Do not reproduce Architect's drawings (whether CADD files, electronic files, hard copy drawings or other publication method) to serve as shop drawings until Architect's written permission is received and then only under the following conditions:
 - a. Use is subject to terms and conditions included in written permission.
 - b. Use only where necessary to indicate general location of a specific fabricated item.
 - c. Remove extraneous notes and information from Drawing before inclusion in submittal. Only show information related to fabrication, erection, installation, application of components, products or systems being produced. Do not include Architect's title block or other information identifying Architect.
 - d. Submitted drawing shall only include information intended to be reviewed and accepted.
 - e. Refer to Summary of Work for additional information on Electronic files.
 - 2. Layout Drawings: Provide where necessary for field use or as required by Architect.
 - 3. Shop Drawings:
 - a. Number in submittal sequence.
 - b. Include contractor's stamp of approval, as evidence that drawings are approved in accordance with General Conditions, except that field dimensions must be verified prior to approval and submittal.
 - c. Provide clear space on each drawing of not less than 40 square inches for Architect's stamp.
 - d. Show field verified dimensions on final shop drawings and identify verified dimensions.
 - e. Show adjacent construction and how each item coordinates with other subcontractors, trades and suppliers.
 - 4. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 5. Not Acceptable as Shop Drawing Submittal: The following types of drawings are not suitable for technical review and will be marked NOT APPROVED or NOT REVIEWED, and returned. Unless indicated otherwise in technical specification Sections, do not submit the following:
 - a. Shop drawings not reviewed by Contractor, or without Contractor's stamped approval.
 - b. Shop drawings with only unnecessary information, or without requested information.
- C. Samples: Submit physical Samples materials and products; for review of quality, kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Electronic Transmittal: For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 - 2. Transmit Samples that contain multiple, related components together in one submittal package.
 - 3. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.

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- b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - b. Delivery: As required by specifications to Architect/Engineer with delivery costs prepaid.
 - c. Removal: At Architect's/Engineer's direction, remove samples after approval.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line.
 - b. Architect will return submittal with options selected.
 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.
 - 1) Assembly Sample: Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) Range Samples: If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
 7. Other Samples: Provide samples for other purposes as specified, such as for testing or for transmittal to other entities for matching.
 8. Not Acceptable as Samples Submittal: The following types of samples are not suitable for review or for final selections and will be marked NOT APPROVED or NOT REVIEWED, and returned. Unless indicated otherwise in technical specification Sections, do not submit the following:
 - a. Electronic color chart files, scanned PDF of color chart, or photocopied hard copies of color charts.
- D. Product Schedules: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.
1. Format: Submit in form of a searchable PDF electronic file format.
 2. Include the following information in tabular form:
 - a. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - b. Manufacturer and product name, and model number if applicable.
 - c. Number and name of room or space.
 - d. Location within room or space.
- E. Certificates:
1. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
 2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

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4. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
 5. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- F. Test Reports:
1. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
 2. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
 3. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
 4. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
 5. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- G. Product Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

1.6 DELEGATED DESIGN SERVICES

- A. Delegated Design Submittal and Shop Drawings: Where professional design services or certifications by a qualified Professional Engineer are specifically required of the Contractor by the Contract Documents, prepare and incorporate the following delegated design requirements into the shop drawings submittal package.
1. Shop drawings shall be signed and sealed by a qualified Professional Engineer or contain an attached certificate, signed and sealed by a qualified Professional Engineer, indicating that the products and systems comply with performance and design criteria in the Contract Documents.
 2. Shop drawings or certificate shall clearly define the design criteria and applied loads for which the system components and connections have been designed. If design criteria indicated in the Contract Documents are not sufficient to perform services or certification required, submit a written request for additional information to Architect/Engineer.
 - a. Include list of design criteria, codes, standards, loads, and other factors used in performing these services.
 3. Shop drawings shall clearly indicate magnitude and location of all forces transferred to the supporting building structure by the product or system in which it is connected to. Forces shall be provided as unfactored values determined in accordance with the applicable building codes.

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- B. Calculations: Upon request from the Architect/Engineer only, Contractor shall submit signed and sealed engineering calculations prepared by a qualified Professional Engineer. Submitted calculations that have not been requested by the Architect/Engineer will be returned without review.
1. Calculations shall indicate structural integrity of members, anchors, fasteners and connections to supporting building structure, in accordance with performance and design criteria in Contract Documents. Provide load calculations, summary of loads and any applicable load diagrams.
 2. Calculations will be reviewed by Architect/Engineer for stated design criteria, general compliance to specified requirements, and forces imposed on supporting structure only. The accuracy of the design calculations is the sole responsibility of the Contractor's Professional Engineer.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the systems, assemblies, or products that are similar in material, design, and extent to those indicated for this Project.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 013310
SUBMITTAL TRANSMITTAL FORM

To: Hammel Green and Abrahamson, Inc.
Attn: Submittals Coordinator
222 Sutter Street, Suite 500
San Francisco, California 94108

From: _____

Contact: _____
Email: _____
Phone: _____

Owner: Natividad
Project: Medical Center
HGA No.: 3707-016-00

Submittal Date: _____
Previous Date: _____

PRODUCT DATA

☐ Partial ☐ Complete ☐ Preliminary ☐ Final

Specification Section, Article, Paragraph: _____

Description: _____

Product/Model: _____

Manufacturer: _____

Supplier: _____

Subcontract: _____

SHOP DRAWINGS

☐ Partial ☐ Complete ☐ Preliminary ☐ Final

Specification Section, Article, Paragraph: _____

Description: _____

Product/Model: _____

Manufacturer: _____

Supplier: _____

Subcontract: _____

SAMPLES

☐ Partial ☐ Complete ☐ Preliminary ☐ Final

Specification Section, Article, Paragraph: _____

Description: _____

Product/Model: _____

Manufacturer: _____

Supplier: _____

Subcontract: _____

SUBMITTED BY

Name: _____ Company: _____

Signature: _____ Date: _____

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SECTION 013513 SPECIAL PROJECT PROCEDURES FOR HEALTHCARE FACILITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Special procedural requirements for work in hospital areas as follows:
 - a. Examination Rooms, and other areas where airborne contaminants must be strictly limited due to their effects on patients, staff, diagnostic operations, or sensitive procedures or equipment.
 - b. Worker identification, non-smoking policy, security, and parking, other hospital requirements.
 - 2. Hospital airborne contaminants control policy and procedures.
 - 3. Ceiling access control of airborne contaminants.
 - 4. Procedures for implementing Owner's Interim Life Safety Measures (ILSM) Program.
 - 5. Requirements for the Owner's ILSM Program.
- B. Related Sections:
 - 1. Section 015200 - Construction Facilities.
 - 2. Section 015615 - Airborne Contaminants Control.
 - 3. Section 017329 - Cutting and Patching.
- C. Related Sections:
 - 1. Sections 017329 - Cutting and Patching and 024119 – Selective Demolition: Removal of debris may be outside of normal work hours and shall be in tightly covered containers. Perform work in accordance with requirements of this Section.
 - 2. Section 013300 – Submittals Procedures: Work and procedures for containment of airborne contaminants shall be included in submittals in accordance with the requirements of this Section.
 - 3. Section 015200 -Temporary Facilities: Provide temporary barriers, chutes and the like as necessary to control airborne contaminants. Extend barriers above ceilings as required to seal off and contain airborne contaminants.
 - 4. Section 017700 – Closeout Procedures: Use wet cleaning methods and HEPA-filtered vacuum cleaners as required to minimize release of airborne contaminants. Disinfect containment and protection areas to effect final cleaning as directed by Owner's Representative.
 - 5. Section 230130 - Ductwork Cleaning: Perform cleaning of heating, ventilating and air conditioning (HVAC) systems and ductwork in accordance with this Section.

1.2 DEFINITIONS

- A. The term "contaminant", as used in this Section, is defined as a material which may be dispersed through normal air movement, including dust, chalk, powders, aerosols, fumes, fibers, outdoor air, and other similar materials.
- B. Non-Smoking Policy: Hospital/Clinic has a non-smoking policy. This means no smoking. Those observed to be smoking on hospital/clinic property will be asked to discontinue their smoking behavior.
- C. Interim Life Safety Measures are a series of eleven administrative actions required to be taken to temporarily compensate for the hazards posed by existing life safety deficiencies or construction activities.
- D. Safety Systems: Systems required by Code for occupant safety and protection. Examples: Fire barriers; smoke barriers; exit pathways; emergency power; fire alarms; medical gases; HVAC systems; fire-rated doors.
- E. Contaminant Producing Activities include, but are not limited to:
 - 1. Demolition and removal of walls, floors, ceilings, and other finish materials.

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2. Demolition of plumbing, mechanical and electrical systems and equipment.
 3. Finish operations such as sanding, painting, and application of special surface coatings.
 4. Routine construction activity which can generate dust.
 5. Sitework operations.
- F. Containment Areas: As determined by Owner's Representative and as shown on drawings. Includes area of construction, adjacent staging and storage areas, and passage areas for contractors, supplies and waste; includes ceiling spaces above and adjacent to construction, if shown.
- G. Protection Areas: As determined by Owner's Representative and as shown on drawings as Protection areas. Includes hospital areas adjacent to Containment Area, either occupied or used for passage, as well as areas connected to construction area by mechanical system air intake, exhaust and ductwork.
- H. "Minor" ceiling access is defined as visual observation or minor adjustments or other activity that does not disturb dust. Acoustical panels shall be replaced or access panel shall be closed immediately when the contractor leaves the work site.
- I. "Major" ceiling access describes any other access not defined as "minor".
- J. "Thorough" cleaning of surfaces which become exposed to dust shall be accomplished by the use of either a HEPA filtered vacuum cleaner or a wet mop.
- K. Negative Air Machine: Portable mechanical units to provide a negative air pressure in the Containment Areas, as specified in this Section.

1.3 SUBMITTALS

- A. Progress Schedules: Submit work areas and procedure schedules for containment of airborne contaminants.
- B. Work Plan: Drawings and details of construction of necessary temporary barriers, and description of procedures to be used to achieve and maintain control of construction-related airborne contaminants. Refer to Sections 017329 - Cutting and Patching and 024119 – Selective Demolition, submittal may be combined with remodeling work plan.
- C. Certification: Submit Contractor's plan certification as specified.

1.4 FROM THE JOINT COMMISSION WEBSITE

- A. *What must an Interim Life Safety Measure policy contain?*
- B. ILSM - Policy Scope: In order to evaluate and implement an effective plan for Life Safety code deficiency mitigation, an Interim Life Safety Measure policy must consist of the following:
1. State that the process is applicable to both construction related situations, and situations of non-compliance with the Life Safety Code.
 2. State circumstances that would require ILSM assessment, to include a statement that at all Statement of Condition, Plans for Improvement (PFI's) are to be assessed for ILSM.
 3. Describe how the organization will respond to situations described in LS.01.02.01.
 4. Describe how occupants are to be protected by using the available menu of interim life safety measures described in LS.01.02.01, as applicable to the situation.
 5. Describe the ILSM assessment process, to include an assessment tool to document which measure(s) will be implemented, or no ILSM needed if that is the assessment result.
 6. Describe the ILSM implementation process, to be effective throughout the duration of the deficiency(s), and to include an implementation tool to document each implemented ILSM for the duration of its application. [LS.01.02.01]

1.5 POLICY

- A. Mold spores such as *Stachybotrys Atr* or *Chartarum*, *Aspergillis*, *Cladosporium*, *Alternaria*, *Penicillium* and any substances that produce mycotoxins or substances (referred to collectively as "spores") that may negatively affect patients or other building occupants must be properly controlled.

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- B. Inhalation of these spores and other toxins released by construction activity can cause nosocomial fungal infections in immuno compromised patients.
 - C. Aspergillus and other spores are known to be prolifically present in construction dust, debris and earthwork excavation dust. Control of construction dust, debris and excavation dust is imperative to help prevent outbreaks of aspergillosis or similar nosocomial fungal infections in immuno-compromised patients.
 - 1. Aspergillus and other related spores are present in the natural environment and thus are not a risk to healthy construction workers.
 - 2. Workers are required to attend an orientation session. Refer to Article 1.7.A.
 - D. Control of airborne contaminants including spores is critical in entire hospital area. Limit dissemination of airborne contaminants produced by construction-related activities, in order to provide protection of immuno-compromised and other patients, staff, diagnostic operations, or sensitive procedures or equipment, from possible undesirable effects of exposure to such contaminants.
 - 1. Dust in ceilings and construction debris contains fungus spores. Construction activities causing disturbance of existing dust, or creating new dust, or other airborne contaminants, must be conducted in tight enclosures cutting off any flow of particles into patient areas.
 - 2. Ceilings and walls in Protection areas and other areas in Hospital as indicated on drawings must be secure at all times. If access into the ceiling in occupied areas, is required, procedures as described in this Section shall be followed.

1.6 PERFORMANCE REQUIREMENTS

- A. Owner's Representative's Responsibilities.
 - 1. Determination of the Containment and Protection Areas, as well as the standard of limitations of the Contractor's responsibilities, required for the project.
 - 2. Statement of Requirements: Description in graphic and written form as required to communicate the above, based on evaluation of the construction area and the impact of the project on patient care.
- B. Owner's Responsibilities.
 - 1. Assist Owner's Representative to determine Containment and Protection Areas.
 - 2. Perform testing and monitoring as specified.
- C. Contractor's Responsibilities.
 - 1. To comply with applicable codes and referenced controls and to use installation procedures and methods which satisfy applicable code requirements and referenced controls and procedures.
 - 2. Specific means and methods of achieving and maintaining control of airborne contaminants during construction.
 - 3. Proposed work plan and procedures for control of airborne contaminants, as noted below.
 - 4. Plan Certification: Contractor's plan shall be signed accepted in writing by Owner's Representative.
 - 5. Notification: Notify Owner's Representative a minimum of 48 hours prior to starting construction activity which might be expected to produce excess levels of airborne contaminants in containment area so that additional precautions may be taken.
 - 6. Provide all dustproof enclosures, warning signs and warning lights to protect the public, the existing building, storage areas and materials or equipment. Enclosures shall be approved by Owner's Representative.

1.7 PROTECTION

- A. If work is being done above a lay-in ceilings and if work must be performed while the space below is occupied, provide temporary work surfaces to provide a safe working platform and protect the ceiling and the spaces below from falling objects and materials. Take all necessary precautions to protect the people and spaces below from injury due to the Contractor's operations.

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- B. Exercise caution when handling fluids, particularly the heating water, in the interstitial space. When working with fluids provide a water-tight barrier beneath the work area to catch and retain all spillage before it reaches the ceiling below.
 - C. Notify the Owner's Representative at least 48 hours, or greater if requested by the Owner's Representative, prior to commencing work in ceiling or interstitial spaces above occupied areas to allow at-risk patients to be relocated or protected.

1.8 MEETINGS

- A. Progress meetings are specified in Section 013100 - Project Management and Coordination, attend meetings with report on control measures being used to insure compliance and ILSM.

1.9 SYSTEM DESCRIPTION AND PLANNING

- A. Because many of the administrative actions require the construction of barriers, the installation of temporary systems, and the training of personnel, ILSM planning will begin prior to the beginning of the Project in coordination with the Contractor.

1.10 OWNER'S ILSM PROGRAM

- A. Buildings or areas under construction must maintain escape facilities for construction workers at all times. Means of egress in construction areas must be inspected daily.
 - 1. Exits shall provide free and unobstructed egress. Personnel shall receive training if alternative exits must be designated.
 - 2. Maintain free and unobstructed access to emergency departments/services and for emergency forces.
 - 3. Ensure that fire alarm, detection, and suppression systems are not impaired. Providing temporary, but equivalent, system when any fire system is impaired. Temporary systems must be inspected and tested monthly.
 - 4. Temporary construction partitions are smoke tight and built of noncombustible or limited combustible material that will not contribute to the development or spread of fire.
 - 5. Provision of additional fire fighting equipment and use training for personnel.
 - 6. Prohibition of smoking in or adjacent to all construction areas.
 - 7. Development and enforcement of storage, housekeeping, and debris removal practices that reduce the flammable and combustible fire load of the building to the lowest level necessary for daily operations.
 - 8. Conductance of a minimum of two fire drills per shift per quarter.
 - 9. Regular hazard surveillance of buildings, grounds, and equipment with special attention to excavations, construction areas, construction storage, and field offices.
 - 10. Training personnel when structural or compartmentation features of fire safety are compromised.
 - 11. Conductance of organization-wide safety education programs to ensure awareness of any LSC deficiencies, construction hazards, and these ILSM.

1.11 PROJECT ILSM PROCEDURES

- A. The Contractor is responsible for the safety of persons and property and compliance with all applicable statutes, rules, regulations, and orders for work under this Contract. Implement the following procedures. Refer to Section 015200.
 - 1. Material for construction operations shall be brought in and work conducted as to avoid any interference with existing Owner's facilities or normal operations.
 - 2. Every effort shall be made to limit dust, noise, weather, and fire hazards during construction and a secured dust wall around each space and ceiling area will be constructed where required to ensure health and safety of those spaces not involved during each stage of construction.
- B. Refer to Section 011100 - Summary of Work. The Contractor is responsible for developing a safety program and site management program as specified.

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1. Provide correction plan for compromised utility services. Example: Medical gases; medical air vacuum; electricity (normal, critical and Life Safety); water; ventilation; steam and any other such utility service.
 - C. Maintain free and unobstructed access and exits to public ways as specified and as indicated on drawings.
 1. Modify existing walkways and cover walkways to provide access to existing facilities for use by public and Owner's personnel as indicated.
 2. Other exits as indicated.
 - D. Provide alternate means of exit where indicated and notify Owner of timing of switchover.
 1. Alternate means are to be in place prior to abandonment of existing means of exit. Allow the Owner one week to train staff after creating alternate means of exit and before abandoning existing means of exit.
 - a. Alternate means must be approved by Fire Marshall prior to abandonment.
 2. Alternate exit at existing boiler plant (if required).
 - E. Maintain escape routes for construction workers. Inspect means of egress in construction areas daily and report any discrepancies to the Contractor's Safety Director for correction.
 1. Report problems and measures taken to correct problems to Architect.
 - F. Provide emergency access for existing ambulance garage (emergency department) (if required).
 1. Phase utility work in roadways and sidewalks as necessary to maintain constant, 24 hour vehicular and pedestrian access to the Ambulance Garage (Emergency Department) Entrances.
 2. Schedule and organize procedures to minimize interference with Owner's operations.
 3. Provide access for firefighters and other emergency personnel.
 - G. (Provide protection for helipad (Life Flight) as indicated and specified for time duration as indicated.)
 1. Keep all utilities serving the helipad including but not limited to: Power, communications, fuel lines and tanks operational at all times.
 2. Helipad Flight patch contours indicated may not be violated by any permanent or temporary construction equipment, including cranes.
 3. On grade routes used by emergency personnel to transport life-flight patients from the helipad to treatment areas within the hospital may not be compromised.
 - H. Develop and enforce fire safe means of storage, housekeeping, and debris removal as specified.
 - I. Ensure that fire alarm, detection, and suppression systems are not impaired. Refer to Section 011100.

1.12 DESCRIPTION OF WORK

- A. Refer to Sections 015200 and 017329.
 1. Specified noise control and contaminant control procedures shall be used for the following:
 - a. Demolition and removal of gypsum board, plaster, floor tile, ceiling tile, ceramic tile, carpet, and finish materials with porous or rough surfaces.
 - b. Demolition of plumbing systems and equipment.
 - c. Demolition, removal, or remodeling of existing duct work.
 - d. Demolition, removal, or remodeling of light fixtures.
 - e. Removal of casework or equipment.
 - f. Finish operations which generate contaminants, including sanding, painting, and application of special surface coatings.
 - g. Cutting of concrete.
 - h.
 2. Other operations which generate contaminants. Smoke is a contaminant under this description. No smoking on hospital/clinic property.

1.13 PRE-EXISTING DAMAGE

- A. Upon written request by the Contractor, representatives of the Owner will be available, prior to the commencement of actual work, to survey the work area for pre-existing damage.
 - 1. Any damage found by this survey will be recorded and will be the Owner's responsibility.
- B. If no survey is requested then, upon commencement of the construction work, finished surfaces in and immediately below the construction areas will be presumed to be in a condition similar to surfaces of similar age and service in the remainder of the clinic.
 - 1. Damage not readily assignable to other causes will be presumed to be caused by the construction work.
 - a. This Contractor must repair all damage caused by the construction work.

1.14 IDENTIFICATION

- A. Upon award of the Contract, provide the hospital with the names of all employees and subcontractors assigned to the Project.
 - 1. When the Contractor and subcontractor reports to the site the first time they will be given identification cards for their employees. They are provided by the Security Department free of charge through Facilities Management.
 - a. The badge must be worn by all construction personal while working on Hospital/Clinic premises and also (when allowed) can be used for access to provided parking.
- B. At final completion of the Project collect all badges and return them to Facilities Management.
 - 1. Final payment on Project may be delayed until all such identification badges are returned.

1.15 SECURITY

- A. The Contractor is responsible for the security of tools, materials, and equipment.
- B. The Contractor will be issued keys as necessary for access to the work and storage areas and will be held responsible for their security and return when no longer needed.
 - 1. Should re-keying become necessary due to the Contractor's actions the cost thereof will be billed to the Contractor.
- C. Access to Special Areas: Several areas exist in the hospital/clinic to which access is restricted.
 - 1. Necessary access may be obtained by contacting the Owner's Representative in advance who will arrange with the department for access.
- D. The Facilities Departments are aware of contractors working within the Hospital/Clinic.
 - 1. Emergency calls can be made through any of those offices during normal working hours.
 - a. During evenings, nights, weekends, and holidays the Security Department will relay emergency messages.

1.16 QUALITY ASSURANCE

- A. Preconstruction Meeting: Before any construction on site begins, Contractor and personnel are required to attend a preconstruction orientation session held by Owner's Representative for training and instruction on precautions to be taken.
 - 1. Training will help personnel to protect immuno-compromised patients and better understand the nature of diseases caused in those patients by air borne fungal spores contaminants.
- B. A written report from the Owner's qualified air balancer will be submitted confirming specified air velocity whenever enclosure is erected or modified in designated Protection Area. Negative air machines shall be connected to emergency power and run continuously in such areas.
- C. Notification: 48 hour notification to Owner's Representative of possible construction activity causing airborne contaminants in Protection Area. Schedule work in ceiling spaces above occupied rooms in advance, and on overtime if required.
- D. Comply with requirements in Section 013216 - Progress Schedules and Reports.

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- E. Interim Life Safety Measures (ILSM) program shall comply with 2006 JCAHO Standards.
 - F. Set up control procedures so that ILSM are adhered to. Contractor's responsibility is to properly notify Architect of anticipated and actual problems complying with ILSM.

1.17 SMOKING

- A. Hospital/Clinic is a smoke-free organization with smoking prohibited in all buildings, on grounds, in vehicles or any leased facilities of the hospital/clinic. Inform all employees and subcontractors not to smoke on premises.
 - 1. Do not loiter on the hospital/clinic property or discard smoking litter in a way that reflects on the Hospital/Clinic.

1.18 PROJECT CONDITIONS

- A. Place internal combustion equipment where directed by Owner's Representative; obtain approval of Owner before operating. The Owner's Representative works in coordination with Environmental Health and Safety.
- B. Obtain approval of Owner before performing operations that generate contaminants that may be drawn into building air intakes. Before beginning excavation or exterior demolition, verify proper installation and operation of building air intake filters with Owner's Representative.
- C. Hazardous Exposures: Proper safety precautions are necessary to prevent injury to clinic patients, visitors and employees. Contractors are responsible for eliminating hazardous exposures in work areas where these individuals may have access. Refer to Sections 017329 and 015200.
- D. Debris transported from internal demolition should be routed to avoid areas housing sensitive occupants and visitors. Elevator usage and type of transport container should be designated by the Owner's Representative. Employees must follow designated routes within Construction Limits.
- E. All through-the-wall connections in patient care areas such as utilities and ducts, shall be sealed appropriately and reviewed by the Owner's Environmental Health specialist.
- F. When demolishing dust-producing materials (plaster, gypsum wallboard, ceiling tiles, and the like), the area shall be sprayed with water to minimize dust.
- G. Advise Owner's Representative of operations that might generate contaminants. Obtain approval of Owner before beginning such operations.
- H. Patient's Safety: Patients' well being is of primary concern to the hospital. It is mandatory for contractors and their employees to share this concern and to take all precautions to prevent any circumstances which would affect any patient's safety or comfort. Each job shall be evaluated to determine potential hazards. Steps should be taken to initiate corrective measures as needed. Refer to Section 011100 for work in occupied areas.
- I. Hospital/Clinic is a no smoking facility in accordance with local clean indoor air regulations. Contractor's personnel must comply with this policy everywhere in the hospital (clinic) building including the construction area.
- J. Utilities: No services, systems, utilities, or devices serving rooms to be remodeled (containing patients on oxygen or procedure rooms) shall be disconnected, tapped into, disengaged or otherwise disturbed without first coordinating such intended work with the Owner.

1.19 GENERAL CEILING ACCESS DIRECTIVES

- A. Notify Owner's representative that work requiring access to the ceilings outside the Containment Area 48 hours before work is to begin.
- B. The Contractor shall report to Owner designated office and fill out a ceiling access form. An approved work tag must be attached to the ceiling access enclosure before work will be allowed to proceed.
- C. Work Tag:

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1. The Contractor shall attach a completed, approved work tag on the ceiling access enclosure before work can proceed.
 2. The work tag can be removed only after the work is done and clean up is completed.
 3. All tags issued from Owner's representative shall be returned the same day to the office at which it was issued, after work and cleanup for the day has been completed.
- D. Spray top of ceiling panels to be removed, and surrounding affected panels, with fine water mist to settle dust prior to removal.
- E. Inform Head Nurse or department manager so that patient room doors near ceiling work will be kept closed while the work is in progress.
- F. Owner' representative shall be contacted for all ceiling access problems.

1.20 CEILING PROTECTION

- A. Protection: If surface below a certain space is the top of the lay-in ceiling and if working above people down below becomes unavoidable, provide temporary work surfaces to provide a safe working platform and protect the ceiling and the spaces below from falling objects and materials. Take all necessary precautions to protect the people and spaces below from injury due to Contractor's operations.
1. When working in ceiling the ceiling tiles shall be replaced on a daily basis, unless further measures are taken such as is listed herein.
- B. Should any operation pose a hazard to people working below, review and schedule the operation with the Owner's Representative to minimize the risk.

1.21 ACCESS PANELS

- A. Access panels may be kept locked. Whenever work is performed in one of these areas, caution should be used to prevent accidental entry by patients, visitors, or staff members. All access openings shall be closed and latched or locked when unattended.

1.22 SERVICE INTERRUPTIONS

- A. Service interruptions involving, connecting into any system, shutting down equipment or de-energizing systems shall be scheduled ahead of time with the Owner's Representative. Many systems are critical and shutdowns during the day may be difficult.
- B. Service interruptions involving the disconnection of duct work serving more than one control zone shall be scheduled ahead of time with the Owner's Representative.
1. Provide temporary closures as required to maintain supply system pressure and prevent short-circuiting of air into the return and exhaust systems.
- C. Service interruptions involving the disconnection of ductwork serving only one control zone may be done at the contractors convenience.
1. Provide temporary closures as required to maintain supply system pressure and prevent short-circuiting of air into the return and exhaust system.

1.23 FIRE AND SMOKE ENCLOSURES

- A. Smoke and firewalls are located throughout the building. Smoke walls have been designed and identified with a one-hour fire rating. They are continuous from outside wall to outside wall and floor slab below to floor slab above.
1. Smoke doors are on automatic door closures installed wherever smoke envelope passes through a corridor or doorway. Firewalls have a two-hour rating.
 2. The doors located in a firewall have a positive latching device attached.
 3. Refer to Fire Safety in Section 011100.
- B. All work on smoke partitions, fire partitions, smoke doors and fire doors must maintain the integrity of the particular unit. All breeches must be patched.

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1. Conduit, raceways, air handling ducts or other items that may pass through the partition must be installed to maintain the protection feature of the wall.
 - C. There are numerous fire and smoke doors throughout the facility. Most of these doors are maintained in an open position by an electrically supervised fire alarm system.
 1. This system will release and close doors whenever an alarm has been initiated. Smoke and fire doors are not to be wedged, blocked or held open in any other way.

1.24 FIRE ALARM SYSTEM

- A. The hospital/clinic maintains a sensitive fire alarm system throughout the building. Pull boxes, smoke detectors, flow switches and alarms are included in this system. Whenever any of the devices are activated, the hospital/clinic fire procedures will be implemented.
 1. When an alarm condition exists, the contractor will cease all activities and abide by Hospital/Clinic or fire department instructions until the alarm condition is cleared.
- B. If a fire does occur in a construction area, the fire alarm system should be activated. This can be done by activating a pull box in the area.
- C. Any activity that produces dust or smoke should be reported to Security in advance so they can temporarily disable the particular alarm to prevent accidental triggering of smoke alarms. This is also true of any activity that might activate a flow alarm.

1.25 PATIENT CONFIDENTIALITY

- A. Patient confidentiality must be maintained throughout Work.
- B. Conduct orientation session for workers and others who will be onsite. Contractor, subcontractors and any other persons or workers performing services under this contract must be instructed regarding procedures to maintain patient confidentiality.
- C. Patient information, files, x-rays, statements made by staff to other staff or patients, anything that identifies a patient, especially patients who are admitted or otherwise present at facility, or information about their medical condition or history must be kept strictly confidential.
- D. Take action to comply with medical facilities confidentiality policies. If any patient information is inadvertently exposed during course of Work, assure workers and others on site comply with applicable laws in effect in location of project.

1.26 TESTING

- A. Air Samples: Owner will provide baseline particle counts and conduct periodic air sampling of Protection Areas during construction to monitor effectiveness of containment procedures.
- B. Air Pressure: Using differential pressure monitors, Contractor shall verify the maintenance of negative air pressure in Containment Area relative to Protection Areas on a continuous basis.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Negative Air Machines: Micro Trap MT-C Negative Air Filtration Units by Micro-Trap, Inc., 38 North Pine Avenue, Maple Shade, New Jersey, 08052, or CRSI 2000 by Control Resource System Incorporated, 670 Marine Drive, Michigan City, Indiana, 46360, 1-800-418-1264 or equal.
 1. Units shall include prefilters, final filters, HEPA filters and filter static pressure gauges.
 2. HEPA filters shall be 99.997% efficient at 0.3 micron particle size.
- B. Carpets or Mats: Provide carpets or mats at enclosure entrances, vacuumed or changed as often as necessary to prevent accumulation of dust. At Owner's option, provide adhesive faced contamination control mats with disposable sheets in lieu of vacuumed mats, Tacky Mat by Liberty Industries, 133 Commerce Street, East Berlin, Connecticut, 06023, 1-800-828-5656, or equal. All vacuuming outside areas not under negative pressure shall be with a certified HEPA-filtered vacuum.

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- C. Dust Caps: Block off all existing ventilation ducts within the construction area. Method of capping ducts shall be dust tight and withstand air flow.
 - D. Temporary Prefabricated Partition for Work in Sterile Corridors: Kontrol Kube, including Adjustable Aluminum Frame #6440; Vinyl Enclosure #6442; Wheel Base Platform #6443; by Fiberlock Technologies, Inc., P.O. Box 432, Cambridge, MA. (617) 876-8020. Provide with inspection window and pressure differential porthole. Include Nilfisk 87 cfm vacuum device and manometer.
 - E. Fire-rated Partitions for Temporary Enclosure: Provide rated gypsum board wall construction meeting requirements of local jurisdiction for use as temporary enclosure.
 - F. Polyethylene: Fire-resistant, UL-labeled tarpaulins with flame spread rating of 15 or less. Provide translucent, nylon-reinforced laminated polyethylene or polyvinyl chloride, fire-retardant sheet certified as conforming to test results of test method 2 contained in NFPA 701, entitled Standard Method of fire Tests for Flame Propagation of Textiles and Films, unless local jurisdiction accepts test method 1 of NFPA 701 or requires other materials.
 - 1. Portable Enclosures: Whenever work is done outside existing enclosed work areas, provide portable polyethylene enclosure, enclosing ladder and sealing off opening fitted tight to ceiling, or provide prefabricated unit.

2.2 TYPES OF CONTAMINANT DEVICES

- A. New Materials: As specified in other Sections, or as recommended by manufacturer of item for intended use.
- B. Dust Caps: Block off all existing ventilation ducts within the construction area. Method of capping ducts shall be dust tight and withstand air flow.
- C. Temporary Prefabricated Partition for Work in Sterile Corridors: Kontrol Kube, including Adjustable Aluminum Frame #6440; Vinyl Enclosure #6442; Wheel Base Platform #6443; by Fiberlock Technologies, Inc., P.O. Box 432, Cambridge, MA. (617)876-8020.
 - 1. Provide with inspection window and pressure differential porthole. Include Nilfisk 87 cfm vacuum device and manometer.
- D. Polyethylene: Polyethylene shall be 6 mil fire retardant type listed by Fire Underwriter's Laboratories, Griffolyn #T55R or Star-Tex of Lakeville, MN, 55044, with Griffolyn fire retardant tape, or equal.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Before any demolition or construction begins, a complete field review of all Protection Areas (airborne contaminant control areas) and policies will be conducted and work plan revised if required.

3.2 SCHEDULE OF REQUIREMENTS

- A. Baseline levels of dust particles in Protection Areas are as set by the Owner.
- B. Owner will monitor particles and other spore counts in vicinity of project in Protection Areas. Such areas are as set by Owner, such as surgery and patient areas. Whenever safe levels are exceeded, Contractor will be notified to correct conditions immediately to avoid fine and work stoppage described.
 - 1. Work shall be stopped on the project whenever a hazardous airborne contaminant control deficiency exists in occupied areas.
 - 2. Take immediate action to correct all deficiencies.
- C. Before any demolition or construction begins in occupied areas, a complete field review of all airborne contaminant control policies will be conducted. A check list will be filled out and signed by the Project Inspector, Airborne Contaminant Control Nurse and the Contractor confirming that the area is ready for work to begin.

3.3 CONTAINMENT

- A. Requirement: Maintain levels of airborne contaminants within limits as defined.
- B. Negative air machines as described herein shall provide air flow into construction area at not less than 100 fpm at enclosure entrances with all doors fully open.
- C. Air Quality Contaminant Control: Fasten windows shut, ventilate barricaded construction areas by use of negative air machines exhausted through filters to the outside of building, or to Owner designated areas inside the building.
 - 1. Provide a minimum of 2 negative air machines. Vent negative air machines to outside by removing existing windows and replacing them with vented sheet metal panels having fittings for exhaust holes. Provide added local exhaust during welding.
 - 2. Change filters as frequently as necessary for duration of the project to maintain a negative pressure of 0.01 - 0.05 inches of water gauge in the Containment Area.
 - 3. Negative air shall be DOP tested and certified prior to being placed in service, after a HEPA filter change, and when dropped or damaged or moved extensively.

3.4 PROTECTION

- A. General: Provide and maintain all barriers, filters, ventilation, and cleaning and removal procedures as detailed in work plan.
- B. Sealing of Openings: Use duct-tape or other impenetrable sealant to seal barrier wall seams, cracks around window and door frames, exhaust system ductwork, pipes, joints and ducts.
- C. Dust Control: Take appropriate steps throughout the term of the Project to prevent airborne dust due to work under this contract. No chemical palliatives shall be used without permission of the Owner's Representative.
 - 1. Hard surface floors in work area, adjacent hallways and passage areas require vacuuming with HEPA-filtered vacuum cleaners and frequent wet-mopping during demolition and construction; protect adjacent carpeted areas with plastic and plywood and vacuum with HEPA-filtered vacuum cleaners.
 - 2. Vacuum walk-off mats daily as a minimum.
 - 3. Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent airborne dust from dispersing into atmosphere.
- D. Airborne contaminant enclosures or infection control enclosures shall be dust-tight. Any dust tracked outside of enclosure shall be removed immediately, as specified. All cleaning outside enclosure should be by HEPA-filtered vacuum or other approved method.
- E. The following procedure shall be implemented when construction personnel are required to pass through a Protected Area to enter the Containment Area:
 - 1. Provide air lock entry vestibules in dustproof enclosures when shown on drawings or required by Owner's Representative.
 - 2. Personnel shall wear protective clothing as required and provided by the Owner's Representative while passing through the Protected Area.
 - 3. Protective clothing shall be removed in the air lock vestibule prior to entering the Containment Area.
 - 4. When exiting the Containment Area, the personnel shall re-don the protective clothing before reentering the Protected Area.
- F. Contractor Personnel: Instruct personnel to refrain from tracking dust into adjacent hospital areas or opening windows or doors that would allow airborne contaminants into adjacent hospital areas.
- G. Exterior Work: Direct exhaust from equipment away from building air intakes; assure that filters on building air intakes are operational and protected from excessive amounts of airborne contaminants.
- H. Any ceiling access panels opened for investigation beyond sealed areas shall be replaced immediately when unattended.
 - 1. Whenever access panels are opened in occupied areas, for work above ceilings, provide portable enclosure enclosing ladder and sealing off opening, fitted tight to ceiling as specified.

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- I. Provide thorough cleaning of existing surfaces which become exposed to dust, before start of Owner's room occupancy, as described in Use of Premises – Clean Conditions in Section 011100.
 - J. Removal of construction barriers and ceiling protection shall be done carefully, possibly outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.
 - K. All vacuuming outside areas not under negative pressure shall be with a certified, Owner approved, HEPA-filtered vacuum.

3.5 AIRBORNE CONTAMINANT CONTROL ENCLOSURES AND BARRIERS

- A. Install dustproof enclosures for work as indicated and when required to protect areas occupied by the Owner from dust, debris and damage.
 - 1. Construction must be conducted in tight enclosures cutting off any flow of dust particles into patient areas.
- B. It is the Contractor's responsibility to determine when a dust proof enclosure is required to protect any adjoining area; however, provide a dustproof enclosure where indicated and whenever requested by the Owner.
- C. Airborne Contaminant Control General Requirements: Floor to structure, air-tight enclosures, drywall barriers, using tape and foam padding.
 - 1. Traffic between Containment Areas and open areas shall be kept to a minimum. Keep door to such areas closed at all times. Transport materials and refuse into an area from an external site without violating patient care areas by transporting in covered containers.
 - 2. Provide negative pressure in construction area as specified herein.
 - 3. Provide adequate forced ventilation of enclosed areas to cure installed materials, to prevent excessive humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
- D. Dustproof Enclosures: Full height, noncombustible construction, with minimum 1/2 inch gypsum board both sides with 3-1/2 inch R-11 insulation batts to reduce noise. Use 3- inch wide duct tape to tightly seal top, bottom, and all seams, to prevent spread of dust to occupied areas, including above ceiling.
 - 1. Enclosure Doors: 4'-0" minimum width, unless shown otherwise, solid core wood with metal frame and hardware, including closer, tightly weatherstripped to prevent flow of dust. Locate as directed and swing into construction area. Keep enclosures locked outside of working hours. Three keys for emergency access shall be furnished to the Owner.
 - 2. Obtain Owner's approval of exact location and details of enclosure construction. Materials for enclosure shall be precut in unoccupied areas. No explosive or pneumatic driven fasteners allowed. Provide entrance vestibules as detailed. Provide carpets inside vestibule and inside enclosures at door to vestibule, and keep vacuumed daily.
- E. Enclosure outside of work area (including spaces above furred ceilings): Whenever work is necessary outside of the construction enclosures, the space where work is being done, including ladders, shall be contained within a full height portable enclosure as specified herein. Contractor option: may use prefabricated unit specified herein.
 - 1. Work performed outside the construction enclosure shown on drawings, including all work in corridors and lobbies, shall be performed outside of normal working hours and shall be scheduled in advance with Owner except where specified otherwise.
 - 2. At no time shall any construction equipment or material be stored outside the construction enclosure.
 - 3. Dust tracked outside of construction area shall be cleaned up immediately. Contractor shall have the necessary manpower and equipment (dust and wet mops, brooms, buckets and clean wiping rags) to keep adjacent occupied areas clean at all times.
 - 4. Hospital Ceiling Access Procedures: Comply with hospital's access and notification policy as specified in this Section and note information on associated fines for lack of compliance.
- F. Power and Lighting: Provide sufficient temporary lighting and power ventilating equipment to ensure proper workmanship and safety everywhere.

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- G. Access Provisions: Provide ramps, stairs, ladders and similar temporary access elements as reasonably required to perform the work and facilitate its inspection during installation. Refer to Section 011419 for access to site.
- H. Where work occurs in occupied areas, the Contractor is responsible to provide access openings through existing plaster, or gypsum board walls, and acoustical ceilings and to restore walls and ceilings to original condition after work is complete and to insure dust control within access areas.
1. Provide temporary plywood panels anchored to existing steel ceiling support grid for support of workers crawling above ceiling. Panel thickness shall suit spans between existing steel support.
 2. Work provided outside the construction enclosures shown on drawings, including all work in corridors in occupied areas, shall be performed outside of normal working hours as described in Section 011419 – Use of Site.
- I. Remodeling work in certain rooms which serve other rooms, shall be coordinated and phased in with the phasing of the remodeled rooms if required, so that at no time are both rooms simultaneously inoperative. Any downtime necessitated by the remodeling work shall be fully discussed and coordinated with the Owner's representative in advance of the shutdown.
1. Dust: Generation of significant quantities of airborne dust will not be tolerated. Clean the work area prior to starting work as necessary to minimize existing dust which may become airborne during construction. Provide drop cloths and dust partitions as necessary to contain dust and debris generated by the work.
 2. Demolition material and dust and dirt shall be removed in tightly sealed, covered, rubber tired plastic dump carts. Containers shall be fitted with clean polyethylene covers, completely sealed at perimeter by wire tying or taping. Before leaving area all containers shall be wiped clean to prevent tracking of dust. Place rugs inside barrier entrance, keep them clean or changed daily. Provide debris chutes if required as specified in Section 017329 - Cutting and Patching and Section 024119 – Selective Demolition..
 3. Hot Processes: Hot processes, particularly welding and flame cutting, which generate significant quantities of smoke pose a special concern. These processes have the potential of setting off the building fire alarm system which automatically calls the Fire Department as well as disrupting the Owner's operations. Therefore, all work involving hot processes shall be scheduled with the Owner's system deactivated. Refer to requirements in Section 013100 – Project Management and Coordination.
 4. Portable vinyl tunnel or a polyethylene enclosure shall be used for a single ceiling access. The enclosures opening shall have a 3 foot overlap of plastic to decrease risk of airborne dust.
- J. The portable vinyl tunnel if used, or portable enclosure as specified shall remain in place until the ceiling is secured (all accesses closed).
1. If the access is larger than the vinyl tunnel, a portable polyethylene enclosure also enclosing the ladder shall be used. The enclosures opening shall have a 2 foot overlap of plastic to decrease risk of airborne dust.
 2. Polyethylene enclosures/barriers must be held in place to walls and floor with the use of tape. The seam on the ceiling shall be reinforced with a frame and flat head screws. All polyethylene shall be fire retardant type.
 3. If the Contractor needs to crawl about pipes, ducts, or other building infrastructure to investigate a condition, use Additional Procedures, i.e., put on a mask, disposable white coverall and disposable shoe covers before going into the access. Afterwards, strip off the coverall, and shoe covers carefully, turning the coverall "inside-out", and deposit the mask, coverall, and shoe covers into a plastic trash bag inside the enclosure. This plastic trash bag shall be secured (tied off) and be discarded as directed by Owner's Representative and may not be discarded within any "patient care area".
 4. When the Contractor leaves the work site, the access, especially at ceiling, shall either be completely closed or protected by an appropriate barrier.
 5. In patient care areas, the apparatus (tunnel or enclosure) shall be dismantled, and access, (ceiling panels), or remodeling of access completed at the end of each day.
 6. Thorough cleaning of surfaces which become exposed to dust shall be accomplished before leaving the job site. The cleaning can be accomplished by the use of either a HEPA filtered vacuum cleaner or damp mop.

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- K. Comply with applicable requirements specified in the Mechanical and Electrical Divisions.

3.6 ENFORCEMENT AND FINES

- A. Process: Failure to maintain containment areas can result in issuance of written warning; if situation is not corrected within eight (8) hours of receipt of warning, Owner will have cause to stop the work as provided in Article 2.3 of the General Conditions.
 - 1. Failure of Contractor to correct deficiencies in containment will result in corrective action taken by the Owner and deducting all cost from the Contractor.
 - 2. Ceiling Access: Each breach of ceiling access policy will cost violators \$500.00 for each occurrence.
- B. The following will be performed by Owner's representative:
 - 1. Periodic Rounds - a photograph will be taken to document each violation.
 - 2. Contractor/Department information will be extracted from the ceiling work tag.
 - 3. A record of all violations of required ceiling access procedures will be maintained, whether in occupied area or not.

3.7 INSTALLATION - GENERAL

- A. Provide waste receptacles in work area for disposal of food and other waste.
- B. Advise the Owner of operations that might affect persons above, below, or in adjacent rooms by generation of contaminants or noise. Proceed only with approval of Owner's Representative.
 - 1. Institute pest control procedures (if required) where directed by Owner.
 - 2. Owner may do air quality monitoring during both interior and exterior Work.
 - a. If counts are too high the work will be shut down and sealing of opening will occur.
 - b. Monitoring will occur when duct tie-ins are made to return air duct, before, during and after each tie in is made.
 - c. Owner will also check air quality with particle counter after balancing of HVAC systems.
 - d. Smoke stick monitoring may occur to assure clean to dirty airflow in critical patient use areas and rooms.

3.8 MOVING AND STORAGE OF MATERIALS (REFER ALSO TO SECTION 015200)

- A. All construction materials and equipment shall enter the building in accordance with the Hospital/Clinic loading/unloading plan and may be transported through the corridors to the work site.
 - 1. Possible points of access to the spaces through the ceilings will be considered so long as their use does not block fire exits or interrupt the Owner's operations.
- B. Do not leave materials or equipment in the corridors or stairs as this will block the necessary exit passages.
- C. Any materials or equipment to be supplied by outside vendors but installed by the Contractor, or the subcontractors, shall be delivered to the loading dock by others and transported from the dock to the work site by the contractor working under this contract.

3.9 EXTERIOR WORK

- A. Maintain the smoke and fire integrity of the building at all times. Do not block doors in smoke or fire rated partitions open except as necessary to move materials.
 - 1. Check to be sure that all doors are closed prior to leaving the work area.
 - a. Seal outside of windows near exterior work areas to prevent infiltration.
 - b. Direct exhaust away from building and building air intakes.
 - 2. Building demolition shall not occur unless building air intake filters are properly installed and operational.
- B. Openings may be required for movement of material in some spaces. Close any such openings with temporary closures when not actually being used.
 - 1. Promptly patch any other openings created in the smoke and fire rated partitions.

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- C. Prior to completion of the project, permanently repair all openings created in any fire or smoke barrier in a manner satisfactory to the Architect/Owner.
 - D. Prior to completion of the project, permanently repair all damage to the fire and heat resistive coatings covering the structural members of the building.
 - 1. This repair work shall be accomplished in a manner satisfactory to the Architect/Owner.

3.10 INTERIOR WORK

- A. Enclose work that involves demolition of walls, floors, or ceilings with sheathing on the construction side of the framing.
 - 1. Enclosures shall be continuous from floor to ceiling and wall to wall, and shall extend from the upper surface of the ceiling to the deck above.
 - a. Seal joints and perimeter with caulk or duct tape.
 - 2. Sealing doors and other openings with duct tape at head, jamb, and sill may contain contaminants from work that occurs within a single room.
 - 3. All air should flow from clean area to dirty area. Control should be implemented utilizing exhaust building ventilation or window exhaust.
 - 4. Exhaust ductwork may need to be sealed to prevent infiltration of airborne contaminants into recirculation system.
 - a. Work above ceilings may be contained with temporary enclosures with plastic sheet where approved by the Owner. Seal seams and perimeter with duct tape; repair breaks immediately.
- B. Windows within construction zone should not be opened during construction, unless with a fan for exhaust ventilation.
 - 1. After hours all windows should be closed or the fan should run constantly until seals occur which will prevent outside air infiltration.
 - 2. No shut down of ventilation systems shall occur unless notification in writing has been submitted to Owner.
- C. To maintain clean air, place, operate, and maintain HEPA filtered area air scrubbers as approved by the Department of Health and Safety.
- D. Damp mop hard surface floors in work area daily to minimize tracking of contaminants from work area.
 - 1. In carpeted areas, protect carpet with plastic and plywood; provide hard surfaced area at entrances for daily damp mopping.

3.11 INTERFERENCE WITH THE OWNER'S OPERATIONS

- A. Throughout the construction process the Owner's personnel, clients and equipment will be occupying the spaces nearby or below the work areas. The Owner intends to conduct normal operations on its normal business schedule.
 - 1. Some disruption due to noise and dust is expected; however, arrange the construction work to minimize its effect on the Owner's operations.
 - 2. The following areas are of particular concern.
 - a. Noise: Some noise is expected. However, operation requiring prolonged periods of noise which continually interfere with normal conversation, telephone usage and similar activities will have to be limited to a small portion of the day.
 - b. Dust: Generation of significant quantities of airborne dust will not be tolerated. Clean the work area prior to starting work as necessary to minimize existing dust which may become airborne during construction. Provide drop cloths and dust partitions as necessary to contain dust and debris generated by the work. Refer to Section 015200.
 - c. Hot Processes: Hot processes, particularly welding and flame cutting, which generate significant quantities of smoke, pose a special concern. These processes have the potential of setting off the building fire alarm system that automatically calls the Fire Department as well as disrupting the Owner's operations. Therefore, all work involving hot processes must be scheduled with the Owner's system deactivated.

3.12 CLEANUP

- A. At the end of each workday remove all scrap material and construction debris from the site. It is Contractor's responsibility to provide a dumpster or container in an approved location and keep dumpster area neat, clean and have unit emptied when necessary. Do not use clinic's waste containers/compactors for any construction/demolition debris. Refer to Section 017700.

END OF SECTION

SECTION 014100 HCAI ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for construction as required by the California Administrative Code.
- B. Unless otherwise specified, specific references to codes, regulations, standards, manufacturers' instructions, or requirements of regulatory agencies, when used to specify requirements for materials or design elements, shall mean the latest edition of each in effect at the date of application for permit.

1.2 REFERENCES AND DEFINITIONS

- A. 2019 California Building Standards Code, California Administrative Code (CAC), Title 24, Part 1, Chapter 7, Safety Standards for Health Facilities.
- B. California Department of Health Care Access and Information (HCAI).
- C. HCAI Code Application Notice (CAN).

1.3 DEFERRED SUBMITTALS

- A. Deferred submittals shall be in accordance with CAC, Section 7-126.
- B. Architect, Contractor, and HCAI Representatives shall meet to review Contractor-provided submittal schedule for HCAI's concurrence with schedule.
- C. Shop Drawings for Specific Deferred Approval Items:
 - 1. Contractor shall submit deferred approval items to Architect for review and comment.
 - a. Shop Drawings for deferred approval items shall be prepared, signed, and sealed by an engineer licensed to practice in the State of California.
 - 2. Contractor shall revise and resubmit as required and incorporate code-required modifications into submittal at no additional cost or time.
 - 3. Architect will review Contractor's incorporation of code-required changes.
 - 4. Architect will, upon acceptance of shop drawings, submit drawings to HCAI.
 - 5. Contractor shall allow a minimum of 60 days for review of deferred approvals by HCAI.
- D. Fabrication and installation of deferred approval items shall not start until approved by HCAI.

1.4 NOTICE OF START OF CONSTRUCTION

- A. HCAI shall be notified by the governing board or authority of the health facility on start of construction in accordance with CAC, Section 7-137.

1.5 ADMINISTRATION OF CONSTRUCTION

- A. Administration of construction shall be in accordance with CAC, Section 7-141.

1.6 VERIFIED COMPLIANCE REPORTS

- A. Contractor shall submit verified reports in accordance with CAC, Section 7-143 and Section 7-151.
 - 1. Submission will be required from Architect, Contractor/Owner, Structural Engineer, Mechanical Engineer, Electrical Engineer, and Project Representative (Inspector).
 - 2. Laboratory and test reports will be required from Testing Laboratory and Testing Agency.

1.7 CHANGES TO THE APPROVED WORK

- A. Changes to the approved work shall be in accordance with CAC, Section 7-153 and CAN 1-7-153.
 - 1. Changes or alterations of the approved construction documents shall be made by means of amended construction documents.
 - 2. Only changes that materially alter the Work, as defined in CAN 1-7-153, shall be submitted to HCAI for review and approval as amended construction documents.
 - 3. Documentation of Changes: Architect or Engineer in responsible charge shall maintain a log of all changes to the work of construction. The log shall be maintained on the project site as part of Inspector's field records.

1.8 FINAL APPROVAL OF THE WORK

- A. Procedures for final approval of the Work shall be in accordance with CAC, Section 7-155.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 014500 QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Procedures to measure and report the quality and performance of construction.
 - 2. Administrative and procedural requirements for quality assurance and quality control.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: 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.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data : For Contractor's quality-control personnel.
- B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.

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4. Identification of applicable standards.
 5. Identification of test and inspection methods.
 6. Number of tests and inspections required.
 7. Time schedule or time span for tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.

1.4 QUALITY ASSURANCE

- A. Comply with requirements of ASTM E329 and ASTM D3740.
- B. Laboratory shall maintain a full-time registered Engineer on staff to review services.
- C. Laboratory authorized to operate in State in which Project is located.
- D. Testing equipment shall be calibrated at reasonable intervals with devices of an accuracy traceable to either NBS Standards or accepted values of natural physical constants.
- E. QUALIFICATIONS: "Approved independent testing laboratory" shall mean an independent testing agency acceptable to the Owner and the Architect and possessing the professional qualifications and equipment to perform the specified tests and to evaluate and report the results.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 SPECIAL TESTS AND INSPECTIONS

- A. Unless otherwise provided in the specifications, provide all materials, samples, mock-ups or assemblies for all tests specified in various sections of specifications, or as directed by the Architect, and pay shipping costs of such samples to laboratory or other testing location and facility.
 1. Unless specified otherwise, all tests shall be made by an approved independent testing laboratory and reports provided to Architect.
- B. Tests shall be provided and accomplished in accordance with the standard used as the reference for the particular material or product, unless other test methods or criteria are specified.
- C. In the absence of a referenced standard, tests shall be accomplished in accordance with applicable ASTM Standards or Test Methods, current at the date of the Contract Documents.

3.2 PAYMENT FOR TESTS

- A. Except for the types of tests specified as being paid for by the Owner, the cost of other tests shall be paid by the Contractor. Tests to be paid for by the Owner will be paid directly to the testing laboratory by the Owner.
- B. The Owner will not pay for tests to determine if a proposed material will initially meet the specified requirements, which will include but not be limited to, analysis of paving aggregate, paving mix designs, and similar tests.
- C. In general, it is intended the Owner will pay for those field tests to determine the quality of materials and quality of installation at site. The following is the list of the type of tests the Owner will pay for, where tests are specified or later determined as necessary:
 1. concrete compressive strength
 2. concrete air entrainment
 3. soil compaction
 4. structural steel field welds
 5. structural steel bolting
 6. welding or brazing of piping
 7. paving samples

3.3 TESTS TO DEMONSTRATE QUALIFICATION

- A. In addition to tests specified, should the Contractor propose a product, material, method or assembly that is of unknown or questionable quality to the Architect, the Architect may require and order suitable tests to establish a basis for acceptance or rejection.
 - 1. Such tests will be paid for by the Contractor, or by the Subcontractor requesting approval. "Standard" test reports on "similar" material will not be acceptable.
- B. The Owner and Architect reserve the right to require certification or other proof that the material, assembly, equipment, system or other product furnished or proposed to be furnished, for this Project is in compliance with any test or standard called for.
 - 1. The certificate shall be signed by a representative of the independent testing laboratory.
- C. Any tests required to qualify the Contractor or any workmen for any phase of the work, and any test of a method, system or equipment that may be required by specification or law to qualify the item for use, shall be made or taken without additional reimbursement.
- D. If exploratory work is required to determine the cause of defects, the cost of such work shall be borne by the Contractor responsible for such work if the work is found, in the judgement of the Architect to be defective.
 - 1. If the Contractor responsible for the work is adjudged by the Architect to be not at fault, exploratory testing will be paid by the Owner.

3.4 INSPECTIONS

- A. Should the specifications, Architect's instruction, laws, ordinances or any public authority require any work to be inspected or approved, give timely notice of its readiness for inspection and a reasonable date fixed for such inspection. If any work requiring inspection should be covered up without approval or consent of the approving agency, it must be uncovered for examination at Contractor's expense.

3.5 CERTIFICATES

- A. Except for test reports provided and signed by approved independent testing laboratories, all certificates required by the specification shall be signed by an authorized official of the firm providing the certificate, with the signature notarized, when such certificates by the producer are acceptable to the Architect.

3.6 RETEST RESPONSIBILITY

- A. Where results of required inspections, tests or similar prove unsatisfactory and do not indicate compliance of related work with requirements of the contract documents, then retests are responsibility of Contractor, regardless of whether original test was Contractor's responsibility.
- B. Retesting of work revised or replaced by Contractor is Contractor's responsibility, where required tests were performed on original work.

3.7 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 015000 TEMPORARY FACILITIES & CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 USE CHARGES

- A. General: Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, **[Owner's construction forces,]** Architect, **[occupants of Project,]** testing agencies, and authorities having jurisdiction.
- B. Sewer Service: **[Pay] [Owner will pay]** sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: **[Pay] [Owner will pay]** water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: **[Pay] [Owner will pay]** electric-power-service use charges for electricity used by all entities for construction operations.
- E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use **[with metering] [without metering and without payment of use charges]**. Provide connections and extensions of services **[and metering]** as required for construction operations.
- F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use **[with metering] [without metering and without payment of use charges]**. Provide connections and extensions of services **[and metering]** as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- C. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
 - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 - 3. Indicate methods to be used to avoid trapping water in finished work.
- D. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.

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3. Location of proposed air-filtration system discharge.
 4. Other dust-control measures.

1.4 QUALITY ASSURANCE

- A. Pre-Construction Conference: Special project procedures and controls, and coordination of Work at Owner-occupied spaces will be included on the agenda for an on-site pre-construction conference, scheduled and conducted by Owner or Architect. Refer to Section 013100 - Project Management and Coordination.
- B. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 1. Building code requirements.
 2. Health and safety regulations.
 3. Utility company regulations.
 4. Police, fire department and rescue squad rules.
 5. Environmental protection regulations.
- C. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with normal application of trade regulations and union jurisdictions.
- D. Standards:
 1. NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations,"
 2. ANSI A10 Series standards for "Safety Requirements for Construction and Demolition,"
 3. NECA Electrical Design Library "Temporary Electrical Facilities."
- E. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- F. Tests and Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.
- G. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and CBC.

1.5 PROJECT CONDITIONS

- A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At earliest possible time when acceptable to Owner, change over from use of temporary service to use of permanent service.
 1. Temporary Use of Permanent Facilities: Assume responsibility for operation, maintenance, and protection of permanent facility during use as a construction facility prior to Owner's acceptance, regardless of previously assigned responsibilities.
- B. Condition of Use: Keep temporary services clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services as the Work progresses. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on site.

1.6 WORK AT OWNER-OCCUPIED SPACES

- A. Throughout the construction process the Owner's personnel and visitors will occupy spaces within and nearby construction areas. The Owner recognizes that some disruption to normal operations will occur as scheduled and coordinated with Contractor in advance of activities.
 1. Owner intends to remain open to the public and to conduct normal operations during normal hours of operation.
 2. Cooperate with Owner during construction operations to minimize conflicts and to facilitate Owner usage.
 3. Perform work in occupied areas in a manner and at such time as will not significantly interfere with, hamper or inconvenience Owner's program or functions.

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4. After Owner's occupancy (full or partial) of Project or portion thereof, work remaining to be accomplished in the occupied spaces shall be done in cooperation with, and approval by, Owner and scheduled in advance with Owner.
- B. Dust: Obtain approval of Owner before performing operations that generate dust and other contaminants that may be drawn into building air intakes.
1. Prevent dust, fumes, and odors from entering occupied areas.
 2. Before beginning excavation or exterior demolition, verify proper installation and operation of building air intake filters with Owner's Representative.
 3. Prior to start of work, clean work area as necessary to minimize dust which may become airborne.
 4. Provide drop cloths and dust partitions as necessary to contain dust and debris generated by the work.
- C. Construction Noise Control: Limit duration of operations that create high levels of noise. Coordinate and schedule such work to minimize disruption to Owner's operations.
1. Attempt to implement the following construction noise mitigation measures on this Project:
 - a. Equip internal combustion engine-driven construction equipment with good condition best available mufflers. Use quiet electric-powered compressors and generators.
 - b. Use welded rather than T.C. bolted steel connections when possible to minimize use of impact wrenches.
 - c. Erect barriers around noise generating operations.
 - d. Turn off engines and compressors when not in operation; no idling.
 - e. Limit noise generating construction activities to times between **[7:30 am and 3:30 pm]**.
 - f. Define truck routes to confine noisy trucks to streets that currently have the heaviest traffic. Develop a truck staging area away from acoustically sensitive areas.
 - g. Pre-cut metal decks and metal studs off site to minimize on-site sawing.
 - h. Avoid hammer drilling; use coring bits, instead. Avoid using power-actuated fasteners; use concrete screws, instead. Avoid sand blasting.
 - i. Avoid sheet metal debris chutes; use plastic chutes, instead.
 2. Contractor is responsible for site supervision of potential sources of noise (e.g., material delivery, shouting, debris box pick-up and delivery) for all trades. Maintain awareness among trades of noise sensitivity of Project
- D. Heat Generating Processes: Welding and other processes that generate significant quantities of smoke have the potential to activate the existing fire alarm system, which automatically calls the Fire Department and may disrupt Owner's operations. Coordinate with Owner.

1.7 ENVIRONMENTAL CONTROLS

- A. Temperature and Humidity Control: Maintain steady ambient temperature and relative humidity levels. Rapid fluctuation in temperature or humidity may be harmful to installed and stored materials and is not allowed.
1. Temperature: Maintain constant temperature of 70 degrees F.
 2. Relative Humidity: Maintain relative humidity 30-50 percent.
 - a. Allowable Fluctuation: Not to exceed 5 percent fluctuation over any portion of a 7-day period and not to exceed 10 percent fluctuation over any portion of a 28-day period.
 3. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis to avoid harmful effects of rapidly fluctuating ambient levels.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials.
1. Upon written request to the Owner, used materials may be used if in the opinion of the Owner they are in serviceable condition and if accepted by the Owner.
- B. Lumber and Plywood: Comply with Section 061000 - Rough Carpentry, for requirements.

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1. UL labeled, lumber and plywood for framing, sheathing and siding.
 2. Exterior type, Grade BB high density concrete form overlay plywood for signs and directory boards.
- C. Paint: Comply with Section 099000 – Painting, for requirements.
- D. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails.
- E. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide concrete bases for supporting posts.
- F. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- G. Fire-rated Partitions for Temporary Enclosure: Provide rated gypsum board wall construction meeting requirements of local jurisdiction for use as temporary enclosure.
- H. Tarpaulins: Waterproof, fire-resistant, UL-labeled tarpaulins with flame spread rating of 15 or less. Provide translucent, nylon-reinforced laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins certified as conforming to the test results of test method 2 contained in NFPA 701, entitled Standard Method of fire Tests for Flame Propagation of Textiles and Films unless local jurisdiction accepts test method 1 of NFPA 701 or requires other materials.
- I. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.

2.2 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Field Offices: Owner will provide conditioned interior space for field offices **[for duration of Project] [upon completion of demolition and enclosure]**.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. General: Provide new equipment. Undamaged, previously used equipment in serviceable condition may be used.
- B. Water-Hoses: Provide 3/4 inch heavy-duty abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- F. Heating Units and Ventilation: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

PART 3 - EXECUTION

3.1 GENERAL

- A. Site Storage: Cooperate and coordinate use of available areas effectively and within sequence of Work. Owner will establish and govern use of the available space, with consideration to the needs of the subcontractors to work effectively on the site.
- B. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities **[is not permitted] [will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use]**.
- C. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class ABC, dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for possible exposures encountered.
- D. Security: Coordinate with Owner for security protocol.
- E. Parking: **[Provide temporary offsite] [Use designated areas of Owner's existing]** parking areas for construction personnel .
- F. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- G. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- H. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- I. Routing: For removal of debris and delivery of new materials to the site, coordinate with Owner or Owner's Representative.
- J. Waste Disposal: The Owner will identify location of dumpster on site. Coordinate with Owner waste evacuation route through facility and disposal.
- K. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- L. Temporary Elevator Use: **[Use of elevators is not permitted] [See Division 14 elevator Section for temporary use of new elevators]**.
- M. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
 - 1. Do not load elevators beyond their rated weight capacity.
 - 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work, so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

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- N. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
 - O. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.
 - P. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.2 TEMPORARY ENCLOSURES

- A. Interior Temporary Enclosures: It is the Contractors responsibility to determine when dust proof enclosure is required to protect adjoining area; however, provide dustproof enclosure whenever requested by Owner for this project.
 - 1. Provide floor to ceiling, airtight enclosures, drywall or plastic barriers, using tape, foam padding or spackling.
 - 2. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
 - 3. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant treated plywood.
- B. Building Envelope Temporary Enclosures: Provide temporary weather-tight enclosures for protection from exposure, foul weather, and other construction operations.
 - 1. Protect openings in exterior walls and roofs so as to prevent damage from water, ultraviolet light and the elements.
 - 2. Provide protection from elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.
 - 3. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated enclosure with continuous vapor barrier.
 - 4. Tarpaulins: Provide waterproof, fire-retardant, translucent, nylon-reinforced laminated polyethylene tarpaulins; with UL-labeled flame-spread rating of 15 or less per ASTM E 84; and in accordance with NFPA 701 Test Method 2; or as required by local jurisdiction.

3.3 TEMPORARY FIRE PROTECTION

- A. Temporary Fire Protection: Comply with NFPA 241. Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses.
 - 1. Review emergency fire suppression procedures with Owner.
 - 2. Instruct personnel in methods and procedures.
 - 3. Post warnings and information.
 - 4. Coordinate with Owner for work involving hot processes with potential of setting off the building fire alarm system.
 - 5. Supervise welding operations and similar sources of fire ignition according to requirements of authorities having jurisdiction. Station fire-extinguishers in immediate reach of workers who are performing welding work.
 - 6. Verify that electric power tools are disconnected from power source when not in use and at end of work day.
- B. Fire Extinguishers: Except for units in individual Contractors' offices, provide and maintain adequate and proper fire extinguishing devices in and about construction area, available for use by workers.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
 - 2. Devices shall not be units to be later installed in Project.

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3. Provide appropriate devices for class of the potential hazard (e.g. oil, electrical) at those areas where unusual hazards may exist, including in mechanical rooms.
 4. As construction proceeds, or materials which create a hazard are moved onto various floors, extinguishing devices shall be available on each floor.
 5. Number and distribution of devices shall be adequate for effective fire control, to satisfaction of Fire Safety Director and Owner.
- C. Sprinkler System: As soon as practicable and as construction progress permits, Mechanical Subcontractor will complete installation of sprinkler system.
1. Systems shall be made operative as soon as practicable, by floors if necessary, to help prevent serious fires.
- D. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or highly combustible materials, including welding, torch-cutting, soldering, brazing, paint removal with heat, or other operations where open flames or implements utilizing high heat or combustible solvents and chemicals are anticipated.
1. Obtain Owner's approval for operations involving use of welding or other high-heat equipment. Notify Owner at least seventy-two hours before each occurrence, indicating location of such work.
 2. Use of open-flame equipment is not permitted.
 3. Use of combustion heating units is not permitted.
 4. As far as practical, restrict heat-generating equipment to shop areas or outside the building.
 5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
 6. Verify that heat generating equipment is powered off and disconnected from power source when not in use and at end of work day.
- E. Existing Fire Alarm System: The Owner maintains a fire alarm system throughout the building. When pull boxes, smoke detectors, flow switches and alarms are activated, the Owner's fire emergency procedures will be implemented.
1. Any activity that produces dust or smoke should be reported to Owner in advance so they can temporarily disable the particular alarm to prevent accidental triggering of smoke alarms. This is also true of any activity that might activate a flow alarm.
 2. If a fire does occur in a construction area, the fire alarm system should be activated. This can be done by activating a pull box in the area.
 3. When an alarm condition exists, cease all activities and abide by Owner's or fire department instructions until the alarm condition is cleared.

3.4 SECURITY AND ACCESS

- A. Security: Coordinate with Owner for security protocol.
1. Owner's security control room must remain operational at all times during construction.
 2. Coordinate with Owner's security director in advance of any breach of the perimeter of the existing building.
- B. Security Enclosure and Lockup: Install temporary secure enclosure before construction operations begin in a manner that prevents people from easily entering the construction area except by designated entrances.
1. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
 2. Lock entrances at end of each work day.
 3. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
- C. Access to Restricted Areas: Access may be obtained as necessary by contacting the Owner's Representative in advance.
1. The Contractor will be issued keys as necessary for access to the work and storage areas and will be held responsible for their security and return when no longer needed.

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- a. Should re-keying become necessary due to the Contractor's actions the cost thereof will be billed to the Contractor.
 - D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
 - E. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

3.5 OCCUPANT AND VISITOR SAFETY

- A. The Contractor shall take all necessary precautions to prevent injury to the public, visitors, building occupants, and to prevent damage to property of others.
- B. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
 - 1. Whenever practicable, the work area shall be fenced, barricaded, or otherwise blocked off from the public or building occupants to prevent unauthorized entry into the work area.
 - 2. When the nature of the work prevents isolation of the work area and the public or building occupants may be in or pass through, under or over the work area, alternate precautions such as the posting of signs, the use of signal persons, the erection of barricades or similar protection around particularly hazardous operations shall be used as appropriate.
- C. Public Thoroughfare: When work is to be performed over a public thoroughfare such as a sidewalk, lobby, or corridor, the thoroughfare shall be closed, if possible, or other precautions taken such as the installation of screens or barricades. Coordinate with Owner.
- D. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

3.6 TEMPORARY USE OF AIR HANDLING SYSTEMS

- A. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- B. If permanent air handling systems are used for temporary heating or ventilating prior to completion of finishing operations, supply air systems must be operated with 100 percent outside air (no return air), with pre-filters and final filters in place and maintained. (Operation of air handling systems may not be possible during extreme outside air conditions.)
 - 1. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 - Closeout Procedures.
 - 2. Return air and exhaust air systems shall not be used, and duct openings shall have closures.
 - 3. If air handling systems are turned off, the supply duct openings shall have closures to preclude entry of construction dirt and debris.
- C. When building is substantially complete, permanent air handling systems may use return air with pre-filters and final filters in place. Take extraordinary measures to prevent dirt and/or moisture from entering duct systems.
 - 1. Filters: Mechanical subcontractor is responsible for providing, maintaining, cleaning and replacing filters, both temporary and permanent. Install new permanent filters just before Owner occupies or accepts Project.
 - 2. Install and maintain temporary filters during construction period, after enclosure, so that duct systems are protected from an accumulation of dirt or dust as a result of this Contract.
- D. Vacuum clean air handling units and system ducts, and wash equipment surfaces as may be necessary to restore systems to new condition prior to final acceptance by Owner.

3.7 WATER SERVICE

- A. Install water service and distribution piping of sizes and pressure adequate for construction until permanent water service is in use.
 - 1. Sterilization: Sterilize temporary water piping prior to use.
 - 2. Install backflow prevention equipment at site water connections.

3.8 ELECTRIC POWER SERVICE

- A. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.
 - 1. Contractor, and each subcontractor, will provide their own temporary wiring, cords, outlets, lamps, and connections. Installation, service, wiring and devices shall be safe, substantially supported and adequately connected.
 - 2. Demand shall not exceed service and damage resulting from misuse, faulty equipment or overloading shall be paid for by persons responsible.
 - 3. Wiring to job offices shall be responsibility of Contractor and each subcontractor, including for fixtures and bulbs.
- B. Energy costs and services for testing of equipment as well as for welders, grinders, pipe threaders and similar heavy loads requiring power greater than services specified shall be provided and paid for by Contractor or subcontractors requiring such service; they shall arrange their own service and meters.
 - 1. Subcontractor performing work at other than normal working hours shall reimburse Contractor for the light and power used.
- C. Building Service: Electrical subcontractor installs permanent primary and secondary systems after various units or parts are enclosed to use light and power through permanent service.
 - 1. Pay meter charge and for energy used.
- D. Service after Occupancy: Contractor will have meter read in presence of Owner and arrange with Owner to assume billing from utility. Owner will pay for energy costs and assume responsibility for bulbs upon occupancy.

3.9 TEMPORARY LIGHTING

- A. Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.10 CONSTRUCTION NOISE CONTROL

- A. Construction Noise Mitigation: Attempt to implement the following construction noise mitigation measures on this Project:
 - 1. Equip internal combustion engine-driven construction equipment with good condition best available mufflers. Use quiet electric-powered compressors and generators.
 - 2. Use welded rather than T.C. bolted steel connections when possible to minimize use of impact wrenches.
 - 3. Erect barriers around noise generating operations.
 - 4. Turn off engines and compressors when not in operation; no idling.
 - 5. Limit noise generating construction activities to times between **[7:30 am and 3:30 pm]**.
 - 6. Define truck routes to confine noisy trucks to streets that currently have the heaviest traffic. Develop a truck staging area away from acoustically sensitive areas.
 - 7. Pre-cut metal decks and metal studs off site to minimize on-site sawing.
 - 8. Avoid hammer drilling; use coring bits, instead. Avoid using power-actuated fasteners; use concrete screws, instead. Avoid sand blasting.

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- 9. Avoid sheet metal debris chutes; use plastic chutes, instead.
 - B. Contractor is responsible for site supervision of potential sources of noise (e.g., material delivery, shouting, debris box pick-up and delivery) for all trades. Maintain awareness among trades of noise sensitivity of Project

3.11 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard and replace stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.12 OPERATION, TERMINATION, AND REMOVAL

- A. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- B. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

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- C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired

3.13 CLEANING AND WASTE REMOVAL

- A. Progress Cleaning: Clean Project site and work areas daily, including common areas.
1. Coordinate progress cleaning for joint-use areas where more than one installer has worked.
 2. Work Areas: Clean areas where work is in progress to level of cleanliness necessary for proper execution of Work.
 3. Provide progress cleaning of common areas and coordinate progress cleaning of areas or pieces of equipment where more than one contractor has worked.
 4. During handling and installation, clean and protect construction in progress and adjoining materials already in place.
 5. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- B. Special Cleaning: Clean special areas and surfaces according to Owner's recommendations, using only cleaning materials specifically recommended, and that are not hazardous to health or property and that will not damage exposed surfaces.
- C. Final Cleaning: Refer to Section 017700 "Close-Out Procedures."

END OF SECTION

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SECTION 015717 CONSTRUCTION NOISE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Methods and procedures to protect building occupants and surrounding area from excessive noise associated with construction work, and are referred to as the Noise Control Policy.
- B. Related Sections:
 - 1. Section 015615 - Airborne Contaminants Control.

1.2 DEFINITION

- A. A-Weighting: A standard frequency weighting which is commonly employed to measure the loudness or "noisiness" of sounds. A-weighting filters the microphone signal in a manner which correlates better with the sensation of the human ear. A-weighting is required by regulation promulgated by the U.S. EPA, the California Department of Aeronautics, CalTrans, and others. A 10 dB increase in sound level is perceived by people to be twice as loud. All noise data herein are A-weighted. Usually the unit of A-weighted sound level is written as dBA.
- B. Ambient noise level: The total noise associated with a given environment, being usually a composite of normal or existing sounds from all sources near and far, excluding the noise source at issue.
- C. Daytime: The hours from 7 a.m. to 9 p.m. on weekdays and 9 a.m. to 9 p.m. on weekends and holidays.
- D. Nighttime: All non-daytime hours.
- E. Property line: The real or imaginary line along the ground surface and its vertical extension, which separates real property owned or controlled by one person from contiguous real property owned or controlled by another person or from any public right-of-way or from any public space.
- F. Receiving noise area: Any real property where people live or work and where noise is heard, excluding the project or source area.

1.3 QUALITY ASSURANCE

- A. References: San Francisco Noise Ordinance which prohibits the operation of equipment that emits noise in excess of 85 dBA when measured at a distance of 100 feet.
- B. Enforcement: Monitor noise levels through measurements to establish levels in excess of 85 dBA at 50 feet, and implementing additional mitigation procedures based on recommendations of acoustical consultant.

1.4 SCHEDULING

- A. Schedule construction work generating severe levels of noise in advance, and set times as required and determined acceptable by Owner.

PART 2 - PRODUCTS

2.1 CONSTRUCTION NOISE ASSESSMENT

- A. Construction Noise levels at a distance of 50 feet for each phase of construction are shown below. Data are based on data for similar construction activities and published data.
- B. Construction Noise levels at a distance of 50 feet for each phase of construction are shown below. Data are based on data for similar construction activities and published data.

NOISE LEVELS GENERATED BY CONSTRUCTION ACTIVITIES AT 50 FEET.

L_{eq} (dBA) L_{max} (dBA).

Excavation:

Earthmoving	90	95-100.
Excavation	90	95-100.
Grading	80	85-90.

Foundation:

Earth Drilling	90	95-100.
Concrete Pouring	85	90-95.

Erection:

Framing with impact wrenches	95	100-105.
Framing without impact wrenches	85	90-95.

Pre-Construction 90 95- .

NOISE LEVELS GENERATED BY CONSTRUCTION ACTIVITIES AT 50 FEET.

Excavation:	L _{eq} (dBA)	LL _{max} (dBA).
Earthmoving	90	95-100.
Excavation.	90	95-100
Grading.	80	85-90
Foundation:		
Earth Drilling	90	95-100.
Erection:		
Concrete Pouring	85	90-95.
Framing with impact wrenches.	95	100-105
Framing without impact wrenches	85	90-95.
Pre-Construction	90	95- .

PART 3 - EXECUTION

3.1 MITIGATION

- A. Construction Noise Mitigation: Attempt to implement the following construction noise mitigation measures on this Project:
1. Equip internal combustion engine-driven construction equipment with good condition best available mufflers. Use quiet electric-powered compressors and generators.
 2. Use welded rather than T.C. bolted steel connections when possible to minimize use of impact wrenches.
 3. Erect barriers around noise generating operations.
 4. Turn off engines and compressors when not in operation; no idling.
 5. Limit noise generating construction activities to times between 7:30 am and 3:30 pm.
 6. Avoid blasting activities. Use ball and crane demolition techniques.
 7. Define truck routes to confine noisy trucks to streets that currently have the heaviest traffic. Develop a truck staging area away from acoustically sensitive areas.
 8. Use and electric-powered tower crane instead of a diesel-powered truck crane.
 9. Use steel structural frames in lieu of concrete structural frames to yield a much shorter assembly time.

10. Pre-cut metal decks and metal studs off site to minimize on-site sawing.
 11. For excavation, use drilled soldier piles with wood lagging instead of sheet pile driving techniques where possible. Avoid impact pile driving.
 12. Retain an acoustical consultant to provide assistance with developing additional noise attenuation techniques where needed.
 13. Chemically demolish concrete where possible.
 14. Avoid hammer drilling; use coring bits, instead. Avoid using power-actuated fasteners; use concrete screws, instead. Avoid sand blasting.
 15. Avoid sheet metal debris chutes; use plastic chutes, instead.
- B. Contractor is responsible for site supervision of potential sources of noise (e.g., material delivery, shouting, debris box pick-up and delivery) for all trades. Maintain awareness among trades of noise sensitivity of Project.
- C. Enforcement of Noise Control Policy:
1. Measurements will be taken on an unscheduled basis to document noise levels.
 2. Information will be noted and transmitted to Contractor.
 3. A record of noise violations will be maintained.

3.2 NOISE MANAGEMENT

- A. Noise Control: Perform **[deconstruction]** **[renovation]** **[construction]** operations to minimize noise. Perform noise-producing work in less sensitive hours of the day or week as directed by Owner.
- B. Repetitive and/or intermittent, high-level noise: Permitted only during Daytime.
1. Do not exceed the following dB limitations:

<u>Sound Level in dB</u>	<u>Time Duration of Impact Noise</u>
70	More than 12 minutes in any hour
80	More than 3 minutes in any hour

2. Provide equipment, sound-deadening devices, and take noise abatement measures that are necessary for compliance.
3. Maximum permissible construction equipment noise levels at 50 feet (dB):

<u>EARTHMOVING</u>	<u>dB</u>	<u>MATERIALS HANDLING</u>	<u>dB</u>
Front Loaders	75	Concrete Mixers	75
Backhoes	75	Concrete Pumps	75
Dozers	75	Cranes	75
Tractors	75	Derricks Impact	75
Scrapers	80	Pile Drivers	95
Graders	75	Jack Hammers	75
Trucks	75	Rock Drills	80
Pavers, Stationary	80	Pneumatic Tools	80
Pumps	75	Saws	75
Generators	75	Vibrators	75
Compressors	75		

- C. Ambient Noise:
1. Maximum noise levels (dB) for receiving noise area at property line shall be as follows:
 - a. Residential receiving area: Daytime 65 dB / Nighttime 60 dB
 - b. Commercial/Industrial receiving area: Daytime 67 dB / Nighttime 65 dB
 2. In the event the existing local ambient noise level exceeds the maximum allowable receiving noise level (dB), the receiving noise level maximum for construction operations shall be adjusted as follows:
 - a. Residential receiving area: Maximum 3 additional dB above the local ambient as measured at property line.

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- b. Commercial/Industrial receiving area: Maximum 5 additional dB above the local ambient as measured at the property line.

3.3 FIELD QUALITY CONTROL

- A. Assess potential effects of construction noise on [adjacent neighbors] [facility occupants] in accordance with ASTM E1686 and as follows:
 - 1. Ambient noise measurement: Measure at the property line at a height of at least four (4) feet above the immediate surrounding surface. Average the ambient noise level over a period of at least 15 minutes.
 - 2. Ambient noise measurement at urban sites: Conduct during morning peak traffic hour between 7 A.M. and 9 A.M. and afternoon peak traffic hour between 4 P.M. and 6 P.M. In addition, conduct a 24-hour measurement at the proposed project site to document the noise pattern throughout the day. Adjust and weight for seasonal and climatic variations.
- B. Monitor noise produced from construction operations in accordance with ASTM E1780.

END OF SECTION

SECTION 016000 PRODUCT REQUIREMENTS AND SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Procedures, requirements and limitations for considering substitutions.
 2. Criteria for selecting product options and substitutions.
 3. Administrative and procedural requirements for selection of products for use in Project.
 4. Product delivery, storage, and handling.
 5. Manufacturers' standard warranties special warranties.
 6. Equivalent products.
 7. Substitution requirements and procedures.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 3. Equivalent Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating equivalent products of additional manufacturers named in the specification.

1.3 SUBMITTALS

- A. Proposed Materials and Products List:
1. Submit within 10 working days after award of Contract and prior to procurement.
 2. Do not order materials or equipment until proposed list of materials is accepted.
 3. Materials and equipment are subject to Architect's and Owner's acceptance.
 4. Arrange list in order of specification sections and in form indicated by Architect/Engineer.
 - a. Items listed shall fully conform to project requirements and specifications.
 - b. Identify each material, product or equipment item by manufacturer and model and other identifying designations such as material identification abbreviations and equipment numbers, including those where only 1 material or product is specified.
 - c. Name products specified by reference standards, described by performance requirements and descriptive language.
 - d. Do not list "as specified."
 5. Where 2 or more makes or kinds of items are named in specifications (or additional names are listed in an addendum), state which particular make or kind of each item is to be provided.
 6. If list is not received within 10 working days, mechanical and electrical equipment under Divisions 21, 22, 23, 25, 26, 27, 28, 40, 41, 42, 43, 44, 45, and 48 will be as scheduled.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism.
 - 1. Comply with manufacturer's written instructions.
 - 2. Comply with requirements specified in individual Specification Sections.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. 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.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 6. Protect stored products from damage and liquids from freezing.

1.5 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Warranty Submittals: Comply with requirements in Section 017700 - Closeout Procedures and Section 017800 - Closeout Submittals.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Comply with General Conditions of the Contract for Construction.

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2. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 3. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 4. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 5. Where products are accompanied by the term "as selected," Architect will make selection.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 7. Provide pricing based on products listed in Contract Documents. Contract award is based on use of specified products or substitutions approved prior to bidding or pricing.
 - a. By execution of Contract, Contractor agrees and understands Work will be accomplished with products specified or accepted by substitution.
- B. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Equivalent products or substitutions for Contractor's convenience will not be considered.
1. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements.
 2. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements and is compatible with adjacent construction, as certified in writing by Manufacturers' of adjacent materials.
 3. Comply with requirements in "Equivalent Products" Article for consideration of an unnamed product.
- C. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Equivalent products or substitutions for Contractor's convenience will not be considered.
1. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 2. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements.
 3. Comply with requirements in "Equivalent Products" Article for consideration of an unnamed manufacturer's product.
- D. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a equivalent product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Equivalent Products" Article for consideration of an unnamed product by one of the other named manufacturers.
1. Reference to "Basis of Design" and a named specific product or manufacturer is intended to establish criteria for use of that product and manufacturer based on that products published information whether or not those criteria are explicitly stated in Specifications.
 2. Criteria may establish higher performance requirement than specified reference or performance standards. Such reference is intended to establish minimum level of quality, standard of design, function, appearance, type, strength, durability, construction, efficiency, sound level, finish, appearance, availability, service and similar characteristics determined necessary for Project.
 3. Specification criteria including basis of design products are considered as a whole.
 4. Other products or manufacturers listed meet features, performance, appearance and other criteria established by that product or manufacturer even if product must be customized to meet those criteria.

-
5. When other products are listed in a Section those products may be used if they meet entire specification criteria including criteria implied by product listed as basis of design. Meeting some requirements but not meeting criteria established by basis of design product does not qualify as meeting specified requirements.
 6. Products or manufacturers accepted for substitution will be acceptable provided they fully comply with requirements and match basic and essential criteria of product used for basis of specification or design, including level of fabrication quality, as determined by Architect.
- E. Equivalent Products: Architect will consider Contractor's request for equivalent product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," or "or equivalent product," comply with requirements in "Equivalent Products" Article to obtain approval for use of an unnamed product.
- F. Equivalent Product Requests: Submit request for consideration of each equivalent product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Include data to indicate compliance with the requirements specified in "Equivalent Products" Article.
 2. Architect and Owner reserve right to accept or reject proposed product. Should a proposed product be unable to meet requirements to satisfaction of Architect, product shall not be used. No additional compensation will be allowed for required Work resulting from use of product accepted by Addendum.
- G. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in this Section for proposal of product.
- H. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- I. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- J. Labels, Nameplates and Trademarks: Do not permanently attach or imprint labels or trademarks on surfaces exposed to view when installed, except as follows:
1. Service-Connected or Power-Operated Equipment: Provide permanent nameplate indicating manufacturer, model number, serial number, capacity, speed, electrical characteristics and similar essential operating data.
 - a. Locate nameplate on easily accessible surface.
 2. UL Fire Rating Labels and Other Required Labels: Install on accessible inconspicuous surfaces.
 - a. Do not paint, deface or conceal required nameplates or labels.

2.2 PRODUCT SUBSTITUTIONS

- A. Intent is to limit unnecessary substitutions after bids. Changes will not be allowed to accepted list of products, except when specified or accepted product subsequently is determined as not meeting requirements of Contract Documents or product becomes unavailable, and then only under following conditions:
1. Orders were placed in timely manner as required after list of materials is accepted. No excuse or proposed substitution will be considered for products due to unavailability unless proof is submitted that firm orders were placed in a timely manner.
 2. Reason for unavailability is beyond control of Contractor: prolonged strikes or lockouts which will delay Project to an extent unacceptable to Owner, bankruptcy, discontinuance of a product, delays or Acts of God or other similar reasons.
 3. Request for substitution is submitted in writing within 10 days after date Contractor becomes aware product does not comply with specifications or has become unavailable, accompanied by supporting evidence.
 4. No extra cost to Owner.
 5. Substitution does not compromise design intent or quality required.
 6. Substitute product is acceptable to Owner and Architect.
 7. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 8. Requested substitution does not require revisions to Contract Documents.
 9. Requested substitution is consistent with the Contract Documents and will produce intended and indicated results.
 10. Substitution request is fully documented and properly submitted.
 11. Requested substitution will not adversely affect Contractor's Construction Schedule.
 12. Requested substitution has received necessary approvals of authorities having jurisdiction.
 13. Requested substitution is compatible with other portions of Work.
 14. Requested substitution has been coordinated with other portions of Work.
 15. Requested substitution provides specified warranty.
 16. If requested substitution involves more than one trade, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to installers involved.
- B. Substitution Request Submittals: Submit requests for substitution in writing to Architect at least 10 calendar days prior to bid date and hour. Requests received after this time will not be considered. Clearly define and describe proposed substitute product including following items:
1. Fully completed Section 016211 - Substitution Request Form.
 2. Manufacturer's printed information supporting claim that proposed product meets specified requirements. Provide following as applicable:
 - a. Literature Specifications Drawings Cut Sheets Performance data List of reference projects of similar size, value and complexity Model numbers Other information necessary to completely describe item.
 3. Provide a point by point comparison between key features of specified Basis of Design item and proposed substitution.
 4. Provide submitted materials marked with Article and Paragraph references from Specification using highlighter, marker and flags on pages to facilitate review and show that substitution meets specified requirements.
 5. Provide a letter indicating requestor has reviewed Contract Documents and examined site (if needed) and that proposed substitution meets specified requirements.
- C. Accepted substitutions will be published in writing. No information or indication of acceptance will be provided by means other than written Addendum during bidding or Architect's written construction administration document following bidding. Refer to "Limitations on Substitutions after Bids or During Construction" in this Section.

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- D. Bid and construct according to Contract Documents unless approval of substitution is provided in writing.
 - E. Architect is not obligated to state reasons for rejecting substitution.
 - F. Substitute products shall:
 - 1. Be available in same range of colors, textures, dimensions, gauges, types, and finishes as specified product.
 - 2. Be equal to specified item in strength, durability, efficiency, serviceability, ease and cost of maintenance.
 - 3. Be compatible with building design.
 - 4. Not necessitate design modifications.
 - 5. Not impose additional work or require changes in work of Prime Contractor, or other Subcontractor, vendor, or materials supplier.
 - 6. Not add cost to Owner.
 - 7. Be similar in essential fabrication features.
 - G. Reference Standards for Products:
 - 1. When references to Federal Specification, ASTM Standard, American National Standards Institute (ANSI) or similar association standards are listed for product quality, provide an acceptable affidavit certifying that proposed substitution for this Project meets with same standard.
 - 2. Submit supporting test data to substantiate compliance.
 - H. Contractor, supplier or manufacturer providing accepted substitute product shall bear cost of required modifications to spaces, services, utilities and other features as result of accepting substitute products, including but not limited to:
 - 1. Larger capacity mechanical or electrical service, devices or utilities resulting from acceptance of product for bidding purposes.
 - 2. Modification to pipes, conduits, ducts, and controls for conveying, distributing, and controlling those services or utilities.
 - 3. Modification to insulation, wrappings, coatings, or other integral features of lines or items conveying those lines.
 - I. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 016211

SUBSTITUTION REQUEST FORM

To: Hammel Green and Abrahamson, Inc.
Attn:
222 Sutter Street, Suite 500
San Francisco, California 94108

From: _____

Owner: Natividad
Project: Medical Center

HGA No.: 3707-016-00

Date: _____

Specification Section Number and Paragraph: _____

Drawing & Details Affected: _____

Proposed Substitution: _____

Manufacturer: _____

Product: _____

REASON FOR SUBSTITUTION REQUEST

- ☐ Pre-Bid Substitution (Prior Approval) Date: _____
- ☐ Specified product is not available. Explain: _____
- ☐ Cost savings to Owner. Provide comparative cost analysis.
- ☐ Other: _____

EFFECTS OF PROPOSED SUBSTITUTION

Does substitution affect dimensions indicated on Drawings?

☐ NO ☐ YES Explain: _____

Does substitution affect Work of other Sections?

☐ NO ☐ YES Explain: _____

Does substitution require modifications to design, changes to Drawings, or revisions to specifications to be incorporated into the Project?

☐ NO ☐ YES Explain: _____

Attach list of at least 3 projects where proposed substitution has been used within past 12 months; include name, address, and telephone number of Owner and Architect.

CONTRACTOR'S / BIDDER'S REPRESENTATION

Undersigned accepts responsibility for coordination of proposed substitution and accepts all additional costs resulting from the incorporation of proposed substitution into the Project per Section 016210.

SUBMITTED BY:

ARCHITECT'S REVIEW

- ☐ Accepted
- ☐ Not Accepted
- ☐ No Action Required
- ☐ Incomplete Submission
- ☐ Late Submission

Reviewer: _____

Review Date: _____

Subcontractor's Signature _____ **Date:** _____

Contractor's Signature _____ **Date:** _____

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SECTION 017132 VIBRATION MONITORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Monitoring of vibration on-site and in the surrounding neighborhood due to construction activities.
 - 2. Maximum vibration levels permitted due to construction activities.
- B. Related Sections:
 - 1. Section 013233 - Photographic Documentation.
 - 2. Section 013512 - Special Project Procedures for Historic Buildings.
 - 3. Section 013535 - Special Project Procedures for Museums.
 - 4. Section 022214 - Existing Conditions Survey
 - 5. Section 024113 - Selective Site Demolition
 - 6. Section 024119 - Selective Building Demolition
 - 7. Section 310000 - Earthwork
 - 8. Section 316224 - Micropiles
 - 9. Section 310900
- C. Related Requirements

1.2 PURPOSE OF VIBRATION MONITORING PROGRAM

- A. During construction.
- B. Establish/determine
- C. The purpose of the Vibration Monitoring Program is to provide the following:
 - 1. Pre-construction baseline data for comparison with construction data and post-construction data.
 - 2. Monitoring of existing buildings during construction, to determine whether they have been adversely affected by construction activities.
 - 3. A forewarning of unforeseen conditions that may require remedial, precautionary measures and a change of procedures.

1.3 REFERENCES

- A. U.S. Bureau of Mines, Report of Investigations 8507
- B. ASCE 83-501 Vibration Criteria for Historic and Sensitive Older Buildings
- C. Federal Transit Administration: Noise and Vibration Manual

1.4 ACTION SUBMITTALS

- A. Vibration Monitoring Plan: Submit plan for vibration monitoring and protocol on Project site and at locations in surrounding occupied buildings during construction; to be reviewed by and accepted by Owner and Architect.
- B. Vibration Monitoring Plan: Coordinate with Owner and Architect to develop plan for construction vibration monitoring and protocol on Project site and at locations in surrounding occupied buildings; to be reviewed by and accepted by Owner and Architect; including but not limited to the following:
- C. Vibration Monitoring Plan: Submit plan and protocol for vibration monitoring on Project site and at locations in surrounding occupied buildings during construction; to be reviewed by and accepted by Owner and Architect/Engineer; including but not limited to the following:
 - 1. Locations of vibration monitoring devices

-
2. Type of vibration monitoring devices
 3. Duration of monitoring
 4. Vibration limit criteria
 5. Alerting and alarm requirements
 6. Responsibilities, procedures and protocol for monitoring, alerting, and stoppage of work

1.5 INFORMATIONAL SUBMITTALS

- A. Qualifications: For personnel developing, installing, and operating the monitoring system.
- B. Vibration Recording Report: Submit on a weekly basis indicating the notable and maximum vibrations measured.

1.6 QUALITY ASSURANCE

- A. Supervising Engineer Qualifications: A qualified engineer licensed in the State of Minnesota with at least four years of experience developing vibration monitoring programs on similar projects. The engineer shall:
 1. Prepare detailed step-by-step procedures for installing and testing instruments.
 2. Review and sign all submittals.
 3. Be on site and supervise at least the first two installations of each type of instrument.
 4. Review preliminary vibration data to confirm appropriate operation of the monitoring system.
 5. Supervise the preparation of the weekly vibration recording report submittals.
- B. Technician Qualifications: A qualified technician with at least 2 years of direct field experience with equipment similar to that used in the monitoring system. The technician shall be under the direct supervision of the Supervising Qualified Engineer. The technician shall:
 1. Install, test, and monitor vibration monitoring equipment.
 2. Inspect equipment on a periodic basis during construction
 3. Alert Owner, Contractor, and Structural Engineer of Record when vibration criteria are exceeded.
 4. Prepare weekly vibration recording reports.
- C. *Qualifications: a qualified Geotechnical Instrumentation Engineer who is a registered Professional Engineer in the District of Columbia, who has a minimum of a Bachelor of Science degree in civil engineering, and who has at least four years of direct field experience in installation and monitoring of the types of instruments specified herein. The Geotechnical Instrumentation Engineer shall:*
 1. *Prepare detailed step-by-step procedures for installing and testing instruments specified herein.*
 2. *Review and sign all submittals.*
 3. *Be on site and supervise at least the first two installations of each type of instrument.*
 4. *Conduct at least the first two activities of each of the following tasks for each instrument specified herein: pre-installation acceptance tests, post-installation acceptance tests, field calibration, data collection, reduction, processing, plotting and interpreting.*
 5. *Supervise the preparation of the weekly submittals as specified below.*
- D. _____: *a superintendent who will be in responsible charge full-time on site during pre-installation testing, installation, post-installation testing, and calibration of the geotechnical instrumentation. The superintendent shall also make frequent site visits to inspect the instrumentation. The superintendent shall have at least 4 years of direct field experience in installation and monitoring of the types of instrumentation specified herein, and shall have supervised instrumentation programs of similar magnitude in similar subsurface conditions.*
- E. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 1. *Requirements of authorities having jurisdiction shall supersede requirements for specialists.*

-
- F. A **factory/field** calibration shall be conducted on all instruments prior to shipment. Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer's calibration requirements and that, where applicable, calibrations are traceable to the National Institute of Standards and Technology.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to [ASTM E 329] <Insert standard>; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated as documented according to ASTM E 329 acceptable to the Owner, Architect, and Structural Engineer of Record.

1.7 SITE CONDITIONS

- A. Existing Conditions:
1. Verify condition of existing building. Take photographs to record any existing settlement or cracking of existing walls.
 2. Prepare a list of such damages, verified by dated photographs, and signed by Contractor, __ and other conducting investigation.
 3. Survey existing building surrounding the courtyard, employing registered surveyor, establishing exact plan locations and elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations and locations.
 4. During installation of the excavation support system, excavation and pile installation, resurvey benchmarks two times daily, at the beginning and end of each days work, maintaining an accurate log of surveyed elevations and locations for comparison with original elevations and locations. Promptly notify __ if changes in elevations or lateral movements occur or if cracks, sags or other damage is evident.
- B. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.
1. Establish work points to facilitate reinstallation of Historical items that are being salvaged, stored, or restored and reinstalled.
 2. Perform surveys as the Work progresses to detect movement, shifting or hazards resulting from Work.
- C. Deformation Monitoring Points (DMPs): Establish DMPs to monitor vertical and horizontal movements at locations **specified herein**.
- D. Provide portable seismographs for monitoring the velocities of ground vibrations resulting from demolition and construction activities.
1. Three component sensor.
 2. Continuous monitoring mode must be capable of recording peak velocities.
- E. Crack monitors or telltales shall consist of equipment manufactured for the purpose of measuring the distance, direction and rotation in at least 2 dimensions of the opposite faces of cracks.

PART 2 - PRODUCTS

2.1 VIBRATION MONITORING EQUIPMENT

- A. Provide portable seismographs for monitoring the velocities of ground vibrations resulting from demolition and construction activities.
1. Three component sensor.
 2. Continuous monitoring mode must be capable of recording peak velocities.

-
- B. Data acquisition system capable of processing vibration measurements in real-time and alerting field personnel if vibration limits have been exceeded.
 - C. Deformation monitoring points (DMPs) will be used to monitor vertical and/or horizontal movements at locations specified herein.
 - D. Crack monitors or telltales shall consist of equipment manufactured for the purpose of measuring the distance, direction and rotation in at least 2 dimensions of the opposite faces of cracks.

PART 3 - EXECUTION

3.1 VIBRATION MONITORING

- A. Install seismographs at locations indicated, and at additional locations determined by the Owner to monitor vibration levels on facilities that may be affected by demolition and construction activities. A total of four vibration monitoring locations shall be assumed in proposals including:
 - 1. On property line along Bryant Avenue.
 - 2. On property line along Groveland Terrace.
 - 3. Inside existing underground parking ramp under active work area
 - 4. Inside existing Walker Art Center at location identifies by project team.
- B. Calibration and Maintenance: Conduct regular field calibrations and maintenance. Regular field calibrations shall be made on a frequency not exceeding three weeks.
- C. Clearly mark location of equipment with cones, tapes or other means to prevent damage due to construction operations. Notify Contractor of equipment locations.
- D. Collect, process, and interpret data from the vibration monitoring equipment.
- E. Notify Contractor's Superintendent immediately if vibration limits are exceeded.
- F. Continuously monitor vibration while construction activities are underway.
- G. Prepare weekly vibration monitoring reports indicating any events that exceeded the vibration limits, peak particle velocities of events and contractor's mitigation efforts following events.

3.2 VIBRATION MONITORING AND LIMITATIONS

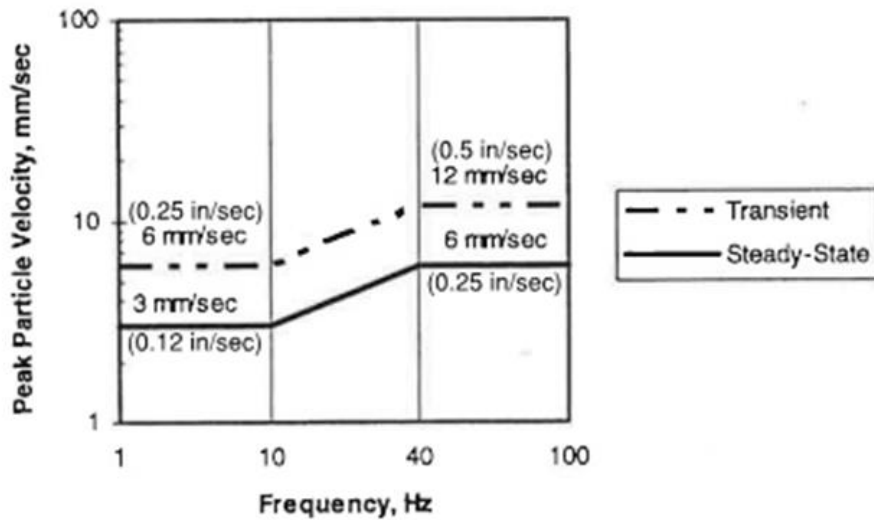
- A. **Interpreting: Contractor will make their own interpretations of the data resulting from**
- B. Install seismographs at locations indicated herein, and at additional locations determined by the Contractor to monitor vibration levels on facilities that may be affected by demolition and construction activities.
- C. Calibration: Conduct regular field calibrations and maintenance of readout units for the Contractor's monitoring program, and regular maintenance of field terminals and accessible instrument components. Regular field calibrations of readout units shall be made on a frequency not exceeding three weeks.
- D. The Contractor's instrumentation personnel and surveyors shall reduce, process, plot and report data for the Contractor's monitoring program..
- E. Continuously monitor vibrations, settlements, and movements to ensure that damage to permanent structures is prevented.
- F. Coordinate with Owner to schedule work that causes high levels of noise or vibration so as to not disrupt Owner's operations.
- G. *Responsibilities of Contractor include:*
 - 1. *Perform optical surveys and report data.*
 - 2. Coordinate with building occupants... surrounding buildings
 - 3. Instrumentation.
 - a. *Provide*
 - b. *Install*

-
- c. maintaining and calibrating
 - d. Protect
 - 4. *Data: Collect, process, and interpret data from the vibration monitoring equipment.*
 - a. *Collect: Continuously monitor vibration while construction activities are underway*
 - b. *Process:*
 - c. *Interpret: Notify Contractor's Superintendent immediately if vibration limits are exceeded.*
 - d. *Reports: Prepare weekly vibration monitoring reports indicating any events that exceeded the vibration limits, peak particle velocities of events and contractor's mitigation efforts following events.*
 - 5. *Respond.*
 - H. *Install seismographs at locations indicated, and at additional locations determined by the Owner to monitor vibration levels on facilities that may be affected by demolition and construction activities.*
 - 1. *A total of <number> vibration monitoring locations shall be assumed in proposals including:*
 - a. *<insert locations per project> .*
 - 2. *Clearly mark location of equipment with cones, tapes or other means to prevent damage due to construction operations. Notify Contractor of equipment locations.*
 - I. *Crack monitors or telltales shall be installed at existing cracks identified during the pre-construction survey and at any other locations or cracks that develop during construction.*
 - J. *Calibration and Maintenance: Conduct regular field calibrations and maintenance. Regular field calibrations shall be made on a frequency not exceeding three weeks.*
 - K. *Execute pile driving operations using means and methods to accomplish work while consistently maintaining vibration levels less than the Damage Threshold Limit, as shown in Figure 1 below.*
 - L. *If pile driving operations result in vibration levels higher than Damage Threshold Limit, stop operations immediately. Adjust and commence operations in manner required to reduce vibration levels.*
 - M. *Immediately notify Owner's representative and Architect if it is determined that work cannot be accomplished without reaching or surpassing Damage Threshold Limit.*

3.3 VIBRATION LIMITS AND IMPACT ON CONSTRUCTION ACTIVITIES

- A. *Vibration limits defined as peak particle velocity at ground surface at the locations of the monitoring devices due to construction activities producing vibrations are specified in the Figure 1.*
- B. *Vibrations exceeding one-half of the transient limits indicated in Figure 1 shall trigger an alarm. The contractor may continue to work, but must modify construction activities as required to prevent exceeding the specified limits.*
- C. *Vibrations exceeding the transient limits indicated in Figure 1 shall trigger a separate alarm. Contractor shall immediately cease vibration producing construction activities and modify construction activities to reduce vibration to below the specified limits prior to resuming activities.*
- D. *Construction activities such as pile driving that produce steady state vibrations shall be limited to the steady state peak particle velocities indicated in Figure 1.*
- E. *Immediately notify Owner's representative and Architect if it is determined that work cannot be accomplished without reaching or surpassing the vibration limits.*

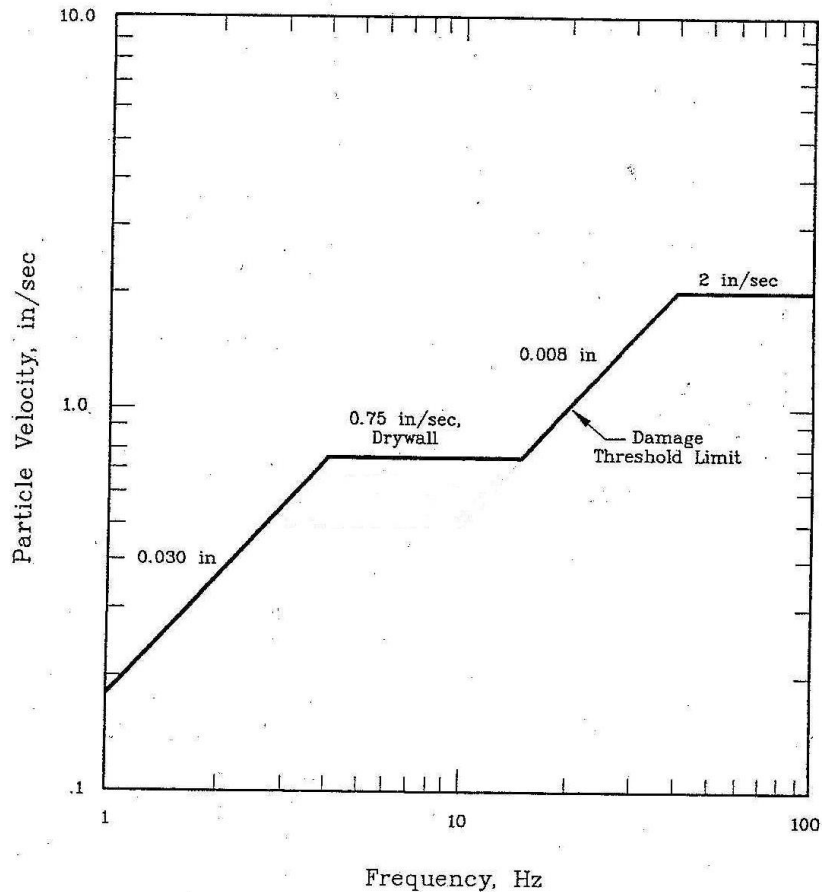
F. FIGURE 1



G.

H.

I. FIGURE 2



J.

K.

END OF SECTION

SECTION 017300 EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: General administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner's portion of the Work
 - 6. Coordination of Owner-installed products.
 - 7. Progress cleaning.
 - 8. Starting and adjusting.
 - 9. Protection of installed construction.
 - 10. Correction of the Work.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at [Project site] <Insert location>.
 - 1. Prior to [submitting cutting and patching plan] [commencing work requiring cutting and patching], review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect [and Construction Manager] of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
 - a. Contractor's superintendent.
 - b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
 - 2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- B. Layout Conference: Conduct conference at [Project site] <Insert location>.
 - 1. Prior to establishing layout of [new] [new and existing] perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect [and Construction Manager] of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
 - a. Contractor's superintendent.
 - b. [Professional surveyor] [Professional engineer] [Contractor's personnel] responsible for performing Project surveying and layout.
 - c. [Professional surveyor] [Professional engineer] responsible for performing site survey serving as basis for Project design.
 - 2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
 - 3. Review requirements for including layouts on Shop Drawings and other submittals.

-
4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [land surveyor] [professional engineer].
- B. Certified Surveys: Submit [two] <Insert number> copies signed by [land surveyor] [professional engineer].
- C. Certificates: Submit certificate signed by [land surveyor] [professional engineer], certifying that location and elevation of improvements comply with requirements.
- D. Cutting and Patching Plan: Submit plan describing procedures at least [10] <Insert number> days prior to the time cutting and patching will be performed. Include the following information:
 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 4. Dates: Indicate when cutting and patching will be performed.
 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- E. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: Refer to Section 014500 "Quality Requirements."
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.
- D. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.[Operational elements include the following:]
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Plumbing piping systems.
 - f. Mechanical systems piping and ducts.

-
- g. Control systems.
 - h. Communication systems.
 - i. Fire-detection and -alarm systems.
 - j. Conveying systems.
 - k. Electrical wiring systems.
 - l. Operating systems of special construction.
 - m. <Insert operating system>.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.[Other construction elements include but are not limited to the following:]
- a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
 - h. <Insert miscellaneous element>.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. Comply with requirements specified in other Sections.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- C. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.
- D. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

2.2 UNSALVABLE MATERIALS

- A. Remove unsalvable materials in a manner that will avoid damage to materials or equipment which will remain. Completely remove and legally dispose of away from the site.

2.3 SALVABLE MATERIALS TO BE RE-USED IN WORK

- A. Salvable materials and items designated for reuse or relocation, such as brick, millwork, or equipment shall be removed by the applicable trades and relocated to the new location or stored and protected from damage until incorporated into the new work.
- B. Carefully remove, salvage, clean and preserve materials, equipment and other items indicated to be reused, or which will be needed for reuse to match existing work.
- C. Exercise extreme care in removals to prevent damage or to make materials unsuitable to reuse.
- D. For materials shown or called for to be reused and which are damaged, replace with equivalent and matching work.
- E. Existing Brick to be Re-Used for Patching: Where brick from existing building is required for patching, exercise care in removing brick from existing building to preserve for reuse. Do not reuse broken brick. After removal clean all mortar from all sides of brick, carefully stockpile and protect to insure brick is available for reuse. Stockpile off site, if space is not available at site, and cover or otherwise protect from soil or damage. Stockpile on suitable platform.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility or Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

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- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
 - D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect.

3.3 CONSTRUCTION LAYOUT

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

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

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2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Final Property Survey: Engage a professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
 - a.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to [minimize] [prevent] interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. [Concrete] [and] [Masonry]: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

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- a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
 - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
 - I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in [Section 015000 "Temporary Facilities and Controls."] [Section 017419 "Construction Waste Management and Disposal."]
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."

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- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
 - C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
 - D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

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

3.10 CORRECTION OF THE WORK

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

END OF SECTION

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SECTION 017324 ANCHORAGE AND SLEEVEING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included:
 - 1. Installation of anchorage devices to securely connect, fasten, hang, mount, anchor, and support all work in both new and existing structures.
 - 2. Design of anchorage devices not specifically detailed on structural drawings.
 - 3. Substitution of anchor manufacturers other than the basis of design shown on the Construction Documents.
 - 4. Installation of sleeves and formwork for piping and openings.
 - 5. Layout and rough-in of anchorage locations for attached work.
- B. Related Sections
 - 1. Division 01 Section "Cutting and Patching" for required repair of finishes and substrate.
 - 2. Division 01 Section "Structural Testing and Special Inspections" for inspection and load testing of anchors.
 - 3. Division 01 Section "Seismic Restraint Requirements for Nonstructural Components"
 - 4. Division 03 Sections for concrete components requiring or receiving attachments.
 - 5. Division 04 Sections for masonry components requiring or receiving attachments.
 - 6. Division 05 Sections for steel and miscellaneous metal components requiring or receiving attachments.
 - 7. Division 07 and 08 Sections for attachment of wall systems to structure.
 - 8. Division 06,09,10,11,12, and 14 Sections for attachment of architectural components to structure.
 - 9. Division 21 Sections for attachment of fire protection system components to the structure.
 - 10. Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for attachment of piping and plumbing system components to structure.
 - 11. Division 23 Section "Hangers and Supports for HVAC Piping and Equipment" for attachment of piping, duct work, and other HVAC system components to structure.
 - 12. Division 24 Section "Hangers and Supports for Electrical Systems" for attachment of electrical systems to structure.

1.2 REFERENCES

- A. ACI 318/R Building Code Requirements for Structural Concrete and Commentary
- B. ACI 355.1R – State-of-the-Art Report on Anchorage to Concrete.
- C. ACI 355.2 – Evaluating the Performance of Post-Installed Mechanical Anchors in Concrete.
- D. ASCE 7: Minimum Design Loads for Buildings and Other Structures
- E. ASTM E 488 – Test Methods for Strength of Anchors in Concrete and Masonry Elements.
- F. ASTM E 1190 – Test Methods for Strength of Powder-Actuated Fasteners Installed in Structural Members.
- G. ASTM E 1512 – Test Methods for Testing Bond Performance of Bonded Anchors.
- H. ASTM F 1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- I. ICC Evaluation Service AC 193 – Acceptance Criteria for Mechanical Anchors in Concrete Elements.
- J. ICC Evaluation Service AC 308- Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.

1.3 DESIGN CRITERIA FOR ANCHORAGE TO STRUCTURE

- A. Structural Performance: Provide anchorage devices capable of supporting the attached work and any loads placed on the attached work without exceeding the design capacity of the anchorage device or supporting structure.
- B. Seismic Performance: Design and install anchorage to withstand seismic forces imposed on anchor by the attached work without exceeding the design capacity of the anchorage device or supporting structure. Refer to Section 017325 for seismic force criteria and restraint requirements.
 - 1. Design and install anchorage to meet requirements of ASCE 7, Section 13.4 – Nonstructural Component Anchorage.
- C. Select anchorage devices that are recommended by the manufacturer for the application being considered.
- D. Structural Design Responsibility: Design of anchors and accessories for attaching a component to the structural shall be the responsibility of the Contractor installing that attaching component unless the anchor types, configuration, and spacings have been specifically detailed on the structural Construction Documents. Contractor is responsible for verifying that the structure being attached to has sufficient capacity to resist the anchorage loads.
- E. Design anchorage devices to meet manufacturer's recommendations and applicable codes.
- F. Anchorage devices that transmit loads between structural components or are used to attach life-safety related components to the structure must have a current ICC-ES Report for the application used.
 - 1. Safety-related components include, but are not limited to: fire sprinkler systems, components of emergency power system, guard rails, fall-protection devices, and heavy suspended items that could cause damage or loss of life in the event of an anchorage failure.
 - 2. Design of anchorage devices to meet all requirements of the ICC-ES Report.

1.4 ANCHOR SUBSTITUTION REQUIREMENTS

- A. Basis of design products have been selected for all anchorage systems specifically detailed on the structural Construction Documents.
- B. Refer to the general structural notes for indication of the basis of design product and manufacturer.
- C. Anchorage products and manufacturers other than the basis of design will be allowed to be incorporated into the work provided that they provide capacity equal to or greater than the basis of design anchorage design and meet all additional requirements of this specification.
- D. Engineering Responsibility for Anchor Substitutions: Where contractor wishes to substitute an alternate anchor for the basis of design, the Contractor shall provide engineering analysis indicating that the substituted product has a capacity equal to or greater than the basis of design anchor for the size, layout, and spacing of anchors under consideration.

1.5 ATTACHMENT TO POST-TENSIONED CONCRETE STRUCTURES

- A. Where post-tensioned concrete construction is indicated, slabs and beams are post-tensioned with high-strength tensioned cables. Damage to cables due to drilling and cutting can significantly affect the capacity of the structure. No nailing, drilling, cutting, chipping, or other disruption to post-tensioned slabs and beams is allowed without written approval from the Structural Engineer of Record. All supports for piping, ducting, conduit, hanging partitions, equipment, or other work supported by or from this structure must be provided using inserts cast into the concrete. All holes must be created with cast-in sleeves or box-outs. Drilling or nailing up to 3/4 inch into post-tensioned slabs is permitted provided that depths are controlled by a mechanical device.

1.6 SUBMITTALS

- A. Product Data: For each type of anchorage device indicated.

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- B. ICC-ES Report: For each type of anchorage device used in structural or life-safety related applications.
 - C. Shop Drawings: Submit in accordance with Section 013300.
 - 1. Show type, material, location, spacing, size, and embedment depth of anchorage devices.
 - 2. Shop drawings may be incorporated into drawings prepared for related sections.
 - D. Calculations: Structural design of anchors not specifically detailed on Structural Drawings shall be prepared by a Professional Engineer, legally authorized to practice in the jurisdiction where Project is located. Signed engineering calculations shall be submitted upon request.
 - 1. Engineering Responsibility: Calculations shall be reviewed for stated design assumptions, general compliance to specified requirements, and forces imposed on structure. The accuracy of engineering calculations is the sole responsibility of the Contractor's Professional Engineer.
 - E. Qualification Data: For persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include documentation for anchor manufacturer that persons have received adequate training to successfully install the manufacturer's products.
 - F. Manufacturer's Instructions: Installation instructions containing sequence of operations and requirements for installation of anchorage devices.
 - G. Calculations for Anchor Substitutions: Capacity calculations for anchorages where an alternative anchorage product has been substituted for the basis of design shall be prepared by a Professional Engineer, legally authorized to practice in the jurisdiction where Project is located, to ensure that the alternate anchors have capacity equal to or greater than the basis of design anchor. Signed engineering calculations shall be submitted upon request.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Installer to be trained by a representative of the anchorage device manufacturer.
- B. Manufacturer Qualifications: Manufacturer experienced in producing anchorage devices similar to those indicated for this Project with a record of successful in-service performance.
- C. Engineering Responsibility: Engage a qualified professional engineer to design anchorage devices and prepare design calculations, Shop Drawings, and other structural data.
- D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of anchorage devices that are similar in material, design, and extent to those indicated for this Project.
- E. Manufacturer Inspection: Anchorage device manufacturer shall provide qualified representative for periodic on-site review of anchorage device installation.
- F. Welding: Use qualified welders and comply with American Welding Society (AMW) D1.1, "Structural Steel".

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to job site in manufacturer's or distributor's packaging undamaged, complete with installation instructions.
- B. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage or deterioration.

1.9 COORDINATION

- A. Coordinate installation of anchoring systems. Furnish setting drawings, templates, and directions for installing cast-in anchors, including concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 TYPES OF ANCHORAGE AND SLEEVING DEVICES

- A. Manufacturers: Where anchor manufacturer and proprietary anchor type is not specifically indicated on Drawings, subject to compliance with requirements and acceptance by Architect/Engineer, manufacturers offering products that may be incorporated into the Work as appropriate for application include, but are not limited to, those listed below. Refer to Section 016210- Product Option and Substitution Requirements for equivalent manufacturer approvals.
- B. As specified in individual Sections, or as herein specified.
- C. Embedded Anchors:
 - 1. Steel plates, angles, and channels: ASTM A36 ($F_y = 36$ ksi).
 - 2. Anchor rods: ASTM F1554, Minimum Yield Strength, $F_y = 36$ ksi, unless noted otherwise on Drawings.
 - 3. Reinforcing Dowels: ASTM A 615, Grade 60, deformed.
 - 4. Headed Shear Connector Studs: ASTM A 108, Grade 1015 through 1020, standard fluxed headed type.
 - 5. Deformed Bar Anchors: Standard fluxed ASTM A496 deformed bars prepared for stud welding.
 - 6. Design embedded anchors to meet the provisions of ACI 318, Appendix D.
- D. Channel Concrete Inserts:
 - 1. Acceptable Products and Manufacturers:
 - a. Halfen Anchoring Systems: HTA, HTB, or HDT Series anchor channel systems.
 - b. Unistrut Corporation: Heavy Duty, Standard Duty, or Light Duty Concrete Inserts.
 - c. Versabar Corporation: VA-1 or VA-4, Hook type channel inserts.
 - d. Approved Equal- as noted under Section 016210- Product options and Substitution Requirements.
 - 2. Anchor channels shall have a foam filler to prevent concrete seepage.
 - 3. Only fasteners manufactured or approved by the manufacturer shall be used for attachment to the anchor channels.
- E. Cast-in Concrete Inserts: Internally threaded inserts cast into concrete at time of placement with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Acceptable Products and Manufacturers:
 - a. Hilti , Incorporated: HCI-WF/MD Cast-in-Anchors.
 - b. Cooper B-Line: B3014 Malleable Iron Insert or B2505 Spot Insert
 - c. Dayton Richmond: COREWALL Slotted Inserts.
 - d. Hohmann & Barnard, Inc.: 380-Series Concrete Inserts.
 - e. Unistrut: P3245, M24, or M26 Spot Concrete Inserts.
 - f. Or approved equal complying with specified requirements.
 - 2. Only fasteners manufactured or approved by the manufacturer shall be used for attachment to the spot inserts.
- F. Powder-Actuated Fasteners: Threaded-steel shank fastener, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Acceptable Manufacturers
 - a. Hilti, Incorporated
 - b. ITW Ramset/Red Head.
 - c. Simpson Manufacturing Co.
 - d. MKT Fastening, LLC.
 - e. Or approved equal complying with specified requirements.
 - 2. Fasteners embedded in post-tensioned concrete slabs shall have a maximum depth of 3/4 inch.
- G. Mechanical-Expansion Anchors: Insert-wedge-type anchor, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Acceptable Manufacturers:

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- a. Hilti, Incorporated
 - b. ITW Ramset/Red Head.
 - c. Simpson Manufacturing Co.
 - d. MKT Fastening, LLC.
 - e. Or approved equal complying with specified requirements.
 - 2. Mechanical-expansion anchors are not permitted in post-tensioned concrete slabs unless explicitly shown on structural drawings.
- H. Drop-in Anchors: Internally-threaded, deformation-controlled expansion anchors with a preassembled expander plug, suitable for flush mount applications in hardened concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- 1. Acceptable Manufacturers:
 - a. Hilti, Incorporated
 - b. Simpson Manufacturing Co.
 - c. ITW Ramset/Red Head.
 - d. Or approved equal complying with specified requirements.
 - 2. Fasteners embedded in post-tensioned concrete slabs shall have a maximum depth of 3/4 inch.
- I. Sleeve Anchors: Torque controlled expansion anchor consisting of a heavy hex bolt, sleeve, expansion sleeve, expansion cone, collapsible plastic sleeve and washer.
- 1. Acceptable Manufacturers:
 - a. Hilti: HSL, HSLG, or HSLB.
 - b. ITW Ramset/Redhead: Dynabolt.
 - c. Powers Fasteners: Lok/Bolt.
 - d. Simpson Strong-Tie: Sleeve-All.
 - e. Or approved equal complying with specified requirements.
- J. Adhesive Anchors: Threaded or otherwise deformed rods grouted into substrate with adhesive, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- 1. Acceptable Manufacturers:
 - a. Hilti, Incorporated
 - b. Simpson Manufacturing Co.
 - c. ITW Ramset/Red Head.
 - d. Or approved equal complying with specified requirements.
 - 2. The use of adhesive anchors in overhead applications and/or applications that result in a sustained tensile load on the anchor is prohibited.
 - 3. The use of adhesives "strongly discouraged" by the Federal Highway Administration Technical Advisory 5140.30 are prohibited. Contractor to verify that adhesives used are not included and do not contain components included on the current list of discouraged adhesives.
 - 4. Adhesive anchors are not permitted in post-tensioned concrete slabs unless explicitly shown on structural drawings.
- K. Concrete and masonry screws
- 1. Acceptable Manufacturers:
 - a. Concrete Fastening Systems: Tapcon.
 - b. Hilti: Kwik-Con II+ Fastening System.
 - c. ITW Ramset/Redhead: Tapcon.
 - d. Powers Fasteners: Tapper.
 - e. Simpson Strong-Tie: Titen High-Low Threaded Self-Tapping Concrete and Masonry Screw.
 - f. Or approved equal complying with specified requirements.
- L. Sleeves: Steel and/or plastic piping as specified in individual sections or as herein specified. Sleeves shall be of new material, cut square, reamed. Sheet metal sleeves may be used only where specifically approved.
- 1. Core-drilling of post-tensioned concrete slabs is not permitted unless explicitly authorized in writing by the Structural Engineer of Record..

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine substrate and conditions under which anchorage and sleeving work is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 COORDINATION

- A. Coordinate construction such that interference of reinforcing steel with concrete anchor placement does not occur. If reinforcing steel is encountered during drilling, adjust the anchor location if possible and notify the Owner's Representative. Care shall be taken not to break or damage reinforcing steel during drilling, unless explicitly permitted by Structural Engineer.

3.3 INSTALLATION- GENERAL

- A. Methods and devices, as well as location, may be subject to Owner Representative's approval and shall not impair, violate or alter structure, water integrity or aesthetic value of the Work.
- B. Full layout data and rough-in data is to be provided by the Contractor or subcontractor supplying the attached work or equipment, to others requiring the data, in sufficient time to facilitate proper and accurate rough-in.
 - 1. For existing equipment of the Owner, the Contractor must examine the equipment and determine the rough-in data. For equipment to be purchased by the Owner, the Owner will arrange to have the data furnished to the Contractor.
 - 2. If rough-in details are not available at the time service systems are being installed, the final rough in shall be postponed until the data is available. At all times prior to roughing-in for equipment by Owner, consult with the Owner to verify the status of rough-in data.
- C. Floor Sleeves: Floor sleeves for services passing through the floor shall be roughed-in prior to pouring the floors. If rough-in locations are not available, postpone pouring floors until the locations are available.
- D. Unless specifically noted, equipment shall be installed in accordance with the manufacturer's recommendations and instructions.

3.4 ANCHORS

- A. Furnish and install anchorage devices to securely fasten, hang, mount, anchor, and support work without unacceptable deflections or exceeding the capacity of the anchorage device or structure.
 - 1. Maximum applied concentrated tension force on any one anchor supporting suspended loads shall not exceed 1500 pounds.
 - 2. Maximum applied concentrated tension force on any one anchor installed in slabs-on-metal deck shall not exceed 750 pounds.
 - 3. Anchors with an applied tension force of 1000 pounds or more shall be cast-in anchors. Drilled-in anchors in applications where this tension force is exceeded shall not be permitted without prior approval of Structural Engineer.
- B. Provide anchorage devices recommended by the Manufacturer for the application in which the anchor is used, unless otherwise shown or specified.
- C. Provide anchorage devices cast integral with the structure wherever possible.
 - 1. Use templates to locate anchor rods accurately and securely in concrete.
 - 2. Anchor channels shall be securely fastened to concrete form work.
- D. Drilled Anchors: Anchors installed using drilled holes, mechanical expansion or adhesive, shall be permitted in concrete structures where the use of cast-in anchors is problematic. Anchor installation shall not cut or damage any reinforcing steel. Spalling of concrete around anchorage device is unacceptable. Install all anchors in clean, dry holes of the diameter recommended by the Manufacturer.

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1. Anchors installed in drilled holes with depth greater than $\frac{3}{4}$ inch in post-tensioned slabs are prohibited. Provide a mechanical means for preventing holes depths greater than $\frac{3}{4}$ inch.
 - E. The use of adhesive anchors in overhead applications and/or applications that result in a sustained tensile load on the anchor is prohibited.
 - F. Shot Anchors: Shot anchors (powder-actuated fasteners) shall be permitted in concrete structures where the use of cast-in anchors is problematic. Anchor installation shall not damage any reinforcing steel. Spalling of concrete around anchorage devices is unacceptable.
 1. Shot anchors will not be permitted in bottoms of joists, in post-tensioned slabs where cable location is unknown, or in slabs 4 inches or less in thickness.
 2. Any shot anchors at concrete joists shall be at the side of the joist, above centerline, located to avoid reinforcing steel.
 3. Shot anchors installed in post-tensioned concrete slabs with depth greater than $\frac{3}{4}$ inch are prohibited. Provide a mechanical means for preventing anchor penetration greater than $\frac{3}{4}$ inch.
 - G. Wood plugs into solid materials, toggle bolting to lath and plaster, or bolting into shields at hollow units will not be acceptable.
 - H. Provide adequate backing for all fastenings and supports to prevent deflection or undue stresses.

3.5 SLEEVES

- A. Sleeve existing pipes unless indicated otherwise.
- B. Provide sleeves for all pipes, ducts and similar features that pass through walls, slabs, concrete joists, beams or girders, concrete columns or concrete bridging. Sleeve penetrations through joists, beams, girders, columns, or bridging are not permitted unless explicitly shown on the structural drawings or authorized in writing by the Structural Engineer of Record.
- C. Sleeves shall be of new material, cut square, reamed. Sheet metal sleeves may be used only where specifically approved.
 1. At all concrete penetrations, sleeves shall be uncoated or galvanized pipe, not less than Schedule 40 steel pipe.
 2. At exposed or concealed masonry walls, sleeves shall be the same as for concrete penetrations.
- D. Sleeves passing through walls, slabs, beams, bridging, columns, shall be no larger than $\frac{1}{2}$ inch greater in inside diameter than external diameter of pipe passing through sleeves, or the insulation diameter, unless detailed or specified otherwise.
 1. Pipe insulation shall be continuous through the sleeves.
- E. Unless detailed or specified otherwise, sleeves through walls shall extend full thickness of wall and be cut flush with finished surface; sleeves through exterior building walls, above or below grade, shall extend full thickness of wall and be cut flush with finished surfaces; sleeves through floor slabs for exposed piping shall extend not less than $\frac{1}{2}$ inch above finished floor.
- F. Sleeve Spacing: Where sleeves occur in rows or clusters, a minimum of 4 inches of concrete shall be left between sleeves and if the normal spacing of reinforcing bars cannot be maintained, or are interrupted because of sleeve size or cluster location, extra reinforcing shall be provided by the Contractor as directed by the Structural Engineer. In no case shall sleeves impair the structural capacity of the Work.
- G. Core Drilled Holes: At core drilled holes, the specified sleeves will generally be required, unless otherwise indicated. Where omission of a sleeve is approved, the hole shall be drilled approximately one inch larger than the outside diameter of the insulation, where insulated. When the pipe is installed, hold down centering wedges one inch minimum below the floor line. The opening shall be sealed.
 1. Core drilling of post-tensioned concrete slabs is not permitted unless explicitly authorized in writing by the Structural Engineer of Record.

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- H. Sealing of Sleeves: As pipe, conduit or other feature is installed through a sleeve, it shall be wedged to keep in the center of the sleeve, with wedges held 1" back from end of sleeve. Pipe, conduit or other features through walls or other vertical surfaces, shall be caulked at the top in all cases, and at the bottom where exposed in a finished space.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with Section 014533. Cooperate with testing agency to facilitate the execution of its duties.

3.7 REPAIR OF DEFECTIVE WORK

- A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with appropriate material as specified by the Architect/Engineer. Anchors that fail to meet load testing requirements shall be considered malfunctioning.

END OF SECTION

SECTION 017329 CUTTING & PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Cutting, demolition, removal, patching and restoration of work as necessary to accomplish and complete all work under the Contract, including general construction, mechanical and electrical work[; except where work is indicated within designated historic areas].

1.2 INFORMATIONAL SUBMITTALS

- A. Schedule: Submit schedule indicating proposed sequence of operations for demolition work to Owner's Representative for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.
 - 1. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations. Coordinate with Work of other related Sections.

1.3 QUALITY ASSURANCE

- A. Skilled Mechanics: Accomplish all work of cutting, removal, demolition, relocation, patching and other restoration by using only mechanics skilled in the trade. If necessary, sublet the work to skilled contractors or subcontractors.

1.4 COORDINATION

- A. Coordinate all work of this Section with all subcontractors so the work will progress without interruption and minimum delays.
- B. Coordinate and schedule work of this Section with the Owner where possible disturbance may occur and where relocations or other potential disruptions of the Owner's functions and services may occur. All work affecting the Owner's functions and services shall be performed at times acceptable to the Owner.
 - 1. Two (2) week notice required, coordinate through Project Services.
- C. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - DISPOSITION OF MATERIALS

2.1 UNSALVABLE MATERIALS

- A. Remove unsalvable materials in a manner that will avoid damage to materials or equipment which will remain. Completely remove and legally dispose of away from the site.

2.2 SALVABLE MATERIALS TO BE RE-USED IN WORK

- A. Salvable materials and items designated for reuse or relocation, such as brick, millwork, or equipment shall be removed by the applicable trades and relocated to the new location or stored and protected from damage until incorporated into the new work.
- B. Carefully remove, salvage, clean and preserve materials, equipment and other items indicated to be reused, or which will be needed for reuse to match existing work.
- C. Exercise extreme care in removals to prevent damage or to make materials unsuitable to reuse.

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- D. For materials shown or called for to be reused and which are damaged, replace with equivalent and matching work.
 - E. Existing Brick to be Re-Used for Patching: Where brick from existing building is required for patching, exercise care in removing brick from existing building to preserve for reuse. Do not reuse broken brick. After removal clean all mortar from all sides of brick, carefully stockpile and protect to insure brick is available for reuse. Stockpile off site, if space is not available at site, and cover or otherwise protect from soil or damage. Stockpile on suitable platform.

PART 3 - EXECUTION

3.1 DESCRIPTION OF WORK

- A. Drawings generally indicate the extent of demolition, removals, relocations and cutting. The drawings shall not be construed as indicating all required work, nor indicating all conditions or details which might be encountered to accomplish the work of this Contract. The Contractor and subcontractors must examine the spaces themselves to determine the actual conditions and requirements.

3.2 TEMPORARY PROTECTION

- A. Provide temporary bracing, shoring, needling and support during demolition, cutting, remodeling and related new construction as necessary for the execution of the Work and the protection of persons and property. Perform all work with appropriate supports, protection and methods to prevent collapse, settling or damage to property or persons. Provide adequate supports for the loads to be carried, with loads properly distributed, including to lower levels and sound bearing, if necessary.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage.
 - 1. Provide protective coverings and enclosures necessary to prevent damage to existing spaces and materials to remain.
 - 2. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
 - 3. Provide dustproof temporary enclosures separating areas under demolition and remodeling from the remainder of the building as well as temporary HEPA filters at ductwork.
 - 4. Provide temporary hinged doors in temporary enclosures where necessary. Temporary and permanent doors shall be completely sealed with tape or other suitable material during demolition work and shall remain sealed until dust has settled.
- C. Limit dust, dirt and noise dispersal to the lowest practical level. Comply with governing regulations regarding environmental hazards and general dust control. Notify the Owner's representative of possible exposure to harmful dusts and vapors, flammable or explosive materials, and other potential hazards.

3.3 CUTTING AND REMOVING

- A. Perform cutting, demolition, removal work, patching and restoration of work as necessary to accomplish and complete all work under the Contract, including any relocation or reuse of existing materials, equipment, systems, or other work, as well as the disposition of salvaged materials or debris.
 - 1. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
 - 2. Beginning of cutting or patching means acceptance of existing conditions.
 - 3. Provide protective coverings and enclosures necessary to prevent damage to existing spaces and materials to remain.
 - 4. Demolish and remove existing construction as shown, indicated or required to be removed to accomplish the Work.
 - 5. Execute work with care. Existing construction that is to remain which is loosened, cracked, or otherwise damaged or defaced as a result of the Work and is unsuitable for use intended shall be removed and replaced at no additional cost to the Owner.

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6. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 7. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 8. Transport debris and rubbish in such a manner as to prevent the spread of dust.
 9. Clean demolition areas and remove debris, waste and rubbish from the building at the conclusion of each day's work.
 - a. Transport debris and rubbish in such a manner so as to prevent spread of dust.
 - b. Do not store or permit debris storage at site.
 - c. Do not burn debris, rubbish or waste at the site.
 - d. Keep adjacent areas unencumbered and clean.
 - e. Keep walks and similar areas broom clean.

3.4 PATCHING AND RESTORING

- A. Patch or otherwise restore disturbed existing construction as indicated on the drawings and schedules, or as otherwise required to restore the work and surfaces. Patching or restoration shall be carried to natural breaks (i.e., corners) wherever possible. Where existing construction is removed, cut or otherwise disturbed by Work of the Project, patch defective and incomplete surfaces. Repair any damage to existing construction which is to remain.
 1. Patching work shall be done by skilled mechanics experienced in the particular type of work involved. Patching work shall conform to the standards of the Specifications where applicable and where not specified, work shall conform to the highest standards of the trade.
 2. Patch existing construction to match existing work (unless otherwise called for) except provide new materials and accomplish as for new work. Examine existing surfaces to be patched before proceeding with the work. Report all conditions where existing materials, colors and finishes cannot be matched to the Architect and Owner, and do not proceed until instructions have been given.
 3. Existing construction that has been damaged as a result of the Work shall be repaired to an extent and as required to match adjacent existing undamaged construction.
 4. Painting: Painting, including preparation, materials, workmanship and number of coats shall comply with Section 099000 - Painting. Painting of surfaces patched shall extend to natural breaks, such as corners, as approved by the Architect and Owner.
 - a. It is the intent that the mechanical and electrical subcontractors are responsible to paint or repaint surfaces at locations where demolition, cutting and patching has been accomplished only for their work.
- B. Thoroughly clean and prepare all surfaces to receive new finish or covering. Completely remove dirt, dust, grease, oil, paint, loose materials and soil. Clean, etch where necessary, and place surfaces in most suitable condition for the finish.

3.5 CLEANING

- A. Perform periodic and final cleaning.
- B. Clean Owner-occupied areas daily.
- C. Clean spillage, overspray, and heavy collection of dust in Owner- occupied areas immediately.
- D. At completion of work of each trade, clean area and make surfaces ready for work of successive trades.
- E. At completion of alteration work in each area, provide final cleaning and return space to a condition suitable for use by Owner.

END OF SECTION

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SECTION 017420 CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative and procedural requirements for recycling or disposing of construction waste for compliance with USGBC's ["**LEED v4.0 /v4.1 for Building Design and Construction**" (hereafter "LEED")] ["**LEED v4.1 for Interior Design and Construction**" (hereafter "LEED")] [**Minnesota Buildings, Benchmarks & Beyond (B3) v3.1**].
- B. Section Includes: Administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous waste.
 - 2. Recycling nonhazardous waste.
 - 3. Disposing of nonhazardous waste.
- C. Related Sections:
 - 1. Section 018113 - Sustainable Design Requirements.
 - 2. Section 024113 - Selective Site Demolition: For disposition of waste resulting from demolition and removal of existing sitework.
 - 3. Section 024130 - Selective Interior Demolition: For disposition of waste resulting from demolition and removal of existing construction and equipment.
 - 4. Section 024120 - Selective Demolition: For disposition of waste resulting from demolition and removal of existing construction and equipment.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 ACTION SUBMITTALS

- A. Waste Management Plan: Prior to start of construction, submit a construction waste management plan indicating how Contractor proposes to collect, segregate, recycle, and recover at least **75%** of construction wastes and debris generated by the Work.
 - 1. Submit documentation indicating compliance with regulations specified in this Section.
 - 2. Include a list of recycling facilities to which indicated recyclable materials will be sent for recycling.
 - 3. Identify materials that are not recyclable or otherwise recoverable that must be disposed of in a landfill or other means acceptable under governing State of Minnesota and local regulations.
 - 4. List permitted landfills and/or other disposal means to be employed.

1.4 SUSTAINABLE DESIGN SUBMITTALS

- A. Letter Template for LEED Credit MR 2.1 and 2.2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

1.5 INFORMATIONAL SUBMITTALS

- A. Sustainable Design Submittals: In addition to other specified action and informational submittals, submit the following in accordance with B3 Guidelines documentation requirements. Mark as "Sustainable Design Submittal".
 - 1. M.3B: Waste Management Report.
- B. Waste Management Report: Documenting actual construction waste disposal and recycling rates indicating at least 75% diversion, including receipts or other documentation related to diversion through the course of construction:
 - 1. Calculation method used.
 - 2. Total amount of nonhazardous construction and demolition waste.
 - 3. Total amount of nonhazardous construction and demolition waste diverted from landfill..
 - 4. Diversion percentage met.
- C. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
 - 1. Submit on completed *Appendix M-3b2: Construction Waste Recycling Economics Calculator*, available on B3 website at https://www.b3mn.org/guidelines/3-1/m_3/. Sample attached at end of this Section.
- D. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons.
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.6 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent [may] [may not] serve as Waste Management Coordinator.
- B. Regulatory Requirements: Comply with applicable requirements of the State in which Project is located and applicable local ordinances and regulations concerning management of construction, demolition, land clearing, inert, and site trash debris and subsequent modifications and amendments to same.
- C. Disposal Sites, Recyclers, and Waste Materials Processors: Use only facilities properly permitted by the State of Minnesota, and by local authorities where applicable.

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- D. Waste Management Preconstruction Conference: Prior to beginning work at the site, schedule and conduct a conference to review the Construction Waste Management Plan and discuss procedures, schedules and specific requirements for waste materials recycling and disposal. Discuss coordination and interface between Contractor and other construction activities. Identify and resolve problems of compliance with requirements. Record minutes of the meeting, identifying conclusions reached and matters requiring further resolution. Maintain waste management as an agenda item at future construction meetings.
1. Attendees: Construction Manager, Prime Contractors, Waste Management Coordinator, and related Contractor personnel associated with work of this section, including personnel in charge of the waste management program; Architect; material suppliers where appropriate; and such additional Owner personnel as Owner deems appropriate.
 2. Plan Revision: Make revisions to Construction Waste Management Plan agreed upon during the meeting and incorporate resolutions agreed to be made subsequent to the meeting. Submit revised plan to Architect for approval.

1.7 STORAGE AND HANDLING

- A. Site Storage: Remove materials for recycling and recovery from the work location to approved containers or storage area as required. Failure to remove waste materials will be considered cause for withholding payment and termination of Contract.
- B. Position containers for recyclable and recoverable waste materials at a designated location on the Project Site. If materials are sorted on site, provide separate collection containers or storage areas for not less than the following materials:
1. Concrete and masonry.
 2. Metals.
 3. Untreated lumber.
 4. Gypsum wallboard scrap.
 5. Paper and cardboard.
- C. Handling: Deposit indicated recyclable, and recoverable materials in storage areas or containers in a clean (no mud, adhesives, solvents, petroleum contamination), debris-free condition. Do not deposit contaminated materials into the containers until such time as such materials have been cleaned.
- D. If the contamination chemically combines with the material so that it cannot be cleaned, do not deposit into the recycle containers. In such case, request resolution by the Construction Quality Manager for disposal of the contaminated material. Directions from the Construction Quality Manager do not relieve the Contractor of responsibility for compliance with all legal and regulatory requirements for disposal, nor shall such directions cause a request for modification of the Contract.

1.8 PROJECT CONDITIONS

- A. Environmental Requirements: Transport recyclable and recoverable waste materials from the Work Area to containers and carefully deposit in the containers without excess noise and interference with other activities, to minimize noise and dust.
1. Do not place recyclable waste materials on the ground adjacent to a container.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

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1. Comply with Section 015000 - Temporary Facilities and Controls for operation, termination, and removal requirements.
 - B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 1. Distribute waste management plan to everyone concerned within [three] <Insert number> days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
 - C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 WASTE MANAGEMENT

- A. General: Implement waste management procedures in accordance with approved Construction Waste Management Plan. Maintain procedure throughout the life of this Contract.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 4. Store components off the ground and protect from the weather.
 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.
- D. Source Separation On- or Off-Site: Either separate, store, protect, and handle at the project site all identified recyclable and recoverable waste products to prevent contamination of materials and maximize recycleability and recoverability of materials. Or mix all identified recyclable and recoverable waste products for separation off-site.
- E. Arrange for the regular collection, transport from the site, and delivery to respective approved recycling centers of indicated recyclable waste materials. Maintain records accessible to the Architect for verification of construction waste materials recycling and recovery.
- F. Delivery Receipts: Arrange for timely pickups from the site or deliveries to approved recycling facilities of designated waste materials to keep construction site clear and prevent contamination of materials. Keep and maintain records of deliveries to recycling facilities and pickups of waste materials at the site by others as specified above.

3.3 RECYCLING CONSTRUCTION WASTE

- A. General: the following paragraphs supplement handling requirements for various materials identified for classification and recycling listed in Part 1 "Summary" article above.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

C. Packaging and Paper:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
5. Bond Paper: General office quality paper used for specifications, correspondence, copiers, PC laser printers, and FAX machines. Collect in separate container at each workstation and deposit loose in appropriate recycle container as required.
6. Newsprint: Newspapers and tabloid style advertising (slick finish magazines and advertising materials are not typically recyclable). Collect in single location and deposit as required in appropriate recycle container.
7. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:
 - a. Paper.
 - b. Aluminum cans.
 - c. Glass containers.
 - d. Plastic bottles and containers.
8. Other: Recycle paper and beverage containers used by on-site workers.

D. Concrete and Masonry: Clean concrete, brick, rock, and masonry free of metals, woods and other contaminates.

1. If possible during demolition, crush existing concrete and concrete masonry units on-site into aggregate size.
2. Store crushed material on-site in clean area to avoid contamination from other materials or building processes.
3. Reuse on-site crushed material for fill, for stabilizing soils, or as base and subbase materials.
4. If crushing on site is impractical, store material during demolition processes on site in clean, uncontaminated area.

E. Metals: Metal scrap including iron, steel, copper, brass, and aluminum including piping, fasteners, wiring, ductwork and sheet metal goods.

1. Cut items to lengths and sizes to fit within the container provided when necessary.
2. Where there is sufficient quantity of a specific recyclable waste item, make special arrangements for items to be bundled, banded or tied, and stack in a designated location for a special pick-up. Coordinate special arrangements with Contractor.

F. Untreated Wood: Unpainted, untreated dimensional lumber, timber beams, engineered wood products, plywood, oriented strand board, Masonite, particleboard, wood shipping pallets, and crates.

1. Salvaged wood materials to be free of metals, concrete, gypsum wallboard, insulation, and other contaminating materials.
2. Stack dimensional wood into like piles. For example, store 2 x 4s with other 2 x 4s, and 2 x 6s with other 2 x 6s. Also, if quantity is sufficient, separate piles into lengths of 4-foot increments.
3. Reuse lumber on site as studs, backing, blocking or other uses where appropriate.
4. Stack non-dimensional wood in piles for possible reuse on-site or transport off-site.

G. Gypsum Wallboard Scrap: Excess drywall construction materials including cuttings, other scrap, and excess materials.

1. Separate gypsum wallboard from other wastes. Dispose of waste gypsum wallboard off-site at a gypsum reclamation or recycling facility, or on-site as a soil amendment.
2. Soil Amending: For on-site application as a soil amendment, incorporate waste gypsum wallboard in landscape areas under construction, at a rate of 50 pounds per 1000 square feet, or approximately one ton per acre.

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- a. Material must be unpainted gypsum wallboard from new construction, ground to reduce material to a fine particle size (70% passing a 100-mesh screen), and must be fully incorporated into the soil surface.
 - H. Carpet: All existing carpet and existing carpet waste shall be reused or recycled at no added cost. A reclamation plan shall be submitted in the proposal that will provide directions for the reclamation of all carpet at the job site.
 - 1. Description of Reclamation Services: Carpet shall be removed by the successful contractor from any existing site and prepared for pickup based on the type of material and reclamation option selected. Documentation such as chain of custody must be provided for each and every job conducted under this contract during the term of the contract. Specifications for removal from the jobsite include:
 - a. Removal of performance broadloom for recycling: Performance broadloom shall be rolled, palletized and secured for shipping. Cut pieces of performance broadloom shall also be acceptable, provided they are secured for shipping. Performance broadloom shall be kept dry and free from moisture damage. Rolls shall be clean of any non-carpet debris, front and back, other than ordinary soiling in normal use.
 - b. Removal of Broadloom Carpet for Recycling: Rolled carpet shall not exceed six (6) feet in length x one (1) foot diameter. Width may vary from 2 feet to 12 feet. Carpet shall be accumulated and kept dry for shipping and processing.
 - I. Other Items: Where recyclability classification of any given waste material is unclear, verify with the Construction Quality Manager.

3.4 DISPOSAL OF NON-RECYCLABLE WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Collect and segregate non-recyclable waste for delivery to a permitted landfill site.
 - 3. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 017700 CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Closeout Procedures.
 - 2. Comprehensive (Punch) List.
 - 3. Substantial Completion Procedures.
 - 4. Final Completion Procedures.
 - 5. Repair and Replacement of Work.
 - 6. Final Cleaning.
 - 7. Instruction and Training.

1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items (Punch List): Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Submit list as Microsoft Excel electronic file. Architect will return annotated file.
 - 2. Submit initial punch list at Substantial Completion and final certified list at Final Completion.
 - 3. Organize list of spaces in sequential order.
 - 4. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.4 CLOSEOUT PROCEDURES AND SUBMITTALS

- A. General Closeout Requirements: Comply with General and Supplemental Conditions of the Contract for Construction.
- B. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings.
 - 6. Advise Owner of changeover in heat and other utilities.
 - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 9. Complete final cleaning requirements, including touchup painting.

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10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
 11. Temporary Door Hardware and Keys: At time of Substantial Completion, just prior to occupancy, replace construction cores and install permanent cores in locks. Thereafter, access to spaces will be provided by the Owner.
 12. Identification of Equipment: Provide identification tags or plates, or other identification means, as specified under Technical Sections of Specifications, such as at valves, panelboards and similar items.
- C. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in Section 017800, including project record documents, operation and maintenance manuals, final completion construction documentation, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Demonstration and Training Video Recordings and Transcripts: Submit two copies within seven days of end of each training module.
 5. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner.
 6. Submit test/adjust/balance records.
 7. Submit sustainable design submittals not previously submitted.
 8. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- D. Comprehensive (Punch) List: Prepare and submit a list of items to be completed and corrected, indicating the value of each item on the list and reasons why the Work is incomplete.
- E. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect[and Construction Manager] will either proceed with inspection or notify Contractor of unfulfilled requirements.
1. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
 2. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 3. Results of completed inspection will form the basis of requirements for final completion.
- F. Incomplete Work: After Substantial Completion, expedite completion of remaining Work in a efficient manner that maintains quality standards, and as follows:
1. Coordinate and Schedule work in advance with Owner.
 2. Perform Work in occupied spaces when space is not in use, such as after hours in administrative areas or public spaces when public use hours are over for the day, unless otherwise approved by the Owner.
 3. Perform Work in occupied areas in a manner and at such time as will not significantly interfere with, hamper or inconvenience Owner's program or functions.
 4. When necessary, use overtime to accomplish work not able to be completed during normal work hours at no extra cost to the Owner.
- G. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 - Payment Procedures.

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2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- H. Final Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect[and Construction Manager] will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 REPAIR AND REPLACEMENT

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

3.2 FINAL CLEANING

- A. Final Cleaning, General: Perform other cleaning as required to turn the Project over to the Owner in new, well maintained condition, ready for full use and occupancy. Leave Project clean and ready for occupancy.
 1. Complete Final Cleaning operations before requesting inspection for certification of Substantial Completion
 2. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
 3. Remove construction waste, dirt and debris, packaging materials and other construction waste, as well as recyclable materials in accordance with Section 017420 - Construction Waste Disposal and Recycling.
 4. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an typical commercial building cleaning and maintenance program.

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5. Comply with manufacturer's written instructions for cleaning installed products and materials.
 6. Contractor is responsible for entire scope of final cleaning.
 - a. Coordinate final cleaning operations executed by subcontracts.
 7. Remove tools, construction equipment, machinery, and surplus material from Project site.
 8. Provide other cleaning as required in individual specification Sections.
 9. Clean areas made dirty by work done after Substantial Completion so building is clean as specified prior to Final Completion.
- B. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.
- C. Project Site: Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
1. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 2. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
- D. General Construction: Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
1. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 2. Sweep concrete floors broom clean in unoccupied spaces.
 3. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 4. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 5. Floors (including concrete) must be free of stains and discoloration
 6. Hardware: Adjust and polish as needed
- E. Building Systems: Clean HVAC, plumbing and electrical equipment, fixtures, ductwork and piping, in rooms and in other locations where left exposed to view.
1. Interiors of electrical cabinets, panelboards and other equipment.
 2. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 3. Clean plumbing fixtures to a sanitary condition and free of stains.
 4. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 5. Remove labels that are not permanent. Do not remove labels specifically designated to remain as part of listed, rated or labeled item.
 6. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - a. Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

3.3 INSTRUCTION PROGRAM

- A. Instruction Program: Engage instruction facilitator to develop and facilitate an instruction program including assemblage of training manuals and on-site training modules for each building system and for equipment not part of a system.
1. Facilitator: Engage qualified firm or individual experienced in training maintenance personnel similar in content and extent to that indicated for this Project. Facilitator will prepare instruction program and training modules, coordinate instructors and manufacturers' representatives, and coordinate between Contractor and Owner for number of participants, instruction times, and location

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2. Instructors: Engage factory-authorized service representatives or otherwise qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- B. Instruction Materials: Assemble educational materials necessary for instruction, including training manuals organized in coordination with requirements in Section 017800 - Closeout Submittals.
 - C. Training Modules: Develop learning objectives and instruction outlines for each module. Include descriptions of specific skills and knowledge that participant is expected to master. Include the following module topics:
 1. Basis of system design, description of subsystems and equipment.
 2. Operating standards and regulatory requirements, performance curves and limiting conditions.
 3. Operational requirements, typical and special operations, startup and shutdown, emergency procedures.
 4. Adjustments, testing, troubleshooting, diagnostics, inspections, maintenance, cleaning, and repair.
 5. Review of operations and maintenance manuals, as well as maintenance service agreements.
 - D. Demonstration and Training Videos: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 1. Video Electronic Media: Read-only format acceptable to Owner, with commercial-grade graphic label.
 2. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
 3. Recording: Film training sessions in segments presenting a single significant piece of equipment per segment.
 4. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.

END OF SECTION

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SECTION 017800 CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Operation and Maintenance Manuals.
 - 2. Warranties and Guarantees.
 - 3. Project Record Documents.
 - 4. Maintenance Materials.

1.2 OPERATION AND MAINTENANCE MANUAL PROCEDURES

- A. Submittal of Manuals: Comply with Section 017700 - Closeout Procedures for schedule for submitting operation and maintenance documentation.
 - 1. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
 - a. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
 - b. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
 - 2. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
 - a. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.
- B. Electronic PDF File Format: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Assemble each manual into a composite electronically indexed (bookmarked) PDF file.
 - 2. Name each indexed document file with applicable item name.
 - 3. Include a complete electronically linked operation and maintenance directory.
 - 4. Enable inserted reviewer comments on initial manual submittals.
 - 5. Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 6. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- C. Paper Copy: Submit two manuals in the form of hard copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name. Indicate volume number for multiple-volume sets.

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2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.3 OPERATION AND MAINTENANCE MANUAL CONTENT

- A. Title Page: Include name and address of Project and Owner; date of submittal; project directory including Contractor, Construction Manager, Architect, Commissioning Authority, and Major Consultants.
- B. Table of Contents: Prepare a single, comprehensive table of contents for all volumes in set, listing each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- C. Organize each manual into a separate section for each product, equipment, system and subsystem. Organize into sets of manageable size. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 1. System, subsystem, and equipment descriptions.
 2. Performance and design criteria
 3. Operating standards, procedures and logs.
 4. Wiring, piping, and control diagrams.
 5. License requirements including inspection and renewal dates.
 6. Other operation data required in individual Specifications Sections.
- D. Source Information: Engage a manufacturer's service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system. List each product, system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent.
- E. Maintenance Documentation: For Manufacturer's standard maintenance procedures, including: test and inspection instructions, troubleshooting guide; aligning, adjusting, and checking instructions; maintenance and service schedules. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly. Identification and nomenclature of parts and components.
- F. Diagrams: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
- G. Emergency Procedures: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies procedures as follows:
 1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 1. Include procedures to follow and required notifications for warranty claims.

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- I. Warranties: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
 1. Partial Occupancy: Submit executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
 2. Paper Copy: Bind warranties and bonds in heavy-duty, three-ring binders, separated with labelled tabbed divider sheets.
 3. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 4. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 5. Provide description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 6. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.4 PROJECT RECORD DOCUMENTS

- A. At completion of Contract, provide Record Set of documents in accordance with General and Supplemental Conditions of the Contract for Construction.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.
- C. Record Drawing Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
 1. Format: Annotated PDF electronic file with comment function enabled.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect for resolution.
- D. Record Drawing Prints: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 1. Include information cut and pasted into appropriate location of documents to reference change, adjustment, or clarification. Type of information to be recorded on record set includes but is not limited to:
 - a. Addendum items sent during bidding
 - b. Changes, deviations or revisions made, except minor or non-critical dimensions, including those made by Change Order or Supplementary Instructions.
 - c. Accepted submittals including shop drawings, product data and samples.
 - d. Omissions, including work omitted by accepted alternates.
 - e. Dimensioned locations of major or main utility lines, such as main conduit runs, piping mains and similar work.
 - f. Locations of control valves.
 - g. Additions to the work.
 - h. Changes in significant details.
 - i. Changed footing or other elevations.
 - j. Locations of electrical home run boxes, including circuit numbers and panel designations for each box.
 - k. Coordination drawings.
 - l. Changes in locations of panelboards, outlets, drains, piping, openings, dampers and similar features.

m. Other similar data.

E. Record Specifications: Submit record Specifications as annotated PDF electronic file.

1. Indicate proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

F. Record Product Data: Submit record Product Data as annotated PDF electronic file. Include record Product Data directory organized by specification section number and title, electronically linked to each item of record Product Data.

PART 2 - PRODUCTS

2.1 MAINTENANCE MATERIALS

A. Schedule of Maintenance Materials: Prepare and submit schedule of maintenance materials, Indicate name and quantity of each item, and name and number of related Specification Section.

B. Maintenance Material Submittal: Prior to final completion, deliver maintenance materials, including extra materials, spare parts, special tools and equipment keys as required in project Specifications and in accordance with written agreement between Owner and Contractor.

1. Coordinate with Owner and review Owner's requests for extra materials, as applicable.
2. Prior to delivery, label each item with manufacturer's name and model number, as applicable.
3. Coordinate with Owner for delivery schedule and storage location.
4. Obtain signature from Owner's authorized personnel for receipt of submittals.

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 017900 DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.2 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of videographer.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Date of video recording.
 - 2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
 - 3. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format.

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

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- D. Preinstruction Conference: Conduct conference at Project site. Review methods and procedures related to demonstration and training including, but not limited to, the following:
1. Inspect and discuss locations and other facilities required for instruction.
 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 3. Review required content of instruction.
 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.

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- d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
 - 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
 - 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
 - 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 - Operation & Maintenance Data.
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, with at least ten business days' advance notice.

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- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
 - E. Cleanup: Collect used and leftover educational materials **and give to Owner**. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.
 - 1. Electronic Media: Read-only format acceptable to Owner, with commercial-grade graphic label.
 - 2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
 - 3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
 - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training Video that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
 - a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. E-mail address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
 - 1. Film training session(s) in segments not to exceed 30 minutes.
 - 2. Produce segments to present a single significant piece of equipment per segment.
 - 3. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
 - 4. Where a training session on a particular piece of equipment exceeds 30 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

END OF SECTION

SECTION 018150 CALGREEN ENVIRONMENTAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: CALGreen environmental requirements related to energy efficiency, water efficiency and conservation, material conservation and resource efficiency, environmental quality, and construction waste management.
 - 1. Comply with specific CALGreen requirements for nonresidential projects as indicated on Drawings.

1.2 REFERENCES

- A. 2019 California Building Standards Code, California Green Buildings Standards Code, Title 24, Part 11 (CALGreen).

1.3 ENVIRONMENTAL REQUIREMENTS

- A. Mandatory Measures: Comply with CALGreen Mandatory Measures applicable to Project.
- B. Requirements: Review CALGreen requirements relative to nonresidential projects as indicated in checklists on Drawings.
- C. Energy Efficiency: Comply with California Energy Commission requirements.
- D. Water Efficiency and Conservation: Comply with requirements for both indoor and outdoor water use.
- E. VOC Content:
 - 1. Verify adhesives comply with CALGreen Table 5.504.4.1.
 - 2. Verify sealants comply with CALGreen Table 5.504.4.2.
 - 3. Verify paints and coatings comply with CALGreen Table 5.504.4.3.
- F. Composite Wood Products: Verify composite wood products comply with formaldehyde limits in CALGreen Table 5.504.4.5.

1.4 QUALITY ASSURANCE

- A. Project Management and Coordination: Contractor to identify one person on Contractor's staff to be responsible for CALGreen issues compliance and coordination.
 - 1. Experience: Environmental project manager to have experience relating to CALGreen building construction.
 - 2. Responsibilities: Carefully review Contract Documents for CALGreen issues, coordinate work of trades, subcontractors, and suppliers; instruct workers relating to environmental issues; and oversee Project Environmental Goals.
 - 3. Meetings: Discuss CALGreen Goals at the following meetings.
 - a. Pre-construction meeting.
 - b. Pre-installation meetings.
 - c. Regularly scheduled job-site meetings.
 - d. CALGreen Issues Criteria: Comply with requirements listed in CALGreen, the drawings, and specifications.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE REDUCTION, DISPOSAL AND RECYCLING

- A. Comply with requirements in CALGreen Section 5.408.
 - 1. Construction Waste Management: Recycle and/or salvage for reuse a minimum of 65 percent of the nonhazardous construction and demolition waste in accordance with Section 5.408.1.1, 5.408.1.2 or 5.408.1.3; or meet a local construction and demolition waste management ordinance, whichever is more stringent.
 - a. Documentation: Per Section 5.408.1.4, provide documentation that demonstrates compliance with Sections 5.408.1.1 through 5.408.1.3.
 - 2. Universal Waste: Comply with requirements of Section 5.408.2.
 - a. Universal wastes include the following:
 - 1) Electronic devices.
 - 2) Batteries.
 - 3) Electric lamps.
 - 4) Mercury-containing equipment.
 - 5) CRTs.
 - 6) CRT glass.
 - 7) Non-empty aerosol cans.
 - 8) Photovoltaic modules (PV modules).
 - 3. Excavated Soil and Land Clearing Debris: Comply with requirements of Section 5.408.3.

END OF SECTION

SECTION 024130 INTERIOR SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Demolition and removal of selected portions of building or structure.
 - 1. Demolition and removal of selected site elements.
 - 2. Salvage of existing items to be reused or recycled.
 - 3. Repair procedures for selective demolition operations.

1.2 INFORMATIONAL SUBMITTALS

- A. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure building manager's and other tenants on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

1.3 QUALITY ASSURANCE

- A. Skilled Mechanics: Accomplish all work of cutting, removal, demolition, relocation, patching and other restoration by using only mechanics skilled in the trade. If necessary, sublet the work to skilled contractors or subcontractors.

1.4 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition such that Owner's operations will not be disrupted.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations.
 - 1. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
 - 2. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.
 - 3. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - a. Do not disturb hazardous materials or items suspected of containing hazardous materials.

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4. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.
- B. Pre-Demolition Conference: Conduct conference at Project site.
1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review structural load limitations of existing structure.
 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 5. Review areas where existing construction is to remain and requires protection.
- C. Examination: Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
1. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
 2. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
 3. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
 4. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - a. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- D. Preparation:
1. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 2. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 3. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
- E. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- F. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- G. Existing to Remain:
1. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

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- 2. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
 - H. Unused Anchorages: Remove anchorages associated with removed items. Dismantle anchorages associated with dismantled items. Patch holes created by anchorage removal or dismantling according to the requirements for new work.
 - I. Brick Removal: At locations indicated, carefully demolish or remove masonry work without damaging surrounding existing construction to be left in place.
 - 1. Maintain adjoining construction to be left in place in an undamaged condition.
 - 2. Notify Architect of detrimental conditions including:
 - a. Voids, cracks and damaged existing masonry backup units.
 - b. Rotted wood, rusted metal, and other deteriorated items.
 - J. Disposal: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - K. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

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SECTION 057300 DECORATIVE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Custom ornamental handrail and guardrail assemblies (HR-1).
 - 2. Engineering required to comply with specified performance requirements.

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not suit structural performance requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: Submit product data for each product used in ornamental metalwork, including finishing materials and methods.
- B. Delegated Design Submittal and Shop Drawings: Where professional design services or certifications by a qualified Professional Engineer are specifically required of the Contractor by the Contract Documents, submit in accordance with the delegated design submittal requirements in Section 013300 - Submittal Procedures.
- C. Calculations: Upon request from the Architect/Engineer only, submit calculations in accordance with Section 013300 - Submittal Procedures.
- D. Shop Drawings:
 - 1. Indicate design criteria and applied loads for which the ornamental stair systems have been designed.
 - 2. Clearly indicate magnitude and location of all forces transferred to the primary building structure by cold-formed metal framing system. Loads shall be provided as unfactored values determined in accordance with ASCE 7-10.
 - 3. Indicate fabrication and installation of ornamental metalwork, including plans, elevations and details of components and attachments to other units of work. Indicate materials, profiles of each ornamental metalwork member and fitting, joinery, finishes, fasteners, anchorages and accessory items.
 - 4. Include setting drawings, templates and directions for location and installation of items and anchor bolts and other anchorage devices to be installed as unit of work of other sections.
- E. Fabrication Samples: Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Prepare samples of metal of same alloy and gauge to be used for Work. Fabrication shall include the following components:
 - 1. All vertical and horizontal rails.
 - 2. Welded and brazed connections.
 - 3. Fittings and brackets.
 - 4. Infill panels.

1.4 INFORMATIONAL SUBMITTALS

- A. Installer's Certificate: Signed by manufacture certifying the welders comply with requirements specified under Quality Assurance article.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in successfully producing ornamental metalwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in Work.
- B. Installer Qualifications: Arrange for installation of ornamental metalwork specified in this section by same firm that fabricated unit.
- C. Qualify welding processes and welding operators in accordance with the following:
 - 1. AWS D1.1 Structural Welding Code - Steel.
 - 2. AWS D1.6, "Structural Welding Code - Stainless Steel."
 - 3. Certify that each welder employed in unit of work of this section has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
 - 4. Testing for recertification is Contractor's responsibility.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build full-height mockups, not less than 24 inches long; consisting of two posts, top rail, infill panels and anchorage components; as applicable for each of the following DEC RAIL configurations:
 - a. (DEC RAIL-):
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 STRUCTURAL DESIGN REQUIREMENTS

- A. Engineering Responsibility: Engage a qualified Professional Engineer to provide delegated design services in accordance with Section 013300 - Submittal Procedures
- B. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections:
 - 1. Top Rails of Guards and Handrails Not Serving as Top Rails:
 - a. Concentrated load of 200 lbf applied at any point and in any direction.
 - b. Linear (Uniform) load of 50 lbf/ft. applied in any direction.
 - c. Linear and concentrated loads need not be assumed to act concurrently.
 - 2. Intermediate Rails, Balusters and Panel Fillers: Capable of withstanding a horizontally applied normal load of 50 pounds over 1 square foot, not concurrent with other loads.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 DECORATIVE RAILINGS SCHEDULE

- A. (DEC RAIL) Dimensions and Configurations: As shown on Drawings and as described below.

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- B. (DEC RAIL-1) Handrail at Lobby Stair: Clear, straight-grained hardwood rails secured to recessed metal spline, anchored to wall & to guardrail (ORN RAIL-3).
1. Steel Finish: Shop-primed for high-performance coating (HPC).
 2. Wood Species and Finish: WD-1 in accordance with Section 064000 - Architectural Woodwork.
 3. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.
- C. (DEC RAIL-3) Interior Guardrail:
1. Top Rail: Steel bar.
 2. Bottom Rail: Steel bar.
 3. Vertical Pickets: Steel bar, square corners.
 4. Mounting: Side of curb/wall.
 5. Finish: Shop-primed for high-performance coating (HPC).
- D. (DEC RAIL-4) Exterior Handrail, Ground-Mounted
1. Handrail: Galvanized steel bar.
 2. Posts: Galvanized steel bar.
 3. Mounting: As shown.
 4. Finish: Shop-primed for high-performance coating (HPC).
- E. (DEC RAIL-5) Interior Plate Guardrail with Handrail:
1. Guardrail: 1/2-inch thick steel plate.
 2. Handrail: Steel pipe, bracket as shown..
 3. Mounting: As shown.
 4. Finish: Shop-primed for high-performance coating (HPC-10).
- F. (DEC RAIL-6) Interior Handrail, Floor-Mounted:
1. Handrail: Steel bar.
 2. Posts: Steel bar.
 3. Finish: Shop-primed for high-performance coating (HPC).
- G. (DEC RAIL-7) Interior Handrail, Wall-Mounted:
1. Handrail: Steel pipe.
 2. Bracket: Steel.
 3. Finish: Shop-primed for high-performance coating (HPC-6).
- H. (DEC RAIL-1) Handrail at Lobby Stair: Clear, straight-grained hardwood rails secured to recessed metal spline, anchored to wall & to guardrail (ORN RAIL-3).
1. Steel Finish: Shop-primed for high-performance coating (HPC).
 2. Wood Species and Finish: WD-1 in accordance with Section 064000 - Architectural Woodwork.
 3. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.
- I. (DEC RAIL-1) Solid Hardwood Toprail:
1. Top Rail: Straight-grained Hardwood (WD-2) on continuous, recessed steel subrail.
 2. Mounting:
 - a. Face-mounted subrail to wall with steel brackets
 - b. Subrail welded to guardrail with steel brackets.
 3. Steel Finishes: Shop-primed for (HPC) finish.
- J. (DEC RAIL-2) Steel Handrail, Exterior, Galvanized:
1. Handrail: Steel tube, galvanized.
 2. Posts: Steel posts (where indicated), galvanized.
 3. Mounting:
 - a. Anchored to guardrail or APC, as shown on Drawings
 4. Steel Finishes: Galvanized and shop-primed for (HPC) finish.
- K. (DEC RAIL-3) Steel Handrail, Interior Exit Stair:

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1. Handrail: Steel tube.
 2. Posts: Steel posts (where indicated).
 3. Vertical Pickets: Steel bars.
 4. Mounting:
 - a. Face-mounted to wall with steel brackets
 - b. Welded to guardrail with steel brackets.
 5. Steel Finishes: Shop-primed for (HPC) finish.\
- L. (DEC RAIL-11) Steel Guardrail, Interior:
1. Top Rail: Steel bar.
 2. Bottom Rail: Steel bar.
 3. Vertical Pickets: Steel bars.
 4. Mounting: Stringer and floor-mounted.
 5. Steel Finishes: Shop-primed for (HPC) finish.
- M. (DEC RAIL-12) Steel Guardrail, Exterior:
1. Top Rail: Steel bar, galvanized.
 2. Bottom Rail: Steel bar, galvanized.
 3. Vertical Pickets: Steel bars, galvanized.
 4. Mounting: Stringer and parapet-mounted.
 5. Steel Finishes: Galvanized and shop-primed for (HPC) finish.
- N. (DEC RAIL-13) Steel Under Stair Cane Rail, Interior:
1. Top Rail: Steel bar.
 2. Bottom Rail: Steel bar.
 3. Vertical Pickets: Steel bars.
 4. Mounting: Floor-mounted.
 5. Steel Finishes: Shop-primed for (HPC) finish.
- O. (DEC RAIL-14) Exterior Steel Site Stair Railing:
1. Top Rail: Steel tube.
 2. Posts: Steel posts (where indicated).
 3. Vertical Pickets: Steel bars.
 4. Mounting: Slab embedment.
 5. Steel Finishes: Shop-primed for (HPC) finish.
- P. (DEC RAIL-1) Handrail:
1. Rail: Stainless steel pipe, satin finish.
 2. Bracket: Stainless steel; at wall-mounted and guardrail-mounted.
 - a. Basis of Design:
 3. Posts: Stainless steel pipe; at floor- mounted.
 4. Attachment: Wall-mounted, floor-mounted, guardrail-mounted.
- Q. (DEC RAIL-2) Exit Stair Guardrail:
1. Posts and Rails: 1-1/2 inch square steel tubes with square corners.
 2. Infill Panel: Formed sheet/plate metal with custom perforation.
 3. Attachment: As shown.
 4. Steel Finishes: Shop-primed for painted finish (PT-1).
- R. (DEC RAIL-3) Balcony Guardrail:
1. Posts and Rails: 1-inch by 3-inch steel tubes or bars with square corners.
 2. Infill Panel: Formed sheet/plate metal with custom perforation.
 3. Attachment: As shown.
 4. Steel Finishes: Shop-primed for painted finish (PT-1).
- S. (DEC RAIL-5) Under-stair Barrier Rail:
1. Rail: Stainless steel pipe.
 2. Attachment: Floor-mounted, as shown.
- T. (DEC RAIL-6) Exterior Handrails

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1. Post and Rail: 1 1/2" diameter 316 Stainless Steel
 2. Attachment: Set handrail in 8" deep galv. Tube steel imbeds with epoxy.
 3. Miter joints at corners and continuously fillet weld. Grind welds smooth.
 4. Steel Finish: #4 Satin Finish
- U. Gates: Form gates from steel tube of same size and shape as top rails, with infill to match guards. Provide with self-closing cam-type hinges or spring hinges for fastening to wall and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.

2.3 MATERIALS

- A. General: Provide ornamental metalwork composed of metals of forms and types which comply with requirements of referenced standards and which are free from surface blemishes where exposed to view in finished unit.
1. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
 2. Exposed to view surfaces exhibiting pitting, seam marks, roller marks, oil canning, stains, discolorations or other imperfections on finished units are not acceptable.
- B. Steel and Iron:
1. Steel Pickets, Plates, Shapes and Bars: ASTM A36; square corners and edges.
 2. Bars: Hot-rolled, carbon steel complying with ASTM A 29, Grade 1010; square corners and edges.
 3. Steel Tubing: ASTM A500 or ASTM A 513; square corners and edges.
 4. Steel Pipe: ASTM A53, Type S, Grade A, standard weight and extra-strong as required, galvanized and plain.
 5. Perforated Metal Plate: Cold-rolled steel sheet, ASTM A 1008, or hot-rolled steel sheet, ASTM A 1011, commercial steel Type B.
 - a. Thickness:
 - b. Perforations: 1/4-inch holes 3/8 inch o.c. in staggered rows.
 6. Cast Iron: Either ASTM A 48 gray iron, or ASTM A 47 malleable iron, unless otherwise indicated.
 7. Expanded Metal: ASTM F 1267, [Type I (expanded)] [Type II (expanded and flattened)], Class 1 (uncoated).
 - a. Style Designation: [3/4 number 13] [1-1/2 number 10] .
 8. Perforated Metal: Cold-rolled steel sheet, ASTM A 1008, or hot-rolled steel sheet, ASTM A 1011, commercial steel Type B, [0.060 inch] thick, [with 1/4-inch holes 3/8 inch o.c. in staggered rows].
 9. Perforated Metal: Galvanized-steel sheet, ASTM A 653, G90 coating, commercial steel Type B, [0.064 inch] thick, [with 1/4-inch holes 3/8 inch o.c. in staggered rows] [with 1/8-by-1-inch round end slotted holes in staggered rows].
 10. Woven-Wire Mesh: Intermediate-crimp, [diamond] [square] pattern, 2-inch woven-wire mesh, made from 0.135-inch nominal diameter wire complying with ASTM A 510.
- C. Stainless Steel: Provide austenitic stainless steel in form indicated complying with following requirements.
1. Tubing: ASTM A554, Grades MT 301, MT 302, or MT 304, as standard with manufacturer.
 2. Pipe: ASTM A167, Type [304] [316], 16 gauge.
 3. Bar Stock: ASTM A276,
 4. Provide stainless steel fasteners where indicated and where dissimilar metals are connected. Where dissimilar metals are connected, provide neoprene spacer or washer for isolation.
- D. Stainless Steel: Provide austenitic stainless steel in form indicated complying with following requirements. Provide passivate exterior stainless steel where required.
1. Plate and Sheet: ASTM A 666, Type [304] [316].
 2. Tubing: ASTM A554, Grades MT 301, MT 302, or MT 304.
 3. Pipe: ASTM A167, Type 304, 16 gauge.
 4. Bar Stock: ASTM A276.
 5. Fasteners: Type 316 stainless-steel fasteners.

E. Stainless Steel Wire Rope and Fittings:

1. Wire Rope: [1-by-19] [7-by-7] [7-by-19] <Insert configuration> wire rope made from wire complying with ASTM A 492, Type 316.
2. Wire-Rope Fittings: Connectors of types indicated, fabricated from stainless steel, and with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

F. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.

G. Hardwood for Railings: (WD-1) as specified in Section 064000 - Architectural Woodwork.

2.4 GLASS RAILING

A. (DEC RAIL-___) Glass Guardrail.

1. Glass: 1/2-inch thick tempered glass.
2. Mounting: Aluminum channel shoe, clear anodized finish.
3. Top Edge Cap: Continuous stainless steel channel cap at top of glass.

B. Clear Tempered Glass: 1/2 inch thickness; comply with ASTM C1036, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), and further processed to comply with ASTM C1048, Kind FT (fully tempered).

1. Glass Fabrication: Fabricate to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.
 - a. Clean-cut or flat-grind edges at butt-glazed sealant joints to produce square edges with slight chamfers at junctions of edges and faces
 - b. Grind smooth and polish exposed edges, including those at open joints, to produce square edges with slight chamfers at junctions of edges and faces.

C. Aluminum Channel for Glass Guardrails: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.

1. Extruded Bars and Shapes: ASTM B 221, Alloy 6063-T5/T52.

D. (DEC RAIL-1) Glass Guardrail, Bronze Cladding and Bronze Top Rail:

1. (GL-1T) Glass: 1/2" thick, ultra-clear, fully-tempered safety glass, as specified in Section 088000 - Glazing.
 - a. Clean-cut or flat-grind edges at butt-glazed sealant joints to produce square edges with slight chamfers at junctions of edges and faces, grind smooth exposed edges, including those at open joints, to produce square edges with slight chamfers at junctions of edges and faces.
2. Bronze Cladding and Top Rail: ASTM B 36, Alloy UNS No. C28000 (muntz metal, 60 percent copper).
 - a. Pre-Weathered Bronze Finish: Brushed finish with patina conversion coating.
 - 1) Mechanical Finish: Directional texture, satin finish as selected by Architect.
 - 2) Chemical Finish: Conversion coating as recommended by fabricator to achieve dark bronze finish as selected by Architect.
 - 3) Wax: Microcrystalline as recommended by fabricator for application.
3. Extruded Aluminum Channel for Glass Guardrails: ASTM B 221. Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper.
 - a. Basis of Design: Struct-U-Rail by Livers Bronze Co..
 - 1) Other Manufacturers: C.R. Laurence.

E. (DEC RAIL-2) Glass Guardrail, Stainless Steel Cladding and Top Rail:

1. (GL-2T) Glass: 1/2" thick, clear, fully-tempered safety glass, as specified in Section 088000 - Glazing.

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- a. Clean-cut or flat-grind edges at butt-glazed sealant joints to produce square edges with slight chamfers at junctions of edges and faces, grind smooth exposed edges, including those at open joints, to produce square edges with slight chamfers at junctions of edges and faces.
 2. Stainless Steel Cladding and Top Rail: ASTM A 666, Type [304] [316].
 3. Extruded Aluminum Channel for Glass Guardrails: ASTM B 221. Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper.
 - a. Basis of Design: Struct-U-Rail by Livers Bronze Co..
 - 1) Other Manufacturers: C.R. Laurence.

2.5 BRONZE HANDRAIL

- A. (DEC RAIL-___) Bronze Handrail:
 1. Mounting: Wall-mounted on bronze bracket or ground-mounted as indicated on Drawings.
 2. Extruded Shapes, Bronze: ASTM B 455, Alloy UNS No. C38500 (architectural bronze).
 3. Seamless Tube, Bronze: ASTM B 135, Alloy UNS No. C23000 (red brass, 85 percent copper).
 4. Plate, Sheet, Strip, and Bars; Bronze: ASTM B 36, Alloy UNS No. C28000 (muntz metal, 60 percent copper).
 5. Castings, Bronze: Composition bronze castings complying with ASTM B 62, Alloy UNS No. C83600 (85-5-5-5 or No. 1 composition commercial red brass).
 6. Pre-Weathered Bronze Finish: Brushed finish with patina conversion coating.
 - a. Mechanical Finish: Directional texture, satin finish as selected by Architect.
 - b. Chemical Finish: Conversion coating as recommended by fabricator to achieve dark bronze finish as selected by Architect.
 - c. Wax: Microcrystalline as recommended by fabricator for application.

2.6 ACCESSORIES

- A. Fasteners and Anchors: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
 1. Stainless-Steel Components: Type 316 stainless-steel fasteners.
 2. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.
 3. Galvanized-Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
 4. Dissimilar Metals: Provide Type 304 stainless-steel fasteners where indicated and where dissimilar metals are connected. Where dissimilar metals are connected, provide neoprene spacer or washer for isolation.
- B. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- D. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. At exterior locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.7 FINISHING

- A. Finishing, General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise shown and specified.
 1. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

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2. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
 3. Fabricate with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.
 - a. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
 - b. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for Architecturally Exposed Structural Steel.
- B. Steel, Galvanized:
1. Hot-dip galvanize indicated steel and iron railings, including hardware, after fabrication.
 2. Comply with ASTM A 123 for hot-dip galvanized railings.
 3. Comply with ASTM A 153 for hot-dip galvanized hardware.
 4. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 5. Galvanizing Touch-Up Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
 6. At railings to be hot-dipped galvanized after fabrication: Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
 7. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
 8. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
 9. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - a. Shop prime uncoated railings with universal shop primer or primers specified in Section 099000 - Painting.
- C. Steel, Non-Galvanized: For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, but galvanize anchors to be embedded in exterior concrete or masonry.
1. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:
 - a. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - b. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - c. Railings Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - d. Other Railings: SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
 2. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - a. Shop prime uncoated railings with universal shop primer or primers specified in Section 099000 - Painting.
- D. Shop-Applied Primer: Coordinate and comply with the following applicable specifications Sections for primer materials, surface preparation and application:
1. Paint (PT) or Epoxy Paint (PTE): Section 099000 - Painting.
 2. High-Performance Coating (HPC): Section 099600 - High-Performance Coatings.
- E. Powder-Coat Finish: Prepare, treat, and coat galvanized metal to comply with resin manufacturer's written instructions and as follows:
1. Prepare galvanized metal by thoroughly removing grease, dirt, oil, flux, and other foreign matter.
 2. Treat prepared metal with zinc-phosphate pretreatment, rinse, and seal surfaces.

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3. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils.
 4. Color: Custom color as selected by Architect..

2.8 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
 1. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
 2. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
 3. Form work true to line and level with accurate angles and surfaces.
 4. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- B. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.
- C. Fabricate with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.
 1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
 2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for Architecturally Exposed Structural Steel.
- D. Connections: Fabricate railings with welded connections to greatest extent possible, and mechanical connections as necessary for fabrication and installation.
 1. Welded Connections: Comply with AWS for recommended practices in shop welding. Weld behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.
 - a. Grind exposed welds smooth and flush, to match and blend with adjoining surface.
 - b. Discoloration of finished surfaces is not acceptable.
 2. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - a. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
 - b. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
 3. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION

- A. Fit exposed connections together to form tight, hairline joints.

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- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - C. Provide necessary anchors, plates, angles, hangers and struts as required for connecting stairs to the structure.
 - D. Ensure alignment with adjacent construction. Coordinate with related work to ensure no interruption in installation.
 - E. Perform necessary cutting and altering for installation of work of other sections. Do not perform any other additional cutting without review of Architect.
 - F. Field bolt and weld to match standard of shop bolting and welding. Hide bolts and screws whenever possible. Where not hidden, use flush countersunk fastenings, unless indicated otherwise. Make mechanically fastened joints flush hairline butted. Grind welds smooth and flush.
 - G. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal-arc welding, for appearance and quality of welds made, and for methods used in correcting welding work. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed welds smooth and flush and restore finish to match finish of adjacent rail surfaces.
 - H. Fit exposed connections together to form tight, hairline joints.
 - I. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
 - J. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - K. Adjust railings before anchoring to ensure matching alignment at abutting joints.
 - L. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.
 - M. Restore protective coverings that have been damaged during shipment or installation of work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.
 - 1. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.
 - N. Expansion Joints: Provide expansion joints at locations indicated or, if not indicated, at intervals not to exceed 40 ft. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6 inches of post.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Mechanical (Nonwelded) Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

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- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ATTACHING RAILINGS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing railings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Welded: Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. Anchor posts to steel by welding to steel supporting members.
- C. Attach handrails to walls with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as required to comply with performance requirements and as follows:
 - 1. For steel-framed partitions, use self-tapping screws or toggle bolts fastened to steel framing or to concealed steel reinforcements.

3.5 INSTALLED WORK

- A. Glass Railings: Clean and polish glass as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.
- B. Cleaning:
 - 1. Clean aluminum and stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.
 - 2. Clean copper alloys according to metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.
 - 3. Clean and polish glass as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.
 - 4. Clean wood rails by wiping with a damp cloth and then wiping dry.
- C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099000 - Painting or Section 099600 - High Performance Coatings.
- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
- E. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- F. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

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SECTION 061000 ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Concealed carpentry work not specified in other Sections and not used as exposed work, including:
 - 1. Miscellaneous wood framing and concealed wood blocking and nailers (WD BLKG-1).
 - 2. Anchors nails, bolts, and screws.

1.2 COORDINATION

- A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit, show location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.
 - 1. Coordinate work directly with other subcontractors as necessary to insure proper fitting, joining or to clearances of other work. Obtain templates as required to insure proper fitting.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.4 INFORMATIONAL SUBMITTALS

- A. Certificates: Submit letter certifying that lumber is kiln-dried to 15 - 19 percent moisture content, well-seasoned, grade marked, trademarked and free from warp.
 - 1. Pressure Treated Wood: Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 3. Submit letter from treatment plant certifying that chemicals and process used and net amount of salts retained are in conformance with specified standards
- B. Fire-Treated Wood: Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 1. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 2. Submit letter certifying that fire-retardant treatment materials comply with requirements herein stated and local authorities having jurisdiction and that treatment will not bleed through finished surfaces.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Inspect wood materials for conformance to specified grades, species, and treatment at time of delivery to Project site.
 - 1. Reject and return unsatisfactory wood materials.
- B. Provide facilities for handling and storage of materials to prevent damage to edges, ends and surfaces.
- C. Keep carpentry materials dry.
 - 1. Store lumber and plywood in stacks with provision for air circulation within stacks.
 - 2. Protect bottom of stacks against contact with damp surfaces. Protect exposed materials against weather.

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3. Stack materials minimum 12 inches off ground, or if on concrete slab-on-grade, minimum 1-1/2 inches, fully protected from weather.
 4. Provide for air circulation within and around stacks and under temporary coverings.
- D. Place spacers between each bundle of pressure treated materials treated with waterborne chemicals to provide air circulation.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 3. Provide dressed lumber, S4S, unless otherwise indicated.
 4. Species and allowable stresses to meet the requirements on drawing S001.
- B. Maximum Moisture Content of Lumber: 15 percent maximum, unless otherwise indicated.
- C. Lumber Standard:
1. Comply with U.S. Dept. of Commerce Product Standard PS 20, including moisture content and actual sizes related to indicated nominal sizes.
 2. Comply with Standard Grading Rules No. 16 for West Coast Lumber.
 3. Comply with American Softwood Lumber Standard and with application grading rules of inspection agencies certified by American Lumber Standard Committee's (ALSC) Board of Review.
 4. Comply with lumber producer's inspection agency grading rules certified as conforming to "National Grading Rules for Dimension Lumber" established under Section 10 of PS 20 and local code standard.
 5. Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying agency, grade, species, moisture content at time of surfacing and mill.
 - a. Seasoning: Kiln-dry lumber to 15 - 19 percent moisture content, well-seasoned, grade marked, trademarked and free from warp.
- D. Not Allowed: Products containing following materials will not be permitted:
1. Urea Formaldehyde.
 2. Chromium in wood pressure treatment products.
 3. Arsenic.

2.2 LUMBER

- A. Dimension Lumber: Finished 4 sides, 15 percent maximum moisture content. Mark lumber "S-DRY".
1. Light Framing: Construction grade Douglas Fir or Southern Pine, appearance grades where exposed.
 2. Boards: Construction grade.
- B. (WD BLKG-1) Miscellaneous Lumber: Lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members.
1. Grade: No. 3 or standard grade.
 2. Moisture content of 19 percent maximum for lumber items not specified to have wood preservative treatment.

2.3 ROUGH HARDWARE, FASTENERS AND ANCHORAGE DEVICES

- A. General: Provide rough hardware required, including nails, screws, bolts, lag screws, cinch anchors, toggle bolts, shot anchors and similar items . Provide proper size and type for use intended and for materials to be fastened.
 - 1. Install adequate hardware to insure substantial and positive anchorage.
 - 2. Use galvanized for exterior locations and high humidity locations and treated wood, plain finish for other interior locations.
 - 3. Fasteners, hangers and bearing plates used on or in connection with treated wood shall comply with IBC 2304.9.

2.4 INSTALLATION ACCESSORIES

- A. Adhesive: As recommended by manufacturer of product to be applied for surface material to give permanent adhesion, with material remaining flat to back surface. Comply with local code standards.
 - 1. Comply with APA AFG-01 for adhesive for use with type of construction panel indicated.
 - 2. Exterior: Phenolic resin waterproof glue.
 - 3. Interior: Water-resistant casein and other adhesives suited for particular use.
 - 4. Adhesive and Sealant VOC Limits: In accordance with South Coast Air Quality Management District Rule 1168 and GS-36 for aerosols. VOC Limits: As tested using U.S. EPA Reference Test Method 24 and as defined by South Coast Air Quality Management District Rules SCAQMD Rule 1168, Adhesive and Sealant Applications.

PART 3 - EXECUTION

3.1 FRAMING, NAILERS, BUCKS, CANT STRIPS

- A. Install plumb, level, true and square to dimensions shown and required. Allow for finishes and proper clearances where necessary.
- B. Provide sound bearing, square cuts, and full bearing surfaces. Set crown up for horizontal members. Shim and block where required.
- C. Eliminate crooked, twisted, cupped or bowed framing where required.
- D. Anchorage: Adequately anchor, fasten and support members to form secure, substantial and accurate anchorage and to hold required dimensions and prevent twist.
 - 1. Use bolts and screws to eliminate loosening up of joints, sagging or similar movement.

3.2 FURRING, STRIPPING, GROUNDS AND BACKING

- A. Install plumb, level, true and square. Anchor substantially for permanent installation. Set and shim to straight edge so finish wall is true and straight.
- B. Provide grounds and backing as shown or required. Blocking as required or shown on drawings for plumbing fixtures, brackets, drapery rods, window and door frames, built-in furniture and other woodwork, both interior and exterior.
- C. Allow for finishes and shim out to form level surfaces. Verify ground sizes and locations before installation.

END OF SECTION

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SECTION 064000 ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Custom-fabricated architectural woodwork.
 - 2. Wood Materials, General.
 - 3. Woodwork for Transparent Finish:
 - a. Prefinished Hardwood Veneer and Solid Hardwood for Transparent Finish (WD-1).
 - b. Matched Veneers for Work of this Section and Other Sections.
 - 4. Plastic-Laminate-Faced Cabinets and Countertops (PL)
 - 5. Solid Surface Fabrications (SS).
 - 6. Wall-Mounted Work Surfaces, Shelves on Brackets and Standards.
 - 7. Installation Accessories, Anchors and Adhesives.
 - 8. Requirements for Fabrication and Installation.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work directly with Work of other Sections as necessary to ensure proper fitting, joining or required clearances of other work.
 - 1. Exchange and coordinate shop drawings and templates.
 - 2. Coordinate fabrication schedule.
 - 3. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.
- B. Veneer Selection Conference: Prior to Pre-Fabrication Conference, conduct conference at veneer supplier's site at which veneer flitches are made available to Architect to select actual flitches to be used on Project for the purpose of establishing acceptable range of aesthetic qualities, identifying flitches of consistent appearance and designating groups of flitches for specific applications and locations on Project.
 - 1. Attendees: Veneer supplier, woodwork Fabricator and Installer, wood door Manufacturer, Contractor, Construction Manager and Architect.

1.3 ACTION SUBMITTALS

- A. Product Data: For each material and product to complete Work, including; solid hardwood, panel and veneer wood products, core materials, high-pressure decorative laminate, solid-surfacing, fire-retardant-treated materials, cabinetwork and hardware, components for wood fabrications, accessories and finishing materials.
- B. Shop Drawings: Indicate dimensions, descriptions of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, including specific requirements where indicated.
 - 1. Indicate materials and wood species, component profiles, fastening, jointing, details, finishes and accessories.
 - 2. For Work to receive matched wood veneers, show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
 - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 4. Indicate special requirements for field assembly and installation, including field connection locations, required clearances and tolerances.
 - 5. Indicate provisions for attachment of architectural woodwork and other components performed by others in the field.

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6. Indicate locations of plumbing and electrical service field conditions.
- C. Integrated Shop Drawings:
- 1.
- D. Samples: Submit full-size units or Samples of sizes indicated, prepared from same material to be used for the Work, with shop-applied transparent finish, that show full range of color and texture variations expected.
1. (WD-1) Hardwood with Transparent Finish: Submit set of at least three units exhibiting approximate limits of variations in color, pattern, texture, or other characteristics inherent in material or product. Apply finish to all faces and edges.
 - a. Solid Hardwood width: 3" wide by 12" long,
 - b. Hardwood Veneer: 12" by 12", representative of and selected from actual flitches to be used for Project.
 2. Other Wood and Surfacing Samples: Submit 12 by 12 inch sample for each type, color and finish, with one edge treatment or profile as specified.
 - a. (PL) Plastic Laminates.
 - b. (SS) Solid Surfacing.
 3. Cabinetwork Unit Samples: Units may be used as part of work if approved.
 - a. Base cabinet with door, drawer, countertop and hardware.
 - b. Wall-hung upper cabinet with door and shelf.
 4. Accessories and Hardware: Submit samples of hardware, accessories, and components of wood fabrications and casework.
 5. Fire-Treated Materials: Prior to commencing fabrication of fire-treated woodwork for Project, test and evaluate samples of prefinished veneer facings bonded to fire-treated core materials.
 - a. Test compatibility of fire-treatment chemicals with adhesives and laminates, and determine whether or not this effects the bond of face veneers to core.
 - b. Evaluate effects of fire-treatment chemicals and veneer laminating processes and their effects on aesthetic appearance of wood veneers with finishes as specified.
 - c. Architect to approve samples prior to fabrication.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Fabricator and Installer.
- B. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.
- C. Site Conditions Reports: Relative humidity and temperature readings taken before, during and after installation. Include readings taken in areas where woodwork is stored on site prior to installation.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A well-established and experienced fabricator, acceptable to Owner and Architect, employing skilled workers to custom-fabricate millwork, casework and other architectural woodwork similar to that required for this Project, whose Work meets or exceeds quality requirements of specified NAAWS Grade, and whose completed Work has a record of successful in-service performance.
 1. Architect reserves the right to reject woodwork fabricator if it is Architect's opinion that previous performance by fabricator has been unsatisfactory, or if any of the following will not result in required quality within time required for completion:
 - a. Shop capacity.
 - b. Experience of workers.
 - c. Equipment or supply of material.
 - d. Previous performance by manufacturer has been unsatisfactory.
- B. Installer Qualifications: Fabricator of woodwork assemblies.
- C. Welding Qualifications: Qualify procedures and personnel in accordance with American Welding Society's AWS D1 "Structural Welding Code."

1.6 SITE CONDITIONS

- A. Delivery, Handling and Storage: Protect woodwork items from damage, dust and dirt. Do not deliver, receive, store or install woodwork materials until storage and installation areas are conditioned in accordance with requirements and recommendations of NAAWS.
- B. Environmental Requirements: Use permanent HVAC system or provide temporary systems and controls to establish and maintain site conditions complying with specified requirements.
 - 1. Do not deliver, receive, store or install woodwork until building is enclosed, wet work is complete, and temporary or permanent HVAC systems are operating in areas where woodwork is stored and installed, and are maintaining temperature and relative humidity at occupancy levels and within the following ranges during the remainder of the construction phase:
 - a. Temperature Range: Between 60 and 90 deg F.
 - b. Relative Humidity Range: Between 25 and 55 percent.
 - 2. Fluctuation of Temperature and Relative Humidity Levels:
 - a. Do not exceed 15 percent fluctuation over any portion of a 7-day period and not to exceed 25 percent fluctuation over any portion of a 28-day period.
 - b. Maintain operation and control of heating, cooling, humidity, ventilation, temporary barriers and similar facilities continuously on a 24-hour basis to avoid rapidly fluctuating ambient levels.
- C. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOODWORK, GENERAL

- A. Quality Standards: Provide custom-fabricated architectural woodwork, casework, millwork and other assemblies that are fabricated and installed in accordance with the *North American Architectural Woodwork Standards, Adopted and Published jointly by Architectural Woodwork Institute, Architectural Woodwork Manufacturer's Association of Canada and Woodwork Institute - Current Edition* (NAAWS).
 - 1. Comply with requirements of specified NAAWS Grade except where more stringent requirements are indicated in the Contract Documents.
- B. Acoustical Performance Requirements for Architectural Woodwork in Acoustically-Critical Spaces:
 - 1. Comply with requirements of Section 018198 - Facility Acoustic Performance Requirements.
 - 2. The following characteristics are not acceptable or permitted in final installed Work:
 - a. Vibration harmonics, buzzing, rattling or squeaking.
 - b. Noises caused by movement of components.
 - c. Loosening, weakening, or fracturing of system components or attachments.

2.2 WOOD MATERIALS, GENERAL

- A. General: Provide specified wood materials and other materials recommended by woodwork fabricator, and in compliance with specified NAAWS Grade.
 - 1. Wood Moisture Content: 5 to 10 percent.
 - 2. Provide wood products made with binder containing no urea formaldehyde,
 - 3. Dimensions: As indicated on Drawings.
 - 4. Sheathing Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

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- 5. Fire-Retardant-Treated Materials: Where fire-retardant-treated materials are indicated, use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - B. Miscellaneous Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.
 - C. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber .
 - D. Veneer-Faced Plywood: HPVA HP-1, made with adhesive containing no urea formaldehyde.
 - E. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 - F. Hardboard: AHA A135.4.
 - G. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
 - H. Softwood Plywood: DOC PS 1, exterior.
 - I. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
 - J. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

2.3 WOODWORK FOR TRANSPARENT FINISH

- A. Source Limitations for Wood Materials with Transparent Finish: The intent of this requirement is to ensure matching of wood species and finishes by providing solid wood and wood veneers of like species from a single source with resources to provide materials of consistent quality in appearance and physical properties, and by shop-finishing woodwork in single shop using one process for each finish type.
- B. Minimum Quality Standard: Comply with *Architectural Woodwork Standards* (NAAWS) Premium Grade for architectural woodwork with transparent finish.
- C. (WD-1) Hardwood Type for Transparent Finish:
- D. Transparent Finish: Shop-applied, NAAWS Premium Grade, **System 5 Conversion Varnish** system as recommended by Fabricator, and as approved by Architect. Provide system in compliance with Project's low-VOC requirements. Defer only final touchup, cleaning, and polishing until after installation. Finish all surfaces, faces and edges of architectural woodwork.
 - 1. Sheen: Matching Architect's sample.
 - 2. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork.
- E. Shop-Applied Transparent Finish System: Provide wood materials with finish system as specified below and matching Architect's sample.
 - 1. Basis of Design: Precision Coat by Sansin Corporation.
 - 2. First Coat, Stain: Deep penetrating, low VOC, one-coat, UV stable stain.
 - a. Product: Sansin Purity Interior Stain.
 - 3. Second and Third Coats, Build-Up: Deep penetrating, clear, low VOC, UV resistant finish.
 - a. Product: Sansin Purity Interior Glacier Finish.
 - 4. Fourth Coat, Finish: Deep penetrating, clear, low VOC, UV and wear resistant finish.
 - a. Product: Sansin Purity Interior Glacier Low Lustre Finish.
- F. Veneer Matching: Provide matched veneered panels as specified below for all exposed Work, including wall panels, casework doors, drawer fronts, side panels, wall base, wood fabrications, wood doors and other finish carpentry indicated on Drawings.
 - 1. Wood Door Veneers: Doors that appear within areas of paneling will be made as part of sequence. If more than one flitch is used, similar flitches will be selected and break shall be made at inconspicuous point such as corner, door or window.

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- a. Match between Veneer Leaves: Book match.
 - b. Assembly of Veneer Leaves on Door Faces: Balance match.
 - c. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - d. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by **12 feet** or more.
 - e. Transom Match: Continuous match.
 - f. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling.
 - g. Exposed Vertical and Top Edges: Same species as faces or a compatible species - edge Type A.
2. Joints shall be tightly spliced to avoid visible open joints. Open joints will be rejected.
 3. Solid Hardwood: Match trim for compatibility of grain and color to itself and with veneers.

G. Veneer Matching:

1. Matching of Adjacent Veneer Leaves: Book match.
2. Matching within Panel Face: Center-balance match.
3. Panel-Matching Method: Blueprint-matched panels and components within each separate area.
4. Vertical Panel-Matching Method: Continuous match; veneer leaves of upper panels are continuations of veneer leaves of lower panels.
 - a. At wood panel transoms over wood doors, provide continuous match between door and transom.
5. Supply book-matched wood veneers from flitches as selected by Architect, and matching solid wood for Work of this Section.
 - a. Section 081400 - Wood Doors: Wood door facing.

2.4 LAMINATE-FACED CABINETS AND COUNTERTOPS

- A. Minimum Quality Standard: Unless otherwise indicated, comply with the *North American Architectural Woodwork Standards* (NAAWS) for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
1. Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Plastic-Laminate-Faced Cabinets: NAAWS Custom Grade for cabinets.
1. (PL) Basis of Design: Refer to Material Identification List.
 2. Type of Construction: Frameless.
 3. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
 4. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 5. Exposed Horizontal and Vertical Surfaces: Grade HGS.
 6. Edges: PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.
 7. Semi-Exposed Surfaces (Other than Drawer Bodies): Thermoset Decorative Panels consisting of particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
 - a. Medium-Density Fiberboard: ANSI A208.2, Grade 130 made with binder containing no urea formaldehyde.
 - b. Edges of Thermoset Decorative Panel Shelves: PVC edge banding.
 8. Semi-Exposed Backs of Panels: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
 9. Concealed Backs of Panels: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
 10. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - a. Join subfronts, backs, and sides with glued dovetail joints.
 - b. Drawer Sides and Backs: Thermoset decorative panels with PVC edge banding.
 - c. Drawer Bottoms: Thermoset decorative panels.

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- C. Plastic-Laminate Countertops: NAAWS Premium Grade for architectural countertops on base cabinets, wall-mounted countertops and shelves.
1. (PL) Basis of Design: Refer to Material Identification List.
 2. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS ; post forming grade (0.039" thick) High Pressure laminate counter top.
 3. Edge Treatment: Post-formed, matching laminate in color, pattern, and finish.
 4. Backsplash: As shown on Drawings.
 5. Core Board for Countertops: 1-inch thick, medium-density fiberboard made from 100% recycled fiber meeting ANSI 208.2 standards, ASTM D1037 2, Grade2-M-2 and HUD 24 emission standards (formaldehyde free).
 6. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.5 SOLID SURFACE FABRICATIONS

- A. Solid Surface Countertops and Fabrications: Comply with NAAWS **Premium Grade** for architectural countertops on base cabinets, wall-mounted countertops and shelves, and other assemblies as shown on Drawings.
1. Dimensions and Configurations: As shown on Drawings.
 2. Countertops: Fabricate tops in one piece with shop-applied eased edges unless otherwise indicated.
 - a. Backsplash: Standard single length solid surface pieces; longest length possible to minimize joints. Where indicated provide countertop with coved backsplash.
 - b. Inside Corners: Fabricate countertops with square inside corners.
 - c. Sinks: Install integral sink bowls in countertops in the shop.
- B. (SS-1) Cast Polymer: Homogeneous non-porous high density product; core structure is composed of paper, impregnated with thermosetting resins; outer surface is metal structure substrate treated with acrylic resins applied as multilayer coating, cured via an electron beam process. Comply with Manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
1. Basis of Design: As indicated to Material Identification List.
 2. Integral Sinks: Install integral sink bowls in countertops in the shop.
 - a. Basis of Design: Corian Model No. 810 by DuPont.
- C. Adhesives and Sealants for Solid Surfacing: Comply with manufacturer's written instructions for adhesives, sealers, fabrication, and sealing. Do not use adhesives that contain urea formaldehyde.
1. Sealant: Silicone sealant as recommended by panel manufacturer for application to substrate.
 2. VOC Limits for Installation Adhesives and Glues, and for Primers and Sealers: Use installation adhesives with VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 WALL-MOUNTED COUNTERTOPS AND SHELVES

- A. Brackets for Wall-Mounted Countertops and Shelves: Provide mounting brackets as shown on Drawings, in size and weight capacity required for use.
1. Coordinate with Sections 061000, 092200 and other applicable Sections for concealed backing, support and anchoring as shown on Drawings.
- B. (CWKA-1) Exposed Brackets: 1/8 inch steel; 1-1/2 inch forms with multiple 1/4 inch mounting holes per side; reversible; color as selected by Architect from manufacturer's standard colors.
1. Sizes: As required by application.
 2. Capacity: 1,000 pounds minimum.
 3. Basis of Design: KV 208 550 Ultimate L-Bracket Series; 5mm thick steel bar with 3/4 inch steel strut, 1000 lb. capacity per pair, epoxy coated finish in color as indicated or selected.
- C. (CWKA-2) Concealed Brackets: Size as required. Finish as selected by Architect.
1. Basis of Design: 2.0" Concealed Brackets by A&M Hardware, Inc..
 2. Basis of Design: Iron Supports, Floating Countertop Wall Bracket, 19.5", color as indicated.

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- D. (CWKA-3) Steel Supports for Lavatory and Workstations: Provide in sizes and shapes as shown on Drawings.
1. Steel Tubing: ASTM A501 or ASTM A500.
 2. Steel Bar: ASTM A36.
 3. Finish: Prefinished or shop-primed for painted finish (PT).

2.7 CABINETWORK HARDWARE

- A. (HDWR) Cabinetwork Hardware: Provide as specified below and as indicated on Material Identification List.
- B. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated. All exposed hardware to match, unless indicated otherwise.
1. Satin Chromium Plated: ANSI/BHMA 626 for brass or bronze base; ANSI/BHMA 652 for steel base.
 2. Bright Chromium Plated: ANSI/BHMA 625 for brass or bronze base; ANSI/BHMA 651 for steel base.
 3. Satin Stainless Steel: ANSI/BHMA 630.
- C. Hinges, Knuckle: BHMA A156.9, B01361, fixed pin, five knuckle steel hinges, dull chrome, 2-3/4 inch by 0.095 thick.
- D. Hinges, Concealed: BHMA A 156.9 B01602, concealed, all-metal hinges, 110 degree opening (unless otherwise noted) self-closing, 3-way adjustable.
1. Basis of Design: Grass Nexis.
 2. Provide 3 per leaf over 48 inches high, 2 per leaf elsewhere.
 3. Closers: Provide Quiet Soft-Cushion Closers: Nexis G-Force Soft Closer.
- E. Door and Drawer Pulls: BHMA A156.9, B02011, back-mounted type pulls.
1. Provide Owner standard, for review and approval by Architect.
- F. Catches: Push-in magnetic catches, BHMA A156.9, B03131.
1. Magnetic Pressure Catches: Häfele 245.80.320, prefinished steel, black.
 2. Metal Strike: Häfele 245.63.988,
- G. Drawer Slides: BHMA A156.9, cold rolled steel, zinc plated with positive stop and full extension. Rolling steel balls, nylon rollers meeting or exceeding the following requirements, unless otherwise indicated:
1. Minimum 75 lb. load rating, for use at drawers 16-inches wide or less.
 2. Minimum 100 lb. load rating, for use at drawers 24-inches wide or less.
 3. Minimum 150 lb. load rating, for use at drawers greater than 24-inches wide, at deep drawers, and drawers with file folder racks.
 4. Full Extension Drawer Slides: Side-mount, ball bearing type; epoxy coated; not less than 100 lb load rated; color to match cabinet interior.
 - a. Accuride EW3832.
 - b. Blum 430EW.
 - c. Hettich W5632.
 - d. Blum#430 with positive in-stop. Nylon ball bearing rollers.
 5. Over-Travel Extension File Drawer Slides: Side-mount, ball bearing type; epoxy coated; not less than 150 lb load rated; color to match cabinet interior.
 - a. Accuride 4034.
 - b. K&V 8505.
 - c. Hettich 558.
- H. Drawer Slides: Blum 562F Tandem Plus Blumotion with T51.1700.04 locking device. Minimum 100 lb. load rating.
- I. Door Locks: BHMA A156.11, E07121.
- J. Drawer Locks: BHMA A156.11, E07041.

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- K. Door and Drawer Locks: BHMA A156.11; E07121 door locks and E07041 drawer locks.
1. Cylinder Lock: Disc tumbler, master-keyed, dull chrome finish by CCL Security Products #0737 and #0738.
 - a. Review final keying sequences with Owner.
 - b. Provide at hinged doors and drawers, where indicated.
 - c. Other Acceptable Manufacturers: Timberline, National, Häfele, CompX National.
 2. Cabinet Keypad Device: BHMA A156.9, B03141.
 - a. C9602 Spring Latch Cabinet Lock by Simplex Access Controls, 2941 Indiana Ave., Winston Salem, N.C. 27105, Tel: (919) 725-1331.
 3. Electronic Locks: Keypad-operated, battery-powered, programmable electronic lock with motorized deadbolt.
 - a. Product and Manufacturer: DK-ATV by Digilok
 - b. Configuration:
 - 1) Mounting: Fully-recessed.
 - 2) Finish: brushed nickel.
 - 3) Pull: No integral pull. Refer to cabinet hardware.
- L. Keyless Cabinet Lock:
1. Codelocks CL1200 Heavy-Duty Electronic Keyless Cabinet Lock, door thickness at 1/8 inches up to 1-1/8 inches, battery operated, stainless steel finish, dimensions: 5-3/8" (L) x 1-5/8" (W) x 1-1/2" (D).
- M. Door and Drawer Silencers: BHMA A156.16, L03011.
- N. Shelf Rests, Typical: BHMA A156.9, B04013; metal.
- O. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
1. Shelf Supports: Knappe & Vogt 346 NP

2.8 CABINETWORK ACCESSORIES

- A. (CWKA-21) Cable Passage Grommets: Provide cord grommets in diameter shown, and in color as selected by Architect.
1. Plastic Grommet Liner and Cap: SG Series or EDP Series by Doug Mockett.
- B. (CWKA-24) Miscellaneous Cabinetwork Accessories: As specified below or as indicated on Material Identification List.
1. Chair/walker hook.

2.9 INSTALLATION ACCESSORIES

- A. Installation Accessories: Provide assembly hardware as shown on Drawings, or as recommended by Fabricator and approved by Architect.
- B. Mechanical Fasteners and Anchors: Use material, type, size and finish required for each substrate for secure anchorage and as recommended by architectural woodwork fabricator and installer.
1. Provide concealed anchors unless otherwise indicated.
 2. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
 3. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.
 4. Stainless steel eye-bolt anchors, washers and other fabrication and installation accessories as shown; or other types as required by design engineer and approved by Architect.
 5. Flathead Hex Wood Screw, black.
 6. Stainless steel fasteners with resilient neoprene washer.
 7. VOC Content, Adhesives: Provide meeting applicable VOC limits of South Coast Air Quality Management District (SCAQMD) Rule 1168, July 1, 2005, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde. VOC Limits for Installation Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

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1. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
 2. Wood Glues: 30 g/L..
 3. Multipurpose Construction Adhesives: 70 g/L.
 4. Contact Adhesive: 80 g/L.

2.10 FABRICATION

- A. General: Fabricate Work of this Section using materials, methods and quality control procedures in accordance with NAAWS, and in accordance with reviewed Shop Drawings.
 1. Complete fabrication in shop, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site.
 2. Join and assemble work to provide durable, strong, rigid units that will not warp or rack, including during shipping and installation.
 3. Disassemble components only as necessary for shipment and installation. Allow for easy handling and passage through building openings.
 4. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 5. Woodwork in Spaces without Humidification Control: Fabricate Work as necessary to protect installed Work from moisture and damage due to movement and dimensional changes associated with fluctuating temperature and relative humidity levels during construction and after Substantial Completion.
- B. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- C. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- D. Metal Framing and Supports:
 1. Welded Connections: Comply with AWS for recommended practices in shop welding. Weld behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.
 2. Non-Welded Connections: Fabricate for interconnection of members by means of mechanical fasteners and fittings unless otherwise indicated.
- E. Shop Finishing: Pre-finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
 1. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
 2. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces. Concealed surfaces of plastic-laminate-clad paneling do not require backpriming when surfaced with plastic laminate.
 3. Primer Application on Steel Framing: Apply shop primer to prepared surfaces of items unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examination and Acceptance of Conditions: Before proceeding with installation, take field measurements, examine substrates and verify temperature and relative humidity and other conditions.
 - 1. Verify that mechanical and electrical items affecting this section are properly placed, complete, and have been inspected by Architect prior to commencement of installation.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected and after building temperature and relative humidity are within specified range. Proceeding with the Work indicates acceptance of surfaces and site conditions.
- B. Material Moisture Content and Environmental Requirements: Install products at the time and under conditions that will ensure the best possible results and maintain conditions until Substantial Completion.
 - 1. Comply with recommendations of Architectural Woodwork Standards.
 - 2. Conditioning: Before installation, condition wood materials and cabinets in accordance with specified site condition requirements.
 - a. Do not install unconditioned woodwork.
 - b. Reject materials that are wet, moisture damaged or mold damaged.
- C. Substrate: Before proceeding with installation, examine substrate to receive work for compliance with requirements for installation tolerances and other conditions affecting performance. Installer must approve substrate prior to installation.
- D. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product.
 - 1. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.
 - 2. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 3. Verify space requirements and dimensions of items shown diagrammatically on Drawings.

3.2 INSTALLATION

- A. General: Install architectural woodwork in accordance with *North American Architectural Woodwork Standards* (NAAWS) and in accordance with reviewed shop drawings and manufacturer instructions.
 - 1. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
 - 2. Install free from hammer or tool marks, open joints or slivers or other defects detrimental to appearance or performance.
 - 3. Set plumb, level, square and true to dimensions shown and required. Allow for finishes and proper clearances where necessary. Use concealed shims where required for alignment.
 - 4. Tolerances: Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining work with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 5. Scribe and cut to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 6. Coordinate with materials and systems in or adjacent to woodwork and provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.
 - 7. Shop-Fabricated Work: Before installing, examine shop-fabricated work for completion. Assemble shop fabricated work and complete fabrication at Project site to the extent that it was not completed in the shop. Backprime unfinished surfaces that are concealed when installed.
 - 8. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
- B. Anchorage: Adequately anchor, fasten and support members to form secure, substantial and accurate work and to hold required dimensions and prevent twist.

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1. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
 2. Provide blocking, attachment plates, anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work.
 3. Provide anchorage type required to allow movement of wood due to changes in relative humidity without permanent damage to the wood and other components.
- C. Joints: Fit exposed connections together to form hairline joints. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect as determined by Architect.
1. Provide joints to accommodate expansion of woodwork due to changes in relative humidity.
- D. Solid Surfacing: Install solid surfacing in accordance with reviewed shop drawings and manufacturer's instructions.
- E. Cabinetwork Installation: Install cabinets to comply with same NAAWS Grade as item was fabricated.
1. Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 2. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork. For shop finished items use filler matching finish of items being installed.
 3. Countertops: Anchor securely to base units and other support systems as indicated.
 4. Maintain veneer sequence matching of cabinets with transparent finish.
- F. Wall-Mounted Shelving and Work-Surfaces: Install standards, brackets and other supports according to manufacturer's written instructions. Fasten to framing members, wood sheathing, wood blocking or metal backing, or use toggle bolts or hollow wall anchors.
- G. Finishes: Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
1. Apply specified finish coats including, back-priming, opaque paint, stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.
 2. Refer to Section 099000 - Painting for final finishing of installed architectural woodwork not indicated to be shop finished, and for related brackets and other Work exposed to view.

3.3 INSTALLED WORK

- A. Damaged or Non-Compliant Woodwork: Remove and replace materials that are damaged or do not comply with requirements.
1. Damaged woodwork may be repaired or refinished if resulting repair work complies with requirements and shows no evidence of repair or refinishing.
 2. Remove and replace woodwork materials that are wet, moisture damaged, or mold damaged.
 3. Replace, at no additional cost to Owner, materials that are damaged or that cannot be cleaned to satisfaction of Owner.
- B. Adjusting: Adjust movable components of assembly to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range, and without binding or damaging assembly components. Lubricate hardware and moving parts. Adjust joinery for uniform appearance.
- C. Cleaning: Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.
1. Clean interior finish carpentry on exposed and semi-exposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes, if any.
 2. Clean cabinetwork, counters, shelves, hardware, fittings and fixtures.

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- D. Protection: Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
1. Comply with specified requirements for temperature and relative humidity.
 2. Protect installed products from damage from weather, moisture, dust, dirt and other causes during construction.
- E. Demonstration and Training: Instruct Owner's personnel to operate, adjust and maintain operable components of woodwork assemblies.

END OF SECTION

SECTION 078100 APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Patching and replacement of existing fireproofing materials that are disturbed, remove or damaged during construction activities.
 - 2. Preparation of substrates.
 - 3. Wet-mix sprayed fireproofing (FP).
 - 4. Patching and repairs.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Framing plans or schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.
- C. Samples: For each exposed product and for each color and texture specified, 4 inches square in size.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.
- D. Preconstruction Test Reports: For fireproofing.
- E. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.
- B. Mockups: Build mockups [to verify selections made under Sample submittals and to demonstrate aesthetic effects] [to set quality standards for materials and execution] [and] [for preconstruction testing].
 - 1. Build mockup of [each type of fireproofing and different substrate] [and] [each required finish] as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.

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1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 2. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAY-APPLIED FIRE-RESISTIVE MATERIALS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Sprayed-on Fire-resistant Coating: Cementitious fireproofing, Wet-mix setting based type as defined by Underwriters Laboratories and free from asbestos, actinolite, amosite, anthophyllite, chrysotile and tremolite. No mineral fiber fireproofing allowed.
 1. Cementitious Wet Mix Admixtures: Materials (with and without aggregate) which, when mixed in accordance with accompanying instructions forms a slurry or mortar providing properties necessary for conveyance and application to building structures.
 2. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Steel members are to be considered unrestrained unless specifically noted otherwise.
 - b. UL design listings must state that the loading was determined by Allowable Stress Design Method or Load and Resistance Factor Design Method. UL design listings requiring a load restriction factor are not allowed.
 3. VOC Content: Products shall comply with VOC
- C. (FP-1) Standard Density: Meeting or exceeding 15 pounds per cubic foot per ASTM E605, no fungal growth per ASTM G21. For concealed locations and in plenum ceilings and above suspended ceilings.

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1. Products and Manufacturers:
 - a. Monokote MK-6 by Grace Construction Products.
 - b. Pyrolite 15 by Carbolite Fireproof Products Division.
 - c. Cafco-300 by Isolotek.
 - d. Southwest Fireproofing Type 5GP by AD Fire Protection Systems.
 - D. Mixing: Perform mixing and preparation of materials at project using mechanical equipment, in accordance with manufacturer's printed directions to achieve performance criteria specified herein.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
 1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.
- C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written instructions. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.
- E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- G. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.
- H. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.
 1. Cement-Based Topcoat: Factory-mixed, cementitious hard-coat formulation for trowel or spray application over SFRM.
 2. Water-Based Permeable Topcoat: Factory-mixed formulation for brush, roller, or spray application over applied SFRM. Provide application at a rate of 60 sq. ft./gal. .
- I. Water: Potable, fresh and free from organic and mineral impurities which would affect set of sprayed fireproofing materials.
- J. Adhesive for Bonding Fireproofing: Type recommended by manufacturer of sprayed-on fireproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to which this work is to be attached or applied and notify Architect if conditions exist which are detrimental to proper and expeditious installation of work. Starting of work shall imply acceptance of substrate for adhesion and performance of work as specified. Substrate is in satisfactory condition if it complies with following :
 - 1. Substrate complies with requirements of section in which substrate and related work is specified and is free of oil, grease, rolling compounds, incomplete primers, loose mill scale, dirt or other foreign substances capable of impairing bond of fireproofing with substrate under conditions of normal use or fire exposure.
 - 2. Objects which will penetrate fireproofing, including clips, hangers, support sleeves and similar items have been securely attached to substrates.
 - 3. Substrates are not obstructed by ducts, piping, equipment and other suspended construction that could interfere with application of fireproofing and until it has dried.
- B. Cooperate with coordination and scheduling of work of this section with work of other sections so not to delay job progress.
- C. Clips, hangers, supports, sleeves and other attachments to fireproofing bases, as covered under other sections of specifications, are to be placed by other trades prior to application of fireproofing material, where these materials can be anticipated in advance.
- D. Ducts, piping or conduit or other suspended equipment that could interfere with uniform application of fireproofing material are to be positioned after application of sprayed fireproofing, unless fireproofing applicator agrees to their installation prior to fireproofing.
- E. Prior to application of fireproofing material, ascertain that steel is acceptable to receive fireproofing. Steel shall be free of oil, grease, loose mill scale, or other substance that may impair proper adhesion.

3.2 SURFACE PREPARATION

- A. Clean surface to receive sprayed fireproofing to remove mill scale, dirt, grime, oil, grease, dust, loose rust, rolling compounds, incompatible primers and other foreign material which will impair satisfactory bonding of fireproofing to substrate.
- B. Cover other work which might be damaged by fallout or overspray of fireproofing materials during application. Provide temporary enclosure as may be required to confine operations, protect environment, and to ensure adequate ambient conditions for temperature and ventilation.
- C. Notify Contractor of surface condition which cannot be corrected by normal cleaning methods and requires correction of conditions prior to application of sprayed fireproofing.
- D. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- E. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Commencement of application of fireproofing shall be deemed as acceptance by applicator of suitability of surface to receive work and acceptance of responsibility for failure of bond between fireproofing and substrate.
- B. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

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- C. Apply spray fireproofing using manufacturer's authorized installer in accordance with manufacturer's directions and instructions and in conformance with city and state codes, regulations and requirements having jurisdiction. Qualified manufacturer's representative shall be present for initial application to guide and assist applicator's personnel.
 - D. Sprayed Fireproofing: Apply to areas and surfaces which are scheduled to be fireproofed and to proper thicknesses to achieve fireproofing hours.
 - 1. Control thickness of fireproofing by utilizing workable depth gauge to assure that minimum thickness has been applied.
 - E. Ventilation: Make provisions to properly dry fireproofing after application. In enclosed areas lacking natural ventilation, provide mechanical air circulation and ventilation.
 - F. Equipment, Mixing and Application: In accordance with manufacturer's written specification and application instructions. Mechanically control material and water ratio on project site.
 - G. Qualified Personnel: Provide to supervise application.
 - H. Bonding Adhesive: Apply to underside of steel roof deck units which do not have concrete topping and where required by appropriate UL Design. Bonding adhesive is optional in other conditions unless recommended by manufacturer of sprayed fire protection material (SFRM). Apply bonding adhesives in accordance with manufacturer's written application instructions.
 - I. Do not install fireproofing prior to completion of concrete work on steel pan stairs. Apply to underside of roof deck assemblies only after roofing system is complete and roof traffic has ceased.
 - J. Cracking: No cracking of fireproofing material allowed per UL requirements. Repair cracks at no additional cost to Owner by removing existing fireproofing and reapplying

3.4 PATCHING, REPAIRING, CLEANING AND PROTECTION

- A. Perform patching and repairing of sprayed fireproofing, due to cutting by other trades, by fireproofing applicator. Work shall be paid for by trades that performed cutting, as directed and at no additional cost.
 - 1. Coordinate installation of fireproofing with other work in order to minimize need for other trades to cut or remove fireproofing. As other trades successively complete installations of their work, maintain protection of structure's fireproofing by patching areas which have been removed or damaged prior to concealment of fireproofing by other work.
- B. After completion of fireproofing work, remove equipment and clean walls, floors, equipment, pipes and conduit of over sprayed fireproofing materials.
- C. Cleaning: Immediately upon completion of sprayed operations in each containable area, remove over-spray and fall-out materials from surfaces of other work and clean exposed surfaces to remove evidence of soiling.
- D. Cure exposed wet-mix fireproofing materials in compliance with fireproofing manufacturer's recommendations to prevent premature drying.
- E. Protect fireproofing according to advice of fireproofing manufacturer and installer from damage resulting from construction operations or other causes so that fireproofing will be without damage or deterioration at time of Substantial Completion.

3.5 FIELD QUALITY CONTROL

- A. At Owner's option Architect may select, and Owner will pay, independent testing laboratory to sample and verify thickness and density of fireproofing in accordance with provisions of ASTM E605, and cohesion/adhesion as per ASTM E736.
 - 1. Minimum testing as follows:
 - a. Randomly Selected Bay: Test each fireproofed element for thickness and density as per ASTM E605 and displacement method per AWCI Tech Manual 12-A, 5.4.5.
 - b. Randomly Selected Typical Structural Elements: Test for cohesion/adhesion as per E736.
 - c. Perform minimum of 5 tests of each kind.

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- B. Contractor and sub-contractor for this Section shall cooperate with testing agency in furnishing samples for testing, and other testing agency procedures.
 - 1. Should tested fireproofing fail to meet performance criteria, remove fireproofing, reinstall and retest at no additional cost to Owner.
 - 2. Correct unacceptable work and pay for further testing required to prove acceptability of installation.
 - 3. Patch test areas as required to re-establish fireproofing integrity.

3.6 INSTALLED WORK

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION

SECTION 078443 FIRE-RESISTANT JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes fire-resistant joint systems (FRJS) for the following:
 - 1. Head-of-wall joints.
 - 2. Joints at cold formed exterior wall framing and floor slab.
 - 3. Joints between perimeter edge of fire-resistance-rated floor assemblies and back of non-fire-resistance-rated, exterior, glazed aluminum curtain walls.

1.2 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistant joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistant joint systems.
- C. Do not cover up fire-resistant joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each fire-resistant joint system, show each kind of construction condition in which joints are installed and relationships to adjoining construction. Include fire-resistant joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistant joint system configuration for construction and penetrating items.
- C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
- D. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.
- C. Compatibility and Adhesion Test Reports.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements", and is a certified Installer of Manufacturer's firestop systems.
- B. Preconstruction Compatibility and Adhesion Testing: Submit to fire-resistant joint system manufacturers, for testing indicated below, samples of materials that will contact or affect fill materials.
 - 1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of fill materials to joint substrates.
 - a. Perform tests under environmental conditions replicating those that will exist during installation.
 - 2. Submit no fewer than nine pieces of each type of material, including joint substrates, forming materials, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain fire-resistant joint system manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire-resistant joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for fire-resistant joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistant joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistant joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

PART 2 - PRODUCTS

2.1 JOINT FIRESTOPPING

- A. Source Limitations: Obtain fire-resistant joint systems for each kind of joint and construction condition indicated through one source from a single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide either the named products or comparable products by one of the following:
 - 1. 3M Fire Protection Products Systems, Inc..
 - 2. A/D Fire Protection Systems Inc..
 - 3. Hilti, Inc..
 - 4. RectorSeal Corporation.
 - 5. Specified Technologies, Inc..
 - 6. United States Gypsum Company(USG).
- C. Joint Firestopping Systems: Provide systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

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1. Select joint systems based on actual conditions. Selected system is subject to approval through Submittals.
 2. Provide engineering judgment acceptable to Architect and authority having jurisdiction for conditions where a tested system is not available for the actual conditions.
 3. Provide components of fire-resistant joint systems, including forming materials, that are needed to install fill materials. Use only components specified by fire-resistant joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.
 4. Compatibility: Provide fire-resistant joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistant joint system manufacturer based on testing and field experience.
- D. Joints in or between Fire-Resistance-Rated Construction (Other than Perimeter Joints): Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
 2. Provide UL-classified systems listed in UL's "Fire Resistance Directory" under product Category XHBN.
 3. Firestop Top Track Seal: For metal stud partitions installed on flat concrete slab use one-piece, pre-formed, polyurethane foam based, firestop seal for use with standard head-joint top tracks and bottom-joint tracks, and slip-type head joints in fire-rated construction at top or bottom of partition to maintain continuity of the fire-resistance-rated assembly indicated. Provide in width and configuration required to accommodate depth and installation of studs and designed to saddle-over the top track or under the bottom-track.
- E. Fire Resistance of Perimeter Fire-Containment Systems:
1. Joints at Exterior Curtain-Wall-to-Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E 2307; with integrity and insulation ratings indicated as determined by UL 2079.
 2. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
 3. Provide UL-classified systems listed in UL's "Fire Resistance Directory" under product Category XHDG.
 4. For edge of slab conditions with a full height vision glass, or for conditions which do not contain an insulated spandrel at the floor line, only tested system HI/BPF 120-11 issued by Intertek Laboratories shall be used. If the tested system does not meet the project conditions, an engineering judgment derived from HI/BPF 120-11 shall be submitted to local authorities having jurisdiction for their review and approval prior to installation.
- F. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.
1. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.
- G. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- H. Mold Resistance: Provide joint firestopping systems sealant with mold and mildew resistance rating of one (1) or less as determined by ASTM G21.

2.2 FIRE-RESISTANT JOINT SYSTEMS SCHEDULE

- A. (FRJS-1) Head-of-Wall, Fire-Resistive Joint Firestopping Systems:
1. UL-Classified Systems: HW-D-0000-0999
 2. Fire-Resistance Rating: Equal to or exceeding that of the wall or roof in which it is installed, as shown on Drawings.
 3. Joint Width: As shown.
 4. Movement Capabilities: Class I <Insert number> percent compression.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistant joint systems to comply with fire-resistant joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistant joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistant joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistant joint system materials.
 - 1. Remove tape as soon as possible without disturbing fire-resistant joint system's seal with substrates.

3.3 INSTALLATION

- A. General: Install fire-resistant joint systems to comply with Part 2 "Performance Requirements" Article and fire-resistant joint system manufacturer's written installation instructions for products and applications indicated.
- B. Install forming, packing and backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install elastomeric fill materials for fire-resistant joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
 - 3. For elastomeric fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
 - 4. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

3.4 JOINT IDENTIFICATION

- A. Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.

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3. Designation of applicable testing agency.
 4. Date of installation.
 5. Manufacturer's name.
 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.
- B. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect fire-resistant joint systems and to prepare inspection reports.
 1. Inspecting agency will state in each report whether inspected fire-resistant joint systems comply with or deviate from requirements.
- C. If deficiencies are found, repair or replace fire-resistant joint systems so they comply with requirements.
- D. Proceed with enclosing fire-resistant joint systems with other construction only after inspection reports are issued and inspecting agency has approved installed fire-resistant joint systems.

3.6 INSTALLED WORK

- A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistant joint system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistant joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistant joint systems immediately and install new materials to produce fire-resistant joint systems complying with specified requirements.

3.7 UL CLASSIFICATION SYSTEM

Fire-Resistant Joint Systems		UL Classification System		
		<u>Joint System</u>	<u>Movement Capability</u>	<u>Joint Width Range</u>
4	Head-to-Wall:	HW	S/D	0000-4999

Movement Capability

D- Allows movement (Dynamic)

Joint Width

0000-0999	Less than or equal to 2 inches
1000-1999	Greater than 2 inches and less than or equal to 6 inches
2000-2999	Greater than 6 inches and less than or equal to 12 inches
3000-3999	Greater than 12 inches and less than or equal to 24 inches
4000-4999	Greater than 24 inches

END OF SECTION

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SECTION 079100 PREFORMED JOINT SEALS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Precompressed foam joint seals (PFJS-1).
 - 2. Precompressed foam joint seals with silicone coating (PFJS-2).
- B. Related Requirements:
 - 1. Section 079200 - Joint Sealants: For liquid sealants applied over preformed seals in dual seal systems.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product.
- B. Shop Drawings: For each joint closure, including plans, elevations, sections, details, attachments to other work.
- C. Samples: For each type and color of preformed joint seal required, provide Samples with joint seals in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint seals.
- D. Preformed Joint Seal Schedule: Include the following information:
 - 1. Joint seal location and designation.
 - 2. Joint width and movement capability.
 - 3. Joint seal manufacturer and product name.
 - 4. Joint seal color.

1.3 QUALITY ASSURANCE

- A. Mockups: Install mockups of assemblies specified in other Sections that are indicated to receive preformed joint seals specified in this Section. Use materials and installation methods specified in this Section.

1.4 PROJECT CONDITIONS

- A. Joint Substrate Conditions: Do not proceed with joint installation until contaminants capable of interfering with their adhesion are removed from joint substrates.
- B. Compatibility and Adhesion Testing: Ascertain joint seal compatibility and adhesion with adjacent materials using laboratory testing procedures.

1.5 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace preformed joint seals that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: **[Two]** years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish preformed joint seals to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: **[Five]** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Products and Manufacturers: Provide Basis of Design product or equivalent product as approved by Architect by one of the following manufacturers:
 - 1. Emseal Joint Systems Ltd. (a Sika Company) .
 - 2. Tremco
 - 3. Watson Bowman Acme Corporation (WABO).
 - 4. Construction Specialties.
 - 5. Dayton Superior Specialty Chemicals.
 - 6. Sandell Manufacturing Co., Inc..
 - 7. Schul International, Inc..
- B. Compatibility: Provide joint seal and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by manufacturer, based on testing and field experience.
- C. Colors: Colors as selected by Architect from manufacturer's standard colors. Acceptance of sealant will depend on range of standard colors available for selection.

REVISION NOTE: Further development of single source requirement is needed.

- D. *Single Source: For vertical and horizontal...*

2.2 PREFORMED FOAM JOINT SEALS

2.3 SILICONE-COATED PREFORMED FOAM JOINT SEALS

REVISION NOTE: Further development forthcoming... Product research and verify likeness of each product listed in each category.

- A. (PFJS-1) Silicone-Coated Foam Joint Seal, **Seismic**: Multi-faced, silicone-coated, precompressed, primary seal seals both sides of substrate; Primary Vertical Joint Applications. Movement: 100% ($\pm$ 50%)
 - 1. Manufacturers and Products:
 - a. Emseal; Seismic Colorseal-DS.
 - b. Tremco; Willseal Seismic.
 - c. Wabo; WaboSeismic WeatherSeal (SWS).
 - 2. Joint Seal Width: As recommended by joint seal Manufacturer for sealing joints of nominal width as shown and as verified in the field.
 - 3. Color: As selected by Architect from Manufacturer's standard options.
- B. (PFJS-2) Silicone-Coated Foam Joint Seal: Flexible profile manufactured from open-cell polyether urethane foam, impregnated with a waterproof polymer sealing compound that meets ASTM 518, ASTM 283 and DIN 18542, with a factory applied Traffic grade silicone membrane coating; designed to provide protection against moisture and water intrusion on horizontal surfaces; capable of providing a minimum of plus or minus 50% building movement and accommodate moderate variations in width of opening, complex directional change transitions and resist ultraviolet degradation.
 - 1. Vertical:
 - a. Emseal; Colorseal.
 - b. Tremco; Willseal Color Coreseal V.
 - c. Wabo; WaboWeatherSeal II (WS).
 - 2. Horizontal:
 - a. Emseal; Horizontal Colorseal.
 - b. Tremco; Willseal Color Coreseal H.
 - c. Tremco; Willseal 250.
 - d. Wabo; EH Series
 - 3. Vertical and Horizontal:

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- a. Emseal; DSM System.
 4. Joint Seal Width: As recommended by joint seal Manufacturer for sealing joints of nominal width as shown and as verified in the field.
 5. As selected by Architect from Manufacturer's standard options.

2.4 INSTALLATION ACCESSORIES

- A. Primer: Material recommended by preformed-joint-seal manufacturer for joint substrates indicated.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to preformed joint seal manufacturer, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces, and formulated to promote best adhesion to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with preformed joint seals and surfaces adjacent to joints.
- D. Splice Adhesive for Foam Gasket Seal: One part urethane wet sealant as recommended by gasket seal manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive preformed joint seals, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting preformed-joint seal performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing preformed joint seals to comply with preformed joint seal manufacturer's written instructions and the following requirements:
 1. Remove all foreign material from joint substrates that could interfere with adhesion of preformed joint seal, including dust, paints (except for permanent protective coatings tested and approved for seal adhesion and compatibility by seal manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimal bond with preformed joint seals. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete. Remove laitance and form-release agents from concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint seals. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by preformed joint seal manufacturer or as indicated by tests or prior experience. Apply primer to comply with joint seal manufacturer's written instructions. Confine primers to areas of joint seal bond; do not allow spillage or migration onto adjoining surfaces.

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- C. Masking Tape: Use masking tape where required to prevent contact of adhesive or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

- A. General: Comply with preformed joint seal manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Install each length of seal immediately after removing protective wrapping.
- C. Firmly secure compressed joint seals to joint gap side to obtain full bond using exposed pressure-sensitive adhesive or field-applied adhesive as recommended by manufacturer.
- D. Do not pull or stretch material. Produce seal continuity at splices, ends, turns, and intersections of joints.
- E. For applications at low ambient temperatures, heat foam joint seal material in compliance with manufacturer's written instructions.

3.4 INSTALLED WORK

- A. Protect preformed joint seals from damage resulting from construction operations or other causes so seals are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated seals immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 079200 JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior and interior sealants (SLNT).
- B. Related Sections:
 - 1. Section 078400 - Penetration Firestopping.
 - 2. Section 078443 - Joint Firestopping.
 - 3. Section 079100 - Preformed Joint Seals: (PFJS).
 - 4. Section 088000 - Glazing: Glazing sealant.
 - 5. Section 092900 - Gypsum Board: Acoustical sealant at gypsum board systems.

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
 - 1. Submit Manufacturer's certifications that products comply with specified requirements and with local regulations for VOC content.
- B. Color Samples:
 - 1. Samples for Initial Selection: Manufacturer's color charts consisting of actual strips of cured sealants showing the full range of colors available for each product exposed to view.
 - 2. Samples for Verification: For each kind and color of joint sealant selected, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Product Schedule: Cross-reference locations and applications of SLNT indicated on Drawings with products in Part 2 of this Section. Indicate proposed product, product type and color.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Sample Warranties: For special warranties.
- C. Quality Control Submittals:
 - 1. Product Test Reports: For each kind of joint sealant.
 - 2. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
 - 3. Statement of qualification for manufacturers and installers.
 - 4. Statement of compliance for compatibility of sealant with adjacent materials and coatings.
 - 5. Field-Adhesion-Test Reports: For each sealant application tested.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with record of successful in-service performance.
- B. Provide materials for exterior envelope from a single manufacturer.
- C. Compatibility: Verify compatibility of silicone sealant with materials in contact with sealant. Provide list of stone materials and verify that silicone sealant will not stain or damage stone work.
- D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

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- E. Integrated Mockups: Provide joint sealants for integrated mockups in accordance with Section 014300 - Mockups.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 2. Conduct field tests for each kind of sealant and joint substrate.
 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi component materials.
- B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Weather Conditions: Do not proceed with installation of sealant under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
1. Proceed with work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength.
 2. Wherever joint width is affected by ambient temperature variation, apply elastomeric sealant only when temperatures are in lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.
- B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.
- D. Compatibility and Adhesion Testing: Ascertain sealant compatibility and adhesion with adjacent materials using laboratory testing procedures.

PART 2 - PRODUCTS

2.1 SEALANT, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Sealant Colors: In accordance with approved sealant color schedule.
 - 1. Colors as selected by Architect from manufacturer's standard colors. Acceptance of sealant will depend on range of standard colors available for selection.
 - 2. Custom Color:

2.2 POLYURETHANE SEALANT

- A. (SLNT-2) 2-Part Polyurethane Sealant for Horizontal Applications: Self-leveling polyurethane based 2 part elastomeric sealant, complying with FS-TT-S-00227E, Type I, Class A, with shore A hardness of not less than 30 and elongation and compression of not less than 25 percent. ASTM C920, Type M, Class 25, Grade P.
 - 1. Manufacturers and Products:
 - a. Tremco Incorporated: THC900.
 - b. Master Builders Solutions: MasterSeal SL-2.
 - c. Pecora Corporation: Urexpan NR-200.
 - 2. Applications:
 - a. Joints in horizontal surfaces subject to traffic.
 - b. Isolation and contraction joints in cast-in-place concrete slabs.
 - c. Joints between plant-precast architectural concrete paving units.
 - d. Tile control and expansion joints.
 - e. Joints between different materials listed above.
 - f. Other joints as indicated.

2.3 SILICONE SEALANT

- A. (SLNT-3) Low-Modulus Silicone Rubber Sealant: Silicone rubber based, one part neutral cure elastomeric sealant with plus 50 percent to minus 50 percent movement complying with FS-TT-S-001543, Class A, and recommended by manufacturer for joints.
 - 1. Manufacturers and Products:
 - a. General Electric: Silpruf SCS 2000.
 - b. Dow Corning Corporation: 795 Building Sealant.
 - c. BASF Building Systems: Sonolastic Omniseal or OmniPlus.
 - d. Pecora Corporation: 864 Silicone.
 - e. Tremco Construction Division: Spectrem 3.
 - 2. Applications: Exterior Vertical Surfaces and Horizontal Surfaces Not Subject to Traffic:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in interior and exterior unit masonry.
 - c. Joints between metal panels.
 - d. Joints between different materials listed above.
 - e. Other joints as indicated.
- B. (SLNT-8) Silicone Sealant, Mildew-Resistant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
 - 1. Products and Manufacturers:
 - a. Dow Corning Corporation; Dow Corning 786.
 - b. GE Silicones; a division of GE Specialty Materials; Sanitary 1700.
 - c. Laticrete International, Inc.; Latasil Tile & Stone Sealant.
 - d. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
 - e. Tremco Incorporated; Tremsil 200 White.

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2. Applications: Interior joints as follows:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Joints subject to water and high moisture areas.

2.4 ACRYLIC SEALANT

- A. (SLNT-7) Acrylic Sealants: General purpose, paintable acrylic-emulsion sealant. Caulk with approximately 12-1/2 percent elongation complying with ASTM C834.
 1. Products and Manufacturers:
 - a. Tremco Incorporated: Acrylic Latex 834.
 - b. Pecora Corporation: AC-20.
 2. Location/Use:
 - a. Joints in vertical surfaces and in horizontal surfaces not subject to traffic.
 - b. Control and expansion joints on exposed interior surfaces of exterior walls.
 - c. Vertical joints on exposed surfaces of interior unit masonry, concrete, walls, and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
 - e. Joints between plant-precast structural concrete units.
 - f. Other joints as indicated.
- B. Acoustic Joint Sealant: Refer to Section 092900 for acoustic sealant in gypsum board assemblies.

2.5 JOINT SEALANT BACKING

- A. Joint Sealant Backer Rod Manufacturers:
 1. Denver Foam, Backer Rod Manufacturing, Inc.
 2. Construction Foam Products, Nomaco Inc..
- B. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- C. Sealant Backing Material: Nonstaining, sealants, primers, and other joint fillers; compatible with joint substrates; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- D. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- E. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 PREPARATORY MATERIALS

- A. Joint Primer: Non-staining type recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive type recommended by sealant manufacturer; compatible with joint forming materials.
- C. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- D. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joint surfaces, backing, and anchorage of units forming sealant rabbet, and conditions under which sealant work is to be performed. Do not proceed with sealant work until unsatisfactory conditions have been corrected.

3.2 JOINT SURFACE PREPARATION

- A. Preparation: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
 - 1. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
 - 2. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- B. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond of sealant.
- C. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant application.
- D. Roughen joint surfaces on vitreous coated and similar non-porous materials, wherever sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or steel wool to produce dull sheen.
- E. Ensure that joint forming materials are compatible with sealant.
- F. Examine joint dimensions and size materials to achieve required width/depth ratios. Use joint filler to achieve required joint depths, to allow sealants to perform properly.

3.3 SEALANT APPLICATION

- A. Installation:
 - 1. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
 - 2. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
 - 3. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 4. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 5. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
- B. Apply sealant in accordance with manufacturer's printed instructions. Perform work in accordance with ASTM C804.
- C. Prime or seal joint surfaces. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.
- D. Install sealant backer rod for liquid elastomeric sealant, except where recommended to be omitted by sealant manufacturer for application shown.

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- E. Install bond breaker tape wherever required by manufacturer's recommendations to ensure that elastomeric sealant will perform properly.
 - F. Employ only proven installation techniques, which will ensure that sealant will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides.
 - 1. Except as otherwise indicated, fill sealant rabbet to slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between horizontal surface and vertical surface, fill joint to form slight cove, so that joint will not trap moisture and dirt.
 - G. Install sealant to depth as shown or, if not shown, as recommended by sealant manufacturer but within following general limitations, measured at center (thin) section of bead:
 - 1. For sidewalks, pavements and similar joints sealed with elastomeric sealant and subject to traffic and other abrasion and indentation exposures, fill joints to depth equal to 75 percent of joint width, but not more than 5/8 inch deep nor less than 3/8 inch deep.
 - 2. For normal moving joints sealed with elastomeric sealant, but not subject to traffic, fill joint to depth equal to 50 percent of joint width, but not more than 1/2 inch deep nor less than 1/4 inch deep.
 - H. Interior joints not subject to movement, these are:
 - 1. Gypsum board to masonry joints.
 - 2. Gypsum board to hollow metal joints.
 - 3. Gypsum board to concrete joints.
 - I. Do not allow sealant or compounds to overflow or flow onto adjoining surfaces, or to migrate into voids of adjoining surfaces including rough texture surfaces. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either primer/sealer or sealant.
 - J. Remove excess and spillage of sealant promptly as work progresses. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes.
 - K. Rope Wicks: Where wicks for weeping masonry cavity occur in sealant, cut wick flush with sealant face and do not seal wick ends.

3.4 PROTECTION AND CLEANING

- A. Protect joint sealers during and after curing period from contact with contaminating operations or other causes so that they are without deterioration or damage at time of Substantial Completion.
 - 1. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.
- B. Clean off excess sealant or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

END OF SECTION

SECTION 081113 HOLLOW METAL DOORS & FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pressed steel hollow metal doors and frames.
 - 2. Fire-rated hollow metal doors and frames.
 - 3. Hollow metal glazed openings, and other hollow metal frames for glass.
 - 4. Rough bucks, frame reinforcing, door reinforcing, door insulation, closure panels, clip angles and anchorage.
 - 5. Factory prime paint finish.

1.2 COORDINATION

- A. Anchorages: Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Preparation for Hardware: Reinforced and machine hollow metal work for hardware specified in Sections 087100 and automatic door operators 087113.
 - 1. Obtain templates, shop drawings, jigs, or materials, and a copy of the accepted Hardware Schedule from the hardware distributor.
 - 2. Templates: Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
 - 3. Reinforcing: Reinforce the work of this Section to meet requirements for anchoring hardware using concealed fasteners.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule, in electronic PDF format, of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly, for tests performed by a qualified testing agency.
- B. Oversize Construction Certification: For assemblies required to be fire-rated and exceeding limitations of labeled assemblies.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.
- D. Handle hollow metal with care to prevent damage to hollow metal and to factory-applied primer and galvanized coatings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105. Provide smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
 - 2. Oversize Fire-Rated Door Assemblies: For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, provide certificate or label from approved independent testing and inspection agency, indicating that door and frame assembly conforms to requirements of design, materials and construction as established by individual listings for tested assemblies.
 - 3. Temperature Rise Rating: At stair enclosures, provide doors with Temperature Rise Rating of 450 degrees F maximum in 30 minutes of fire exposure.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door Products; an Assa Abloy Group company.
 - 2. Curries Company; an Assa Abloy Group company.
 - 3. Deansteel Manufacturing.
 - 4. Door Components, Inc..
 - 5. Hollow Metal Xpress.
 - 6. Pioneer Industries, Inc..
 - 7. Republic Doors and Frames.
 - 8. Steelcraft; an Ingersoll-Rand company.

2.3 MATERIALS AND COMPONENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Sheets:
 - 1. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS), Type B; suitable for exposed applications.
 - 2. Hot-Rolled Steel Sheet: ASTM A1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
 - 3. Galvanized Steel Sheet: ASTM A653, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

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- a. Provide galvanized steel sheets for exterior hollow metal doors, door and window frames, frame anchors and reinforcements, and louvers.
 - C. Fastenings: Provide fastenings, anchors and clips as required to secure hollow metal work in place. Provide Jackson head screws, or flatter. Dimple metal work to receive screw heads. Set stops and other non-structural fastenings with #8 FHSMS.
 - D. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
 - E. Steel Reinforcing: ASTM A36.

2.4 FABRICATION, GENERAL

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Construct doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
 - 1. Refer to Openings Schedule on Drawings for openings and locations.
 - 2. Door Thickness: 1-3/4 inches, unless otherwise indicated.
 - 3. Door Edge Construction: Model 2, Seamless.
 - 4. Minimum Thickness: Construct from base metal without coatings according to NAAMM-HMMA 803 and SDI A250.8. Provide heavier gage if required by details or specific condition. Entire frame and sidelight shall be of same gage.
- C. Interior Doors and Frames:
 - 1. Provide Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B; 0.042 inch (20 ga.) minimum steel thickness, typical.
 - 2. Provide Maximum-Duty Doors and Frames, ANSI/SDI A250.8, Level 4; ANSI/SDI A250.4, Level A; 0.067 inch (16 ga.) minimum thickness, at the following conditions:
 - a. Single Door Openings Exceeding 48 inches Wide.
 - b. Pair of Doors with Either Door Exceeding 48 inches Wide.
 - c. Openings with Nominal Door Opening Height of 120 inches or more.

2.5 HOLLOW METAL FRAMES

- A. General: Provide frames as full profile welded unless otherwise indicated. Where necessary, alternate details will be considered provided design intent is maintained. Consider and provide for erection methods.
 - 1. Clearances: Provide and be responsible for proper clearances at metal frames, including for weatherstripping, sound stripping and smoke gasketing. Glass clearance shall be thickness of glass plus clearance each side (1/8 inch minimum exterior - 1/16 inch minimum interior), adjust for installation, glass thickness to allow for glazing and sealant. Where sealed double glazing is indicated, provide rebates minimum of 3/4 inch and provide 1/4 inch clearance at glass edges. Where units fit around concrete blocks (blocks built into frames) obtain actual dimensions of blocks being used to establish minimum clearances.
 - 2. Fire-Rated and Smoke-Rated Frames: Construct in accordance with requirements for labeled work. Attach proper U.L. label, Warnok Hersey. "B" labeled frames shall be 1-1/2 hour construction.
- B. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

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- C. Mullions: Provide mullions, continuously reinforced, straight and without twist, of tubular design. For removable mullions provide fastenings of non-ferrous bolts at bottom, with sleeves at head of frame for mullion to clip over.
 - D. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with [butted] [or] [mitered] hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow-metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 - E. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
 - F. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.
 - G. Fasteners:
 - 1. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153.
 - 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

2.6 HOLLOW METAL DOORS

- A. Flush Doors: Reinforce, stiffen and sound deaden. Provide cut-outs for glass and louvers with stops as shown.
 - 1. Provide flush steel closure at top of exterior and interior doors and at bottom of exterior doors with drain holes in bottom closure. Following door construction types are acceptable.
 - 2. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 3. Seamless Vertical Edges: Construct doors with smooth flush surfaces, without visible joints or seams on exposed faces or stile edges. Tack weld door edge seams, fill with body putty and grind smooth.
 - 4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
 - 5. Bottom Edge Closures: Close bottom edges with end closures or channels of same material as face sheets.
 - a. Exterior doors where required for attachment of weather stripping
 - b. Interior doors to receive sound gasket.
- B. Fire-Rated Doors: Insulate as required by Underwriters Laboratories. Build in special hardware and provide astragals as indicated.

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1. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.

2.7 FINISHES

- A. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting structure and conditions under which hollow metal is to be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install hollow metal in accordance with reviewed shop drawings and manufacturer's printed instructions. Securely fasten and anchor work in place without twists, warps, bulges or other unsatisfactory or defacing workmanship. Set hollow metal plumb, level, square to proper elevations, true to line and eye. Set clips and other anchors with Ramset "shot" anchors or drill in anchors as approved. Units and trim shall be fastened tightly together, with neat, uniform and tight joints.
- B. Placing Frames: Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
 1. At acoustic rated metal stud and gypsum board partitions, install insulation within frames.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 3. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
 4. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Place fire-rated frames in accordance with NFPA Standard #80.
- D. Door Installation: Fit hollow metal doors accurately in their respective frames, within following clearances: Jambs and head 3/32 inch, meeting edges pair of doors 1/8 inch, sill where no threshold or carpet 1/4 inch above finished floor, sill at threshold 3/4 inch maximum above finished floor, sill at carpet 1/4 inch above carpet. Place fire-rated doors with clearances as specified in NFPA Standard #80.
 1. Provide undercut no greater than 3/8-inch at doors equipped with automatic sound seal door bottoms.

3.3 INSTALLED WORK

- A. Remove grout and other bonding material from hollow-metal work immediately after installation.
- B. Touchup: Sand and clean rusted or abraded surfaces and apply compatible touchup finish:
 1. Primer: Apply air-drying, rust-inhibitive primer.

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- 2. Metallic-Coated Surface: Repair with galvanizing repair paint according to manufacturer's written instructions.
 - 3. Painting: As specified in Section 099000 - Painting.
 - C. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.
 - D. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

END OF SECTION

SECTION 082000 SLIDING DOOR ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Face-of-wall-mounted sliding door assemblies with aluminum-framed glass doors.
 - 2. Aluminum-framed glass interior partitions.
 - 3. Assembly includes door tracks, valance, top-hung doors on rolling trucks, side-rolling operation.

1.2 REFERENCES

- A. ANSI – American National Standards Institute
 - 1. ANSI 156.18 Materials and Finishes
 - 2. ANSI A117.1 Specifications for making buildings and facilities usable by physically handicapped people.
- B. BHMA – Builders Hardware Manufacturers Association
- C. DHI – Door and Hardware Institute
- D. AWS – Architectural Woodwork Standards

1.3 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's product data, including installation instructions.
- B. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, components, hardware, finish, options, and accessories. Shop Drawings to show required blocking by others.
- C. Samples: Submit manufacturer's samples of the following sliding door components:
 - 1. Door veneer or laminate sample
 - 2. Aluminum Frame finish sample

1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of interior aluminum frames and doors.
- B. Source: Obtain sliding aluminum framed doors and hardware from single source.
- C. Manufacturer's Qualifications: Manufacturer regularly engaged for past 5 years in manufacture of sliding doors similar to that specified.

1.5 DELIVERY, STORAGE AND PROTECTION

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Notify manufacturer immediately of any shipping damage.
- C. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Store materials in clean, dry area indoors.
 - 4. Protect materials and finish during storage, handling, and installation to prevent damage.

PART 2 - PRODUCTS

2.1 PRODUCTS (SD-4)

- A. Interior Aluminum-Framed Top-Hung Sliding Doors:
 - 1. Basis of Design: ExamSlide High Performance Barn (Sliding) Door System by AD Systems.
- B. Operation:
 - 1. Aluminum perimeter frames with integral acoustic seals.
 - 2. Soft self-closing mechanism integrated with top track.
 - 3. Concealed door guide.
- C. Frames: Extruded aluminum frames with integral vertical jamb (stile pocket).
 - 1. Finish: Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 2. Color: As selected by Architect.
- D. Frame Profiles: Extruded aluminum frame "wrap" frame with integral vertical jamb (stile pocket). Frames required to complete seal around door leaf. Gasketing required at all frame to door interfacing. Exposed gaskets at jamb to be silicone.
- E. Door Panel: All Doors to be factory machined for hardware including pilot and function holes.
 - 1. **Flush Wood Door:** Reference Spec Section 081400 Wood Doors or other section as applicable.
 - a. Door Panel Thickness: 1-3/4" .
 - b. Glazing: other glass as specified by architect.
 - c. Note: Standard stile widths are 6" with a 10" bottom rail
 - 2. Glazing: other glass as specified by architect
- F. Door Components:
 - 1. Single Top Track: AD Systems extruded aluminum track by AD Systems
 - 2. Valances: Standard square valance; extruded aluminum with integral end caps
 - 3. Top Rollers: Tandem nylon roller sized to match door weight
 - 4. Concealed Floor Guide: Integral Jamb floor guide.
 - 5. Soft-Closer: Soft and self-closing damper mechanism at both sides of door leaf
 - 6. Handles: AD Systems Standard Ladder Pull: 16" long x 1" diameter.
 - a. Finish: US32D Satin Stainless Steel
 - 7. Locks:
 - a. As indicated on the Door Hardware Schedule and as specified in Section 087100 Door Hardware.
 - 8. Self-Closing Spring Mechanism.
 - 9. Automatic Door Bottom for improved acoustical performance
 - 10. Power operated, where indicated.

2.2 PERFORMANCE

- A. Steel reinforced aluminum perimeter frames with intumescent seals.
- B. Self-closing mechanism integrated with top track.
- C. Sill mounted door guide.
- D. Self-latching mortise lock with lever.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine wall openings to receive sliding doors for plumb, level, and square. Note: Finish door operation will be affected by out of tolerance framing.
- B. Verify dimensions of wall openings.
- C. Examine surfaces to receive top and bottom guide.

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- D. Notify Architect of conditions that would adversely affect installation or subsequent use of sliding doors.
 - E. Do not begin installation until unacceptable conditions are corrected.
 - F. Base of door side to be flush or minimal. Rubber Base acceptable.

3.2 INSTALLATION

- A. Install sliding doors in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install sliding doors plumb, level, square, and in proper alignment.
- C. Install sliding doors to close against walls without gaps
- D. Install sliding doors to open and close smoothly.
- E. Anchor sliding doors securely in place to wood backing in accordance with Manufacturer's warranty requirements.
 - 1. Required: Fire treated 2 x 6 blocking required full length of track.

3.3 INSTALLED WORK

- A. Adjusting: Adjust sliding doors for proper operation in accordance with manufacturer's instructions. Adjust sliding doors to operate smoothly without binding.
- B. Repairing: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- C. Cleaning: Clean sliding doors promptly after installation in accordance with manufacturer's instructions. Do not use harsh cleaning materials or methods that could damage materials or finish.
- D. Protecting: Protect installed sliding doors from damage during construction.

END OF SECTION

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SECTION 087100 DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Sliding doors.
 - c. Folding doors.
 - d. Other doors to the extent indicated.
 - 2. Cylinders for doors and locking devices specified in other Sections.
 - 3. Electrified door hardware.
- B. Related Sections:
 - 1. Section 081113 – Hollow Metal Doors and Frames.
 - 2. Section 081400 – Wood Doors.
 - 3. Section 084113 – Aluminum-Framed Entrances and Storefronts
 - 4. Section 087113 – Automatic Door Operators.
 - 5. Division 26: Electrical.

1.3 GENERAL REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Meet the requirements of CBC Section 716.1
 - 1. CBC Section 716.2.6.1 Door Closing: Fire doors shall be latching and self – or automatic - closing.
 - 2. CBC Section 716.2.6.4 Automatic-Closing Fire Door Assemblies: Automatic-closing fire door assemblies shall be self-closing in accordance with NFPA 80
- C. Meet requirements of CBC Sections 1010 and 11B.
 - 1. CBC Sections 1010.1.9: Door Operations shall be provided that affords free egress at all times, does not require a key or prior knowledge for operation and not more than one releasing operation to egress, in accordance with NFPA 101: 7.2.1.5.1, 7.2.1.5.3, 7.2.1.5.10.2
 - 2. CBC Section 1010.1.10: Panic and Exit Hardware.
 - 3. CBC 11B, Divisions 3 and 4:
 - a. 11B-309.4: Operable parts must be operable with one hand not requiring tight grasping, pinching, or twisting of the wrist.
 - b. 11B-404.2.5: Thresholds maximum ½-inches high.
 - c. 11B-404.2.7: Mount latching hardware 34 inches to 44 inches A.F.F.
 - d. 11B-404.2.8.1: Closer Speed from 90 degrees open position to 12 degrees, 5 seconds minimum.
 - e. 11B-404.2.9: At interior, exterior, and fire rated doors, 5 lbs., 22.2N maximum opening force.
 - 1) Increase of opening force at fire rated doors allowable by the appropriate administrative authority not to exceed 15 lbs., 66.7N.
 - f. 11B-404.2.10: Swinging doors and gates surfaces within 10 inches of the finish floor or ground measured vertically shall have a smooth surface on the push side extending the full width of the door or gate.
 - 1)

1.4 COORDINATION

- A. 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.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- D. Existing Conditions: Where hardware components are reused or where modifications to existing hardware is required, field verify existing conditions and coordinate installation resulting in proper door operation and ensure fire-rating recertification if required.
- E. Coordination Meeting: When requested by Architect and/or Owner, the Contractor will schedule a meeting prior to the installation of electrified hardware to review and coordinate functions and connections. Participants to include representatives and—suppliers of all applicable electrified hardware components. Advise Architect/Owner of scheduled date, time, place, and attendees.

1.5 PREINSTALLATION MEETINGS

- A. Pre-Installation Conference: Prior to the installation of hardware, manufacturers' representatives must arrange and conduct a jobsite meeting to instruct Installers on the proper installation. A letter of compliance must be sent to the Architect and Owner.
- B. Refer to Keying article for keying conference requirements.

1.6 ACTION SUBMITTALS

- A. Hardware Schedule: Submit hardware schedule per Section 013300 in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Schedules, which do not comply, will be returned for correction before review. Hardware schedule shall clearly indicate architect's hardware group and manufacturer of each item proposed. The schedule shall be reviewed prior to submission by a certified Architectural Hardware Consultant, who shall affix his or her seal attesting to the completeness and correctness of the schedule.
 - 1. Provide illustrations from manufacturers' catalogs and data in brochure form.
 - 2. Check specified hardware for suitability and adaptability to details and surrounding conditions. Indicate unsuitable or incompatible items and proposed substitutions in the hardware schedule submittal.
 - 3. When requested, provide listing of manufacturers' template numbers for each item of hardware in the hardware schedule submittal.
 - 4. Furnish associated Contractors and Subcontractors with copies of final approved hardware schedule. Submit necessary templates and schedules as soon as possible to hollow metal, wood, aluminum, and other door and frame fabricators in accordance with schedule they require for fabrication.
 - 5. Samples; if requested by Architect, provide for each exposed product in each finish specified, in manufacturer's standard size
 - a. Tag Samples with full product description to coordinate Samples with door hardware schedule.
 - 6. List of related door devices specified in other Sections for each door and frame.
- B. Closer Mounting: Indicate mounting description for each closer included in the submittal's hardware groups.
- C. Existing Hardware Conditions: Refer to Part 1 - Coordination.
 - 1. Advise Hardware Supplier and Architect of any existing conditions which would prevent utilization of specified hardware.

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- D. Provide keying schedule, prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents. Keying schedule to be coordinated with and approved by Owner.
 - E. Electrified Hardware Coordination:
 - 1. List all hardware specified in groups and identify items not in your scope as -inches by Others-inches or other means of identification.
 - 2. Provide operational descriptions for each electrified hardware group including operation for exit, entry, and fire alarm conditions.
 - a. Refer to operational descriptions in electrified hardware groups. Part 3 - Hardware Groups.
 - 3. Wiring Diagrams: When requested after final approval of the hardware schedule submittal, provide wiring diagrams for each opening that requires electrified hardware.
 - a. Exception: groups where only magnetic hold-opens or door position switches are specified.
 - b. Approved diagrams to be sent with hardware delivery to the jobsite.
 - F. Installation Instructions: Provide manufacturer's written installation and adjustment instructions for finish hardware. Send installation instructions to site with hardware.

1.7 QUALITY ASSURANCE

- A. Manufacturer: Obtain each type of hardware, i.e. latch and locksets, hinges, closers from single manufacturer, although several may be indicated as offering products complying with requirements.
- B. Supplier: Recognized architectural finish hardware supplier, with warehousing facilities, who has been providing hardware for period of not less than 3 years. The supplier shall be, or employ, a certified Architectural Hardware Consultant AHC, who is registered in the continuing education program as administered by the Door and Hardware Institute. The hardware schedule shall be prepared and signed by a certified AHC.
- C. Installer: Firm with three years experience in installation of similar hardware to that required for this project, including specific requirements indicated.
- D. Regulatory Label Requirements: Provide nationally recognized testing agency label or stamp on hardware for labeled openings. Where UL requirements conflict with drawings or specifications, hardware conforming to UL requirements shall be provided. Conflicts and proposed substitutions shall be clearly indicated in hardware schedule.
- E. All electric locking system units that control egress shall be listed in accordance with UL 294.
- F. Accessibility Requirements: Doors to stairs, other than exit stairs, loading platforms, boiler rooms, stages and doors serving other hazardous locations shall have knurled or other similar approved marking of door lever handles or cross bars, if required by local building codes.
- G. Pre-Installation Conference: Prior to the installation of hardware, manufacturers' representatives for locksets, closers, and exit devices shall arrange and conduct a jobsite meeting to instruct the installing contractor's personnel on the proper installation of their respective products. A letter of compliance, indicating when this meeting is held and who is in attendance, shall be sent to the Architect and Owner. Refer to Keying article for keying conference requirements.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver hardware to jobsite in manufacturer's original packaging, marked to correspond with the approved hardware schedule. Do not deliver hardware until suitable locked storage space is available. Check hardware against reviewed hardware schedule. Store hardware to protect against loss, theft, or damage.
- B. Deliver hardware required to be installed during fabrication of hollow metal, aluminum, wood, or stainless-steel doors prepaid to the respective manufacturer.

1.9 WARRANTY

- A. Guarantee workmanship and material provided against defective manufacture. Repair or replace defective workmanship and material appearing within period of one year after Substantial Completion.
- B. Provide a minimum ten-year factory warranty on door closer body against defects in material and workmanship from date of occupancy of Project.
- C. Replace shortages and incorrect items with correct material at no additional cost to Owner.
- D. At completion of project, qualified factory representative shall inspect closer installations. After this inspection, letter shall be sent to Architect reporting on conditions, verifying that closers have been properly installed and adjusted.

1.10 ATTIC STOCK

- A. Coordinate with Owner for products and quantities desired for attic stock.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Confirm acceptable manufacturers and models of all hardware products with Owner. Specified products are listed only to establish function and a level of quality.

2.2 BUTTS AND HINGES

- A. Acceptable Manufacturers:
 - 1. Bommer
 - 2. Hager listed below for design intent only
 - 3. Ives
 - 4. McKinney
 - 5. PBB
 - 6. Stanley/Best
- B. Types per Application:
 - 1. Exterior Out-Swinging doors: BB1199 x NRP
 - 2. Exterior in-swinging doors and vestibule doors: BB1168
 - 3. Interior doors with closers: BB1279/BB1168
 - 4. Interior doors over 36 inches wide: BB1168
 - 5. Interior doors 36 inches or less without closer: BB1279
 - 6. Provide NRP, non-removable pins, at out-swinging doors that are lockable or locked and at other doors when specifically indicated.
 - 7. Provide hospital tips only when specifically indicated.
- C. Size:
 - 1. 2-1/4 inch Doors 5 inch by 5 inch
 - 2. 1-3/4 inch Doors 4-1/2 inch by 4-1/2 inch
 - 3. 1-3/8 inch Doors 3-1/3 inch by 3-1/2 inch
- D. Quantity:
 - 1. 2 – hinges per leaf for openings through 60 inches in height.
 - 2. 1 – additional hinge per leaf for each additional 30 inches in height or fraction thereof.
 - 3. 1 – additional hinge per leaf for openings 40 inches wide and wider.
 - a. For mineral core doors Refer to Part 2 - Continuous Stainless-Steel Hinges
 - 4. 4 – hinges for Dutch doors up to 90 inches in height.
- E. Drill 5/32 inch hole and use No. 12, 1-1/4 inch steel threaded to the head wood screws for hinges on wood doors.

2.3 ELECTRIC HINGES

- A. Acceptable Manufacturers:
 - 1. Bommer BB5000 Series concealed electric thru-wires
 - 2. Hager ETW
 - 3. Ives: TW Series
 - 4. McKinney CC
 - 5. PBB EL
 - 6. Stanley/Best: CE
- B. Provide sufficient number of concealed wires to accommodate electrified function of specified hardware.
- C. Electric hinges to be located at second hinge from bottom. Where electric hinges are used in conjunction with exit devices, locate hinge nearest to exit device.
- D. UL 10C fire tested and listed for labeled doors up to and including Class A.
- E. Provide mortar guard for each electric hinge specified.
 - 1. McKinney MG-16, or equivalent

2.4 ELECTRIC POWER TRANSFERS

- A. Acceptable Manufacturers:
 - 1. ABH: PT Series
 - 2. Pemko: EL-CEPT
 - 3. Securitron EPT/EPTL
 - 4. Von Duprin EPT-2/EPT-10
- B. Provide electric power transfer devices as specified in hardware groups or as required by electrified hardware voltage requirements.
- C. When specifically indicated, provide surface-mounted armored power transfer loops with length to accommodate door opening conditions.
- D. UL 10C fire tested and listed for labeled doors up to and including Class A.

2.5 CONTINUOUS STAINLESS-STEEL HINGES

- A. Acceptable Manufacturers:
 - 1. ABH: A500, A515
 - 2. McKinney; MCK-FM300, MCK-HG305
 - 3. Markar; FM 300, HG 305
 - 4. Ives: 700, 705
 - 5. Hager; 790-900, 790-905
 - 6. Select; SL300, SL305
 - 7. Stanley/Best; 651, 652
- B. Provide concealed leaf continuous hinges when specified in the hardware groups. When specifically indicated, provide continuous hinge with door hinge edge protection. Coordinate hinge type requirements with the door and frame suppliers.

2.6 BOLT LOCKS

- A. Acceptable Manufacturers:
 - 1. ABH
 - 2. Burns
 - 3. Door Controls International
 - 4. Hager
 - 5. Ives listed below for design intent only
 - 6. Rockwood
 - 7. Trimco

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- B. Automatic Flushbolt: FP31/FP41 Series
 - C. Semi-automatic, constant-latching Flushbolt: FP51/FP61 Series
 - D. Manual Flushbolt: FB358/FB458 Series
 - E. Dust Proof Strike: Ives DP2
 - F. Surface bolts: SB1600 Series
 - G. Provide flush bolts meeting the requirements of ANSI A156.3, Grade 1, Type 25, conforms to positive pressure standards of UL10C and UBC 7-2 -1997, and is UL listed at fire rated openings.
 - H. Provide flush bolts for inactive door of pairs as indicated in the hardware groups, as required for metal or wood doors, and per the following conditions, unless indicated otherwise:
 - 1. At all exterior openings and locking interior openings, provide top and bottom bolt configuration for inactive door of pair, unless indicated otherwise.
 - 2. At non-locking interior openings, provide top bolt only.
 - 3. At fire-rated openings utilizing top bolt only configurations, provide appropriate auxiliary fire latch, as required by the door manufacturer to attain the specified fire-rating/label.
 - 4. Include appropriate strike to receive bolt/pin when projected.
 - 5. Where bottom bolts are utilized, provide dustproof strike, as required for sill conditions.
 - 6. Locate centerline of top bolt not more than 78 inches above finished floor – provide rod extensions as necessary.
 - 7. Only provide manual flushbolts or surface bolts when specifically indicated in the assigned hardware group.
 - I. Provide surface bolts only where indicated.
 - 1. Provide bottom panic guard Von Duprin LGO-3/4, Trimco PG8002, or approved equivalent

2.7 LOCKSETS – MORTISE

- A. Acceptable Manufacturer and Series: Lever design: Schlage 06A, or equal
 - 1. Best: 40H
 - 2. Sargent: 8200
 - 3. Schlage: L9000
- B. Provide mortise locks, unless indicated otherwise, with functions specified in Hardware Groups and with following provisions:
 - 1. Cylinders: Provide cylinders, as required, to accomplish specified lock function. Refer to Part 2 – KEYING.
 - 2. Locksets shall meet the requirements of ANSI/BHMA A156.13-1994, Operational Grade 1, and Security Grade 1.
 - 3. Backsets: 2-3/4 inches.
 - 4. Strikes: Provide wrought boxes and strikes with proper lip length to protect trim but not to project more than 1/8 inch beyond trim, frame or inactive leaf. Where required, provide open back strike and protected to allow practical and secure operation.
 - 5. ANSI functions – mortise locks.
 - a. Passage – F01
 - b. Privacy – F22
 - c. Office – F04
 - d. Classroom – F05
 - e. Storeroom – F07
 - 6. Where electrified locksets are specified, provide wiring harness and connections from electric lock to electric power transfer.
 - 7. Provide escutcheons to match existing conditions, where applicable.
 - 8. Where required by codes, doors which open onto stairways, mechanical rooms, or other spaces where caution is required, shall have levers with tactile markings to alert a visually impaired person of such conditions.

2.8 LOCKSETS – HEAVY-DUTY CYLINDRICAL

- A. Acceptable Manufacturer and Series. Lever design: Schlage RHO, or equal
 - 1. Best: 9K
 - 2. Sargent: 10-Line
 - 3. Schlage: ND
- B. Provide heavy-duty cylindrical locks unless indicated otherwise with functions specified in Hardware Groups and with the following provisions:
 - 1. Cylinders: Provide cylinders, as required, to accomplish specified lock function. Refer to Part 2 – KEYING.
 - 2. Backsets: 2-3/4 inches.
 - 3. Strikes: Provide wrought boxes and strikes with proper lip length to protect trim but not to project more than 1/8 inch beyond trim, frame or inactive leaf. Where required, provide open back strike and protected to allow practical and secure operation.
 - 4. ANSI functions – cylindrical locks.
 - a. Passage – F75
 - b. Privacy – F76
 - c. Office – F82
 - d. Classroom – F84
 - e. Storeroom – F86
 - 5. Where electrified locksets are specified, provide wiring harness and connections from electric lock to electric power transfer.
 - 6. Where required by codes, doors which open onto stairways, mechanical rooms, or other spaces where caution is required, shall have levers with tactile markings to alert a visually impaired person of such conditions.

2.9 EXIT DEVICES

- A. Provide Heavy-Duty Manufacturers and Models as listed below. Sargent and Von Duprin are included in the hardware groups as a basis of design and function only. Provide only manufacturers and models as listed below.
 - 1. BEST Precision 2000 Series
 - 2. Sargent 80-5CH Series
 - 3. Von Duprin AX-35A/98 Series
- B. Provide exit device pushpad armor where required by local jurisdictions: Von Duprin PA or equal
- C. Panic hardware shall comply with UBC Standard 10-4 and shall be mounted above 34 inches to 44 inches above finish floor surface. The unlatching force shall not exceed 15 lbs applied in the direction of travel. Panic hardware shall comply with CBC Section 1008.1.10.
- D. All exit devices shall be UL listed for panic. Exit devices for labeled doors shall be UL listed as Fire Exit Hardware.
- E. Where lever trim is specified, provide lever design to match locksets specified in previous articles.
- F. Where exit devices are specified with aluminum storefront doors, verify with Architect if narrow stile exit devices should be scheduled, where not specified with assigned hardware group.
- G. Provide cylinder dogging feature for non-rated heavy-duty exit devices with pull or locked lever outside trim.
- H. Cylinders: Provide cylinders as required for specified locking function and cylinder dogging. Refer to Part 2 – Keying.
- I. When less bottom rod configuration is specified in the assigned hardware group, provide appropriate fire bolts/thermal pins, as required by the door manufacturer to attain the specified fire-rating/label. Also include appropriate strike to receive bolt/pin when projected.
- J. Provide keyed removable mullions, including keyed cylinders, as specified in the Hardware Groups.

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- K. Provide bottom rod and latch protection for surface-mounted vertical rod exit devices specified with bottom rods to provide minimum 10-inch smooth and uninterrupted surface at bottom of push side of doors.
 - 1. Von Duprin LGO-3/4, Trimco PG8002, or approved equivalent
 - L. Door supplier to coordinate exit device mounting location to be mounted below half-height glazing to keep exit device from obstructing vision panel.

2.10 ELECTRIC STRIKES

- A. Acceptable Manufacturers and Series:
 - 1. HES 1600 Series; 9500/9600 Series
 - 2. Folger-Adam 310 Series
 - 3. Von Duprin 6000 Series
- B. Provide electric strikes designed for use with latch/lock type shown at each specified opening.
- C. Electric Strikes shall be UL Listed as Burglary-Resistant Electric Door Strikes and, where required, shall be UL Listed as Electric Strikes for Fire Doors and Frames. Provide fail-secure type electric strikes, unless specified otherwise.
- D. Provide power supply, transformer, and rectifier for each strike as required, unless indicated otherwise. Verify voltage with electrical contractor.
- E. Provide spacer plates and accessories as required for installation to suit details.
- F. Ensure fire-rating recertification if required at doors that are modified.

2.11 IN-LINE POWER CONTROLLERS

- A. Acceptable Manufacturers and Series:
 - 1. Best; 8WTCM
 - 2. Command Access; CRU-3
 - 3. HES; 2005ME Smart Pac III
- B. Provide in-line power controllers for electrified locks, electrified lever trim, and electric strikes where indicated in the hardware group or by modifiers to reduce overheating due to continuous power required to maintain specified lock/unlock function for extended periods of time.

2.12 KEYING

- A. Integrate keying of new locks/cylinders with existing key system as directed by Owner. Confirm existing key system manufacturer and keyway. Factory key all cylinders with manufacturer retaining permanent keying records. If requested, provide Owner with copy of bitting list via Owner acceptable delivery method.
- B. Contractor shall provide construction masterkeying and keys for the construction period.
- C. Authorized local distribution/service shall be available for purchase of additional keys and cylinders to allow for system revisions, expansion, and service, as required.
- D. Keying Conference: Conduct conference.
 - 1. Conference participants shall include Installer's Architectural Hardware Supplier/Consultant, Architect and Owner's security consultant.
 - 2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Flow of traffic and degree of security required.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.

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- E. If requested, submit proposed keying schedule to Architect and meet with Owner and Architect to review schedule.
 - F. Provide construction masterkeying. Permanent cylinders/cores shall be installed/activated upon completion of the project.
 - G. Provide 6 masterkeys for each masterkey set. Provide 3 change keys for each lock. Stamp keys Do Not Duplicate. When interchangeable core cylinders are specified, provide 2 control keys for core removal.
 - H. All keys shall be delivered to the designated Owner's representative via method determined and agreed upon by the Owner at the keying meeting.

2.13 DOOR TRIM

- A. Acceptable Manufacturers and Types:
 - 1. Burns
 - 2. Hiawatha listed below for design intent only
 - 3. Rockwood
 - 4. Trimco.
- B. 6-inch x 16-inch push plate:
 - 1. Burns 56
 - 2. Hiawatha 200H
 - 3. Rockwood 70E
 - 4. Trimco 1001-9
- C. 4-inch x 16-inch push plate:
 - 1. Burns 54
 - 2. Hiawatha 200F
 - 3. Rockwood 70C
 - 4. Trimco 1001-3
- D. 1-inch diameter push bar
 - 1. Burns 422
 - 2. Hiawatha 1081LBP
 - 3. Rockwood 47
 - 4. Trimco 1741
- E. 1-inch Diameter, 10-inch CTC, offset pull
 - 1. Burns 39C
 - 2. Hiawatha 658A
 - 3. Rockwood BF157A
 - 4. Trimco 1191-3
- F. 1-inch Diameter, 10-inch CTC, straight pull
 - 1. Burns 26C
 - 2. Hiawatha 536B
 - 3. Rockwood 111
 - 4. Trimco 1195-2
- G. 3/4-inch diameter, 8-inch CTC, straight pull
 - 1. Burns 25B
 - 2. Hiawatha 523A
 - 3. Rockwood 107
 - 4. Trimco 1194-2
- H. Non-Mortise edge guard bottom rod and latch guard
 - 1. Burns 301/302
 - 2. Hiawatha DES-1A/DES-2A
 - 3. Rockwood 304/305

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- 4. Trimco KE31-1/KE32-1 PG8002
 - I. Push Plates:
 - 1. 0.50 inches thick, 4 beveled edges
 - 2. Where width of door stile prevents use of 6-inch-wide plate, provide push plate one inch less than width of stile centered within stile.
 - J. Push Bars:
 - 1. Length:
 - a. Stile and rail doors: center of stile to center of stile.
 - b. Flush doors: 3 inches less than door width.
 - 2. Use concealed mounting and mount back-to-back with pulls.
 - K. Pulls:
 - 1. Length: 10-inches CTC
 - a. 8-inches CTC when used with pull plate.
 - 2. Use concealed mounting and mount back-to-back with push bars.
 - L. Door Protection Plates and Edge Guards: Minimum of 0.050 inch thick, stainless-steel, beveled 4 edges.
 - 1. Kick Plates:
 - a. At single doors provide width 1-1/2 inches less than door width on push side.
 - b. At pairs of doors provide width 1 inch less than door width on both doors.
 - c. Height: 10 inches unless otherwise detailed in Architectural drawings or indicated in hardware groups.
 - 2. Armor Plates:
 - a. Push side Single door: 1-1/2 inches less than door width.
 - b. Pull side Single door: 1 inch less than door width.
 - c. Pairs of doors: 1 inch less than door width on both doors.
 - d. Height: 34 inches, unless otherwise detailed in Architectural drawings or indicated in hardware groups.
 - 3. Mop Plates, for pull-side mounting:
 - a. At single doors provide width 3/4 inches less than door width.
 - b. At pairs of doors provide width 1/2 inches less than door width.
 - c. Height 4-inches inches
 - 4. Edge Guards:
 - a. Height: 34 inches, unless otherwise detailed in Architectural drawings or indicated in hardware groups.
 - b. When edge guards are specified in conjunction with protection plates, coordinate widths of to result in a continuous smooth surface with no more than 1/8-inches between the edge of the edge guard and the edge of the protection plate. Do not overlap.
 - c. Coordinate sizing of edge guards with door and frame supplier/manufacturer to ensure that opening clearances prevent binding and/or rubbing of the swinging door.
 - 5. When door protection plates and edge guards are specified for fire-rated openings, they must be installed in accordance with the listing of the door. Field-installed products must be labeled and installed in accordance with manufacturers' listings.
 - 6. Do not provide protection plates, or edge guards for impact-resistant doors. Refer to Door Panel type in Opening Schedule or MAT-ID list.

2.14 COORDINATORS

- A. Acceptable Manufacturers:
 - 1. Door Controls International
 - 2. Hager
 - 3. Ives.
 - 4. Trimco, listed below for design intent only
 - 5. Ives

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- B. Provide stop-mounted coordinator for labeled pairs of doors equipped with automatic flush bolts and those with vertical rod/mortise lock fire exit device combinations with astragals, unless indicated otherwise.
 - 1. Trimco 3094 series, or approved equivalent
 - C. Provide filler bars for total opening width, closer mounting brackets, carry bars, and special preparation for top latches where applicable.

2.15 DOOR CLOSERS

- A. Acceptable Manufacturers and Types of Exposed Closers:
 - 1. Heavy-Duty - cast iron bodies:
 - a. LCN 4040/4040XP
 - b. Norton 9500
 - c. SARGENT 281/281 P-10
- B. Provide heavy-duty non-sized closers, unless indicated otherwise in Hardware Groups, adjustable to meet maximum opening force requirements of CBC.
 - 1. Refer to Part 1 – General Requirements
- C. Provide heavy-duty drop plates, brackets, or adapters for arms as required to suit details.
- D. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors, unless indicated otherwise.
- E. Provide back-check for closers.
- F. Provide heavy-duty mechanical holder arms where holder function is indicated.
- G. Provide closers for doors as noted in Hardware Groups and, in addition, provide closers for labeled doors whether or not specifically noted in group.
- H. Provide closers meeting the requirements of UBC 7-2 and UL 10C positive pressure tests.
- I.
- J. No through bolting of closers will be accepted.

2.16 ELECTRONIC CLOSER/HOLDERS

- A. Acceptable Manufacturers and Types of Exposed Electronic Closer/Holders:
 - 1. Single-point; Multi-point:
 - a. LCN 4040SE; 4310ME
 - b. Norton 7700PT; 7210MPI
 - c. SARGENT 2408 Series; 2900; 351EHT
 - d. YALE 400PT; 4210MPI
- B. Provide non-sized closers, adjustable to meet maximum opening force requirements of CBC.
 - 1. Refer to Part 1 – General Requirements
- C. Provide drop plates, brackets, or adapters for arms as required to suit details.
- D. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- E. Provide back-check for closers.
- F. Provide single-point hold-open arms, unless indicated otherwise.
- G. Provide closer/holders meeting the requirements of UBC 7-2 and UL 10C positive pressure tests.
- H. Provide overhead stop with a dead stop/non-cushion to avoid damage to closing device.
- I. Hold-open devices at fire-rated assemblies must be listed by CSFM for use in a fire alarm system.

2.17 OVERHEAD STOPS

- A. Acceptable Manufacturers and Types: BHMA A156.8.
 - 1. ABH listed below for design intent only
 - 2. Glynn-Johnson
 - 3. Rixson
 - 4. Sargent
- B. Standard duty, surface:
 - 1. ABH 4400
 - 2. Glynn-Johnson 450
 - 3. Rixson 10
 - 4. Sargent 1540
- C. Standard duty, concealed:
 - 1. ABH 4000
 - 2. Glynn-Johnson 410
 - 3. Rixson 2
 - 4. Sargent 1530
- D. Heavy duty, surface:
 - 1. ABH 9000
 - 2. Glynn-Johnson 90
 - 3. Rixson 9
 - 4. Sargent 590
- E. Heavy duty, concealed:
 - 1. ABH 1000
 - 2. Glynn-Johnson 100
 - 3. Rixson 1
 - 4. Sargent 690
- F. Provide concealed mounted overhead stops unless indicated otherwise.
- G. Provide overhead stops for the following opening conditions.
 - 1. At doors that swing more than 140 degrees before striking a wall.
 - a. Provide a closer stop arm at interior doors with parallel arm closer mountings.
 - 2. At doors that open against objects, materials, casework, equipment, or other conditions that make wall stops inappropriate.
 - 3. At doors located 1'-6-inches or more from the wall, unless specifically indicated otherwise.
- H. Where overhead stops are required per opening conditions defined above, provide the following.
 - 1. Provide surface-mounted overhead stops for fire-rated wood doors, exterior hollow metal doors, or where specifically indicated.
 - 2. Provide heavy-duty overhead stops for doors that are over 39 inches wide and for exterior doors.
 - a. A heavy-duty closer compression stop arm is an acceptable option for overhead stops at exterior doors with parallel arm closer mountings.
 - 3. Provide hold-open function where indicated at non-label doors.
 - 4. Provide sex bolt attachments for mineral core wood door applications.

2.18 STOPS AND HOLDERS

- A. Acceptable Manufacturers:
 - 1. Burns
 - 2. Hager
 - 3. Ives listed below for design intent only
 - 4. Trimco
- B. Wall Bumper: WS406/407CVX; WS406/407CCV

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- C. Wall Mounted Stops: WS11/WS11X
 - D. Manual Wall Holder/Stop: WS20/WS20X
 - E. Automatic Wall Holder: WS45/WS45X
 - F. Provide wall bumper for each door leaf except where wall mounted stops are specified in the Hardware Groups, or where opening conditions require the use of an overhead stop. Refer to Part 2 – Overhead Stops
 - 1. Provide an overhead stop for doors in which the door face or operating trim on the leading/latch edge does not open against wall or opens against equipment or furniture.
 - G. Provide base mounted stops at toilet rooms, unless alternate stop is specified: WS11/WS11X.
 - H. Provide heavy-duty base stop and manual holder function where indicated for non-label doors.
 - I. Provide heavy-duty automatic wall holder where indicated for non-label doors.
 - J. Floor or base stops must be used only where specified or absolutely unavoidable.

2.19 FIRE AND SMOKE GASKET

- A. Acceptable Manufacturers:
 - 1. Hager
 - 2. National Guard Products
 - 3. Pemko listed below for design intent only
 - 4. Reese Enterprises
 - 5. Zero
- B. Refer to drawings for special details. Provide accessories, shims and fasteners.
- C. Provide gaskets for doors designated for smoke and draft control as required by local codes and/or door manufacturer. Include astragal and/or gasket as required for meeting edges of pairs. Refer to Architectural Life-Safety plans and/or Opening Schedule.
 - 1. Where smoke gasket is specified or required by fire-rating criteria, provide PK55D, unless detailed otherwise.
- D. Provide gaskets for fire labeled doors as required by local codes and/or door manufacturer tested assembly. Also include astragal and/or gasket as required for meeting edges of pairs.
- E. Where frame-applied intumescent seals are required by the wood door manufacturer, provide gaskets that comply with NFPA 252 and UL-10C positive-pressure testing.
 - 1. Must meet CBC 716.2.1.2
- F. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

2.20 SPECIAL GASKET

- A. Acceptable Manufacturers:
 - 1. Hager
 - 2. National Guard Products
 - 3. Pemko listed below for design intent only
 - 4. Reese Enterprises
 - 5. Zero
- B. Refer to drawings for special details. Provide accessories, shims and fasteners.
 - 1. Provide self-tapping fasteners for product, if required, being applied to hollow metal doors and frames.
 - 2. Cutting or notching of gasket for stop-mounted hardware on frame shall not be permitted. Provide special brackets, as required by actual frame conditions, for specified stop-mounted hardware.

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- a. Use Zero 770SPB as example for basis of design
 - 3. Adjust backset of lockset, as required to accommodate special stop-mounted gasket and to avoid conflict between lock trim and special gasket.
 - C. Where gasket is assigned by hardware group modifier "G", provide the following:
 - 1. At fire rated assemblies
 - a. Provide gasketing as required by door manufacturer's tested assemblies. Refer to PART 2 - Fire and Smoke Gasket.
 - 2. At non-fire-rated assemblies:
 - a. Jamb and Head, self-adhesive: Pemko S88D.
 - b. Astragal:
 - 1) SPLIT-type; both doors active, brush-type: 18041_NB
 - 2) OVERLAPPING-type at active/inactive and double-egress pairs: S88D applied to fixed astragal by door supplier. Matching wood material at wood doors, flat bar steel at hollow metal doors, unless specifically indicated otherwise.

2.21 DOOR POSITION SWITCHES

- A. Acceptable Manufacturers and Types:
 - 1. Ademco ADI 800-233-6261: 944SP-WH 3/4-in recessed white
 - 2. Detex: MS-2049F
 - 3. SARGENT: 3287
 - 4. Sentrol: 1078
- B. Provide model to accommodate door and frame materials and mounting conditions.
- C. Coordinate door and frame preparations with door and frame suppliers.
- D. Switches shall be installed in frame head approximately 4-inches from latching edge of door, unless detailed otherwise.

2.22 KEY CABINET

- A. Provide key cabinets by:
 - 1. Lund Equipment
 - 2. Telkee Incorporated
 - 3. Key Control
- B. Basis of design shall be Lund Deluxe wall type cabinet, Series 1200, unless indicated otherwise.
- C. G.
- D. Provide cabinet with one hook for each lock or cylinder plus at least 50 percent extra hooks.
- E. Provide each hook with one non-removable security key tag and one snap-on link duplicate key tag.
- F. Provide tools, instruction sheets and accessories required to complete installation.
- G. Owner will place keys in key cabinet and complete index cards furnished with key system.

2.23 FASTENERS

- A. Including, but not limited to; wood or machine screws, special screws, bolts, special bolts, nuts, expansion shields, anchors, and other accessory items of proper type, material, and finish required for complete operational installation of hardware.
- B. Use phillips head for exposed screws. Do not use aluminum screws to attach hardware.
- C. Provide self-tapping, TEC, screws for attachment of sweeps and stop-applied weatherstripping.

2.24 TYPICAL FINISHES AND MATERIALS

- A. Finishes, unless otherwise specified: Satin Stainless Steel 32D [*recommended for lab spaces*]
 - 1. Butts, Out-swinging Exterior Doors: US32D/BHMA 630 on Stainless-Steel.

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2. Butts, Interior Doors and In-swinging Exterior Doors: US32D/BHMA 630
 3. Continuous Geared Hinges: US28/BHMA 628 on Aluminum.
 4. Continuous Stainless Steel: US32D/BHMA 630on Stainless-Steel.
 5. Pivots: US32D/BHMA 626 on Brass or Bronze
 6. Flush Bolts: US26D/BHMA 626 on Brass or Bronze.
 7. Exit Devices: US32D/BHMA 630 on Stainless-Steel
 8. Locks and Latches: US32D/BHMA 626 on Brass or Bronze
 9. Push Plates, Pulls and Push Bars: US32D/BHMA 630 on Stainless-Steel.
 10. Coordinators: USP/BHMA 600 on Steel.
 11. Kick Plates, Armor Plates, and Edge Guards: US32D/BHMA 630 on Stainless-Steel.
 12. Overhead Stops and Holders: US26D/BHMA 626 on Brass or Bronze.
 13. Closers - Surface mounted. Sprayed Lacquer or Powder Coat to Match.
 14. Latch Protectors: US32D/BHMA 630 on Stainless Steel.
 15. Miscellaneous Hardware: US26D/BHMA 626 on Brass or Bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors, frames, and related items for conditions that would prevent the proper application of finish hardware. Do not proceed until defects are corrected.

3.2 INSTALLATION

- A. Install finish hardware in accordance with reviewed hardware schedule and manufacturer's printed instructions. Prefit hardware before finish is applied, remove and reinstall after finish is completed. Install hardware so that parts operate smoothly, close tightly and do not rattle.
- B. Installation of hardware shall comply with the current NFPA 80 and NFPA 101 requirements or as amended by state and local building codes.
- C. Set units level, plumb and true to line and location. Adjust and reinforce attachment to substrate as necessary for proper installation and operation.
- D. Screws for hinges and lock fronts in wood doors shall have pilot holes pre-drilled to avoid splitting doors. Do not over-drill pilot holes or over-torque installation of screws.
- E. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. For doors with door pulls and push plates, install door pulls with through bolted fasteners countersunk and flush with door face. Then install push plates over countersunk through bolts so they are concealed by push plate.

3.3 FIELD QUALITY CONTROL

- A. After installation has been completed, provide services of qualified hardware consultant to check Project to determine proper application of finish hardware according to schedule. Also check operation and adjustment of hardware items.
- B. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.4 ADJUSTING AND CLEANING

- A. At final completion, hardware shall be left clean and free from disfigurement. Make final adjustment to door closers and other items of hardware. Where hardware is found defective repair or replace or otherwise correct as directed.
- B. Adjust door closers to meet opening force requirements of Uniform Federal Accessibility Standards.
 1. Force Requirements:
 - a. Interior hinged doors and gates: 5 pounds maximum.
 - b. Sliding or folding doors: 5 pounds maximum.

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2. Adjust door closers to meet opening force requirements of and opening force and closing speed requirements of ADA and CBC 11B-404.2.9 .
 3. Force Requirements:
 - a. Interior hinged doors and gates: 5 pounds, 22.2 N maximum.
 - b. Sliding or folding doors: 5 pounds, 22.2 N maximum.
 - c. Required fire doors: the minimum opening force allowable by the appropriate administrative authority, not to exceed 15 pounds, 66.7N.
 - d. Exterior hinged doors: 5 pounds, 22.2 N maximum.
 4. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door or gate in a closed position.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of space or area, return to work during week prior to acceptance or occupancy, and make final check and adjustment of hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors.
- D. Instruct Owner's personnel in proper adjustment and maintenance of door hardware and hardware finishes.
- E. Clean adjacent surfaces soiled by hardware installation.

3.5 PROTECTION

- A. Provide for proper protection of hardware items until the Owner accepts Project as complete.

3.6 HARDWARE GROUP MODIFIERS

- A. Hardware Group modifiers added to numeric hardware group assignments on the schedule of openings indicate a variation to the group as defined below.

"A" – Add armor plate to push side of doors and edge guards to hinge and latch edges, both leaves of pairs and both sides of double-acting doors, omit kickplate if previously scheduled. Refer to Part 2 - Door Trim. Confirm compliance with any/all fire-ratings. Where surface vertical rod exit devices are also specified, provide bottom rod and latch protection.

Frame protection, if applicable is provided by Section 102600.

"D" – Add delayed-action feature to specified closers, if required to attain specified delay time. Set delay for specified closers to 5 – 7 seconds, unless indicated otherwise.

NOTE: Do not exceed 10-second delay, unless specifically indicated otherwise.

"G" – Provide gasket seal for jambs, heads, and meeting edges of pairs. Refer to Part 2 – Special Gasket.

"X" – New door, existing frame, existing hardware to remain / be reused; remove existing hardware that does not contribute to the new function and return to Owner.

- Field verify all hardware to remain is in good condition and functions as manufacturer originally intended. Replace as required with product and manufacturers listed within this specification.
- Field verify existing mounting and prep locations on frame and coordinate with new door.
- Patch and repair frame as required to match adjacent material and finish.
- Confirm maintenance of existing fire-labels/ratings with installation of new hardware. Any modifications to existing fire-rated assemblies must be performed by certified installers.
- Balance of existing hardware to remain / be reused.

"Y" – New door, new hardware, existing frame to remain; remove existing hardware and return to Owner.

- Field verify existing mounting and prep locations on frame and coordinate with new door and hardware.
- Prep frame for new hardware and electronic connections.
- Patch and repair frame as required to match adjacent material and finish.
- Confirm maintenance of existing fire-labels/ratings with installation of new hardware. Any modifications to existing fire-rated assemblies must be performed by certified installers.

3.7 HARDWARE GROUPS

- A. Provide all required door hardware for each specified opening to comply with requirements of this section in its entirety. Included are desired/intended functions, acceptable manufacturers and models, systems coordination, etc. for a complete installed opening.
- B. Refer to the openings schedule for hardware group and modifiers assigned to each door opening. Ignore hardware groups and modifiers not assigned on the openings schedule.
- C. All electrified hardware groups listed below, assigned to doors in the project, provide free egress at all times, complying with code requirements for door operations, sensor release of electrically locked egress doors and door hardware release of electrically locked egress doors.

GROUP 7.02 –Surface Sliding Door Assembly, with latching lever and cylinder

1 each Cylinder, For lockset/deadbolt provided by 087100

Balance of hardware by door assembly manufacturer including but not limited to:

1 each Top Track

2 each Hangers

1 set Floor Guides

2 each Soft Close Stops

1 each Self-Latching Lever Lockset

Function: Keyed cylinder outside or thumbturn inside throws and retract bolt. Push & pull operation when bolt is retracted.

OPERATIONAL DESCRIPTION: Door is manually slid opened and closed. Latchbolt is locked and unlocked by key or thumbturn.

NOTE: Door is to room with less than 10 occupants.

NOTE: G.C. to coordinate weight of door panel with assembly manufactures hardware to ensure smooth operation per manufactures recommendations, including provision and installation of products.

GROUP 10 – Single, passage, no closer

Hinges

1 each Latchset: Passage Function

Function: Latchbolt is retracted by lever on either side. Free egress at all times.

1 each Stop, as required by opening conditions

GROUP 11.02 – Single, mortise privacy latchset with occupancy indicator, no closer

Hinges

1 each Mortise Privacy Latchset with OCC/VAC Indicator

Function: Latchbolt is retracted by lever on either side unless inside thumb turn lever locks outside lever. Operating inside lever or closing door unlocks outside lever. Outside indicator indicates occupancy when door is locked. Outside emergency release unlocks outside lever. Free egress at all times.

1 each Stop, as required by opening conditions

GROUP 30 – Single, Passage lever with closer

Hinges

1 each Latchset: Passage Function

Function: Latchbolt is retracted by lever on either side. Free egress at all times.

1 each Closer

1 each Kickplate

1 each Stop, as required by opening conditions

GROUP 31.02 – Single, mortise privacy latchset with occupancy indicator, closer

Hinges

1 each Mortise Privacy Latchset with OCC/VAC Indicator

Function: Latchbolt is retracted by lever on either side unless inside thumb turn lever locks outside lever. Operating inside lever or closing door unlocks outside lever. Outside indicator indicates occupancy when door is locked. Outside emergency release unlocks outside lever. Free egress at all times.

1 each Closer

1 each Kickplate

1 each Stop, as required by opening conditions

GROUP 32 – Office with closer

Hinges

1 each Lockset: Office function

Function: Latchbolt is retracted by lever on either side unless outside lever is locked by inside turn button, cylindrical or toggle on lock front, mortise. Key outside retracts latchbolt. Deadlocking latchbolt. Free egress at all times.

1 each Closer

1 each Kickplate

1 each Stop, as required by opening conditions

GROUP 34 – Single, Storeroom lock with closer

Hinges

1 each Lockset: Storeroom Function

Function: Latchbolt is retracted by inside lever only. Outside lever is always locked. Key outside retracts latchbolt. Deadlocking latchbolt. Free egress at all times.

1 each Closer

1 each Kickplate

1 each Stop, as required by opening conditions

GROUP 211.01 –Single Storeroom lock with electronic access control system via electric strike, closer

Hinges

1 each Lockset: Storeroom, mechanical

Function: Latchbolt is retracted by lever inside only. Outside lever is always locked. Key outside retracts latchbolt. Deadlocking latchbolt.

1 each Electric Strike, fail-secure

1 each Closer

1 each Kickplate

1 each Stop, as required by opening conditions

1 each Door Position Switch/Contact

Electronic access control system/devices, power supply for electric strike, request-to-exit device and monitoring/alarms are provided with Security System. Contractor to coordinate the provision and installation of products. Refer to documents with Security information for locations and types of controls. Connection by Electrical.

OPERATIONAL DESCRIPTION: Door is normally closed and mechanically locked on the outside.

Electronic access control device releases and secures electric strike for predetermined periods of time to control entry.

Interruption of power and/or fire-alarm event, at fire-rated openings secures electric strike to positively latch door.

END OF SECTION

SECTION 087113 AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Furnish and install electro-mechanical/hydraulic low-energy automatic swing door operators,. Also provide control system including actuator switches/controls and related accessories.
 - 2. Supplier shall coordinate and interface automatic operators with electronic door hardware and security systems to ensure specified door operation.
 - 3. Provide fasteners and anchors for materials provided.

1.2 REFERENCES

- A. American National Standards Institute, ANSI:
 - 1. ANSI A156.19: Power Assist and Low Energy Operated Doors.
 - 2. ANSI A117.1: Accessible and Usable Buildings and Facilities.
- B. National Fire Protection Association:
 - 1. NFPA 80: Standard for Fire Doors and Windows.
 - 2. NFPA 101: Code for Safety to Life from Fire in Buildings and Structures.
- C. Underwriters Laboratories, Inc. UL:
 - 1. UL Building Materials Directory.
 - 2. UL 325 Electrical Door, Drapery, Gate, Louver and Window Operators and Systems.
- D. Americans with Disabilities Act, ADA, 2010 ADA Standards
- E. California Building Code, 2022 CBC Section 11B-404

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Open door to 90 degrees by forces transmitted to drive shaft and maintain a constant engagement throughout opening cycle.
 - 2. Function as a manual door closer if power fails.
 - 3. Force required to open door in event of a power failure shall not exceed 15 pounds of pressure applied 1-inch from latch edge of door.
 - 4. Provide adjustment for opening, closing, and latch speed.
 - 5. Operators to be activated or de-activated by controls as indicated.
 - 6. Comply with ANSI A156.19,

1.4 SUBMITTALS

- A. Comply with Section 013300, unless otherwise indicated.
- B. Product Data: Manufacturer's specifications and technical data including the following.
 - 1. Detailed specification of construction and fabrication.
 - 2. Manufacturer's installation instructions.
- C. Shop Drawings: Indicate dimensions, descriptions of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, including specific requirements indicated.
- D. Contract Close-out Submittals: Comply with Section 017800.
 - 1. Operating and maintenance manuals: Include name, telephone number, and address of nearest service representative.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Not less than 5 years experience in the actual production of specified products.
- B. Manufacturer: Obtain automatic operators from a single manufacturer throughout the project if subdividing into multiple contracts.
- C. Installer's Qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this project, including specific requirements indicated.
 - 1. Acceptable to or licensed by manufacturer.
 - 2. AAADM certified for compliance with current ANSI/BHMA 156.19 standards with not less than 3 years experience with systems.
 - 3. Authorized service representative of the door operating equipment manufacturer must be located near enough to Site to ensure a repairperson would be on Site with tools and ready to work within 24 hours after receiving a request for service.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Deliver products in original unopened packaging with legible manufacturer's identification.
- B. Storage and Protection: Comply with manufacturer's recommendations.
 - 1. Store in a cool, dry place out of direct sunlight.
 - 2. Protect from the elements and from damage.

PART 2 - PRODUCTS

2.1 OPERATORS

- A. Electro-Mechanical Operators, low-energy, heavy-duty: Surface-mounted electro-mechanical door operators, power open/ spring close, enclosed in an extruded aluminum case, microprocessor control and solenoids and switches to synchronize for complete operation with the hardware as specified. Include power supply and connection for operation of electric strikes when included in specified hardware group in Section 087100. Provide full frame width extruded aluminum case for pairs of doors.
 - 1. Mount operators on corridor side of openings, unless indicated or drawn otherwise.
 - 2. Finish: Color anodized finish.
 - 3. Acceptable manufacturers and models: For 3'-0" - 4'-0" wide x 9'-0" high doors
 - a. Besam: SW200i
 - b. LCN Dor-O-Matic Senior-Swing.
 - c. Horton: 4000LE Series.
 - d. Stanley: Magic-Force-LE.
 - e. Record 8100 Series.
 - 4. When specifically indicated, provide safety sensors to prevent doors from opening or closing when detection zone is occupied.
- B. Provide a terminal strip in an enclosed box near or above door that indicates connections for security and fire alarm equipment and for electrified hardware items associated with proper door operation, as indicated by hardware group operational description.
- C. Smoke Detection: At all labeled assemblies provide fire alarm connection, or smoke detectors, as required by local codes to de-activate automatic mode upon activation of fire alarm, or smoke detector.
- D. Hold-open option at fire-rated assemblies must be listed by CSFM for use in a fire alarm system.
- E. Battery back up per 2022 CAC11B-404.2.9 exception b.

2.2 CONTROLS

- A. When control device is activated, doors shall swing 90 degrees to open position. Provide adjustable delay from 5 – 60 seconds to begin closing cycle. Doors shall be manually operable in event of power failure. Each operator shall be adjustable for opening, closing and latch speed.
- B. Actuation Devices:
 - 1. Wall Plate Actuator switch: Provide momentary contact push button switches with low voltage hard-wired connections to control boxes and 6-inch diameter stainless steel or aluminum push plates having an engraved and painted ISA, International Symbol of Accessibility logo, lettering - Push To Open, and arrow indicating direction of travel, unless indicated otherwise.
 - 2. Basis of design: WIKK Industries S-6R-3
 - a. Where indicated on plans, provide narrow style jamb-mounted actuator switches.
 - b. Where specifically indicated, utilize electronic access control devices to actuate automatic operator after presenting authorization, omit manual wall actuator switch in this application. Refer to assigned hardware group, to Operational Description, and to all notes related to specific door indicated.
 - c. Where specifically indicated provide touchless actuator switches.
 - 1) Square: WIKK S-4x4-NoTouch square with lettering No Touch.
 - 2) Single gang: WIKK S-SG-NoTouch, with lettering stating No Touch.
 - d. Where specifically indicated provide radio-frequency controlled actuators: WIKK Industries S-NAR-3
 - e. Where specifically indicated, provide momentary contact switches with low voltage hard-wired connections for interior and exterior vertical bar type Actuator switches Wikk Ingressr I36-3 or I36NAR-3 or approved equivalent: Provide engraved and painted ISA, International Symbol of Accessibility logo, lettering - Push To Open, and arrow indicating direction of travel, unless indicated otherwise.
- C. Where indicated on floor plan, provide standard 6" square bollards with finish to match doors and frames, and prepared for 4 ½ inch square actuators to be located at 38" centerline above finished floor.
 - 1. Basis of design: Wikk BPS SM-PREP 36 aluminum
 - 2. Surface-mount including anchoring base, anchors, and instructions, or in-ground mount one foot minimum recess with instructions as indicated on plan or required by mounting conditions.
 - 3. Also accommodate access control devices, if indicated and/or specified.
 - 4. In California in lieu of square actuators prep bollard for bar type actuators.
- D. Where round bollards are indicated, provide square switch adapter cuffs.
 - 1. Basis of design: Wikk aluminum No. BP4X4 ADT RFBLK, or equivalent
- E. Provide connections and integration with other specified electronic hardware components to achieve the specified operational description.
- F. Where specifically indicated, provide presence/safety sensors on approach side for swinging doors with automatic door operators for doors indicated with low energy automatic door operators as defined by ANSI A156.19..
 - 1. Basis of design: BEA SuperScan, door-mounted

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
 - 1. Do not proceed until satisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions.

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- B. Locate controls as indicated.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Inspect installation of assembly and confirm that installation is in compliance with manufacturer's installation procedures.

3.4 ADJUSTING

- A. Adjust automatic operators for smooth and quiet operation.

3.5 DEMONSTRATIONS

- A. Instruct Owner on automatic operation and procedure.

3.6 HARDWARE

- A. Refer to Section 087100 – DOOR HARDWARE.

END OF SECTION

SECTION 088100 INTERIOR GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Glass and glazing for interior locations (GL).

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details. Include the following:
 - 1. Size and location of penetrations.
 - 2. Glazing method.
 - 3. Mounting method.
 - 4. Attachments to other work.
- C. Samples: For each glass type (GL) specified.

1.3 FIELD CONDITIONS

- A. Handling, Storage and Protection: Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.2 MANUFACTURERS

- A. Single Source Responsibility: Provide materials obtained from one source for each type of insulating glass and glazing product indicated.
- B. Manufacturers:
 - 1. AFG Industries.
 - 2. ACH.
 - 3. Guardian Industries.
 - 4. Pilkington.
 - 5. Vitro Glass.

2.3 GLASS TYPES

- A. Monolithic Glass, General:
 - 1. Specified glass thickness and thickness of individual glass plies are minimum.
 - 2. Provide heat-strengthened as required for wind pressure or thermal stress.

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3. Provide fully-tempered complying with ASTM C1048, Kind FT (fully tempered), as required to comply with safety code requirements and as indicated with "T" in the Material Identification Abbreviation.
 4. Provide safety glazing labeling, as applicable.
- B. (GL-1T) Clear Fully-Tempered Float Glass: 1/4-inch minimum thickness; ASTM C1036, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), and heat-treated to comply with ASTM C1048, Kind FT (fully tempered).

2.4 ACCESSORIES

- A. Framing for Butt Glazing: Aluminum or stainless steel angles as indicated. Anchor to ceiling and floor substrates with appropriate fasteners in locations as indicated.
- B. Provide silicone sealant at vertical butt-joint glazing.
 1. Product: NuFlex, 319 Glazing Silicone Sealant, Clear.
 2. Install per manufacturer's recommendations.
 3. Provide sample installation for Architect's approval prior to final installation.
- C. Setting Blocks: Neoprene, 80 to 90 shore "A" durometer hardness, chemically compatible with glazing sealant or compound, length as recommended by glass manufacturer.
- D. Spacers and Shims: Neoprene, 40 to 50 shore "A" durometer hardness, chemically compatible with glazing sealant or compound, length as recommended by glass manufacturer.
- E. Glazing Tape: Butyl or silicone preshimmed tape similar to Tremco 440 Tape.
- F. High-Bond Tape: B23F, 4991 VHB Tape by 3M. Unless otherwise recommended by fabricator. Application temperature is 70 deg F per tape manufacturer. See Fabrication and Installation.
 1. Color: As selected by Architect.

2.5 FABRICATION

- A. Heat-Treated Float Glass: ASTM C 1048. Fabricate using horizontal roller heating process only. Roll wave distortion parallel to bottom edge of glass as installed. Deviation from flatness at any peak (peak to valley deviation): shall not exceed 0.003 inches in the center of a lite and shall not exceed 0.008 inches within 10.5 inches of the leading or trailing edge.
- B. Fully tempered (FT) glass shall be heat soak tested to eliminate the potential of spontaneous breakage due to nickel-sulfite inclusions or other defects that can affects glass performance in place.
- C. Butt-Glazed Glass: Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examine framing members, with Installer present, for compliance with the following:
 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Minimum required face or edge clearances.
 3. Effective sealing between joints of decorative-glass framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.2 GLAZING, GENERAL

- A. Orientation:

-
1. Set glass units in each series true in line with uniform orientation, pattern, draw, bow, and similar characteristics.
 2. Set glass lites with proper orientation so that each outer surface faces the direction indicated on Drawings and as approved by Architect.
- B. Install glass with hardware and accessories according to hardware manufacturer's written instructions. Attach hardware securely to mounting surfaces and building structure.
 - C. Comply with combined written instructions of manufacturers of glass, gaskets, sealants, tapes, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
 - D. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
 - E. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
 - F. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
 - G. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
 - H. Provide spacers for glass lites where length plus width is more than 50 inches.
 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances, and to comply with system performance requirements.
 2. Provide 1/8-inch- minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
 - I. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.4 INSTALLED WORK

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.

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- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
 - C. Remove and replace glass that is damaged during construction period.

END OF SECTION

SECTION 088700 GLASS SURFACE FILM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Surface-applied film overlay (WF-1).
- B. Related Sections:
 - 1. Section 088000 - Glazing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details.
- C. Samples: For each type of film overlay on glass substrate, 12 inches square.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of decorative film overlay, to include in maintenance manuals.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with application of film when ambient and substrate temperature conditions are outside limits permitted by manufacturer, or are wet from frost, condensation, or other causes.

PART 2 - PRODUCTS

2.1 GLASS SURFACE FILM

- A. Manufacturers:
 - 1. Llumar.
 - 2. 3M.
 - 3. Avery Dennison Graphics.
 - 4. DesignTex.
 - 5. FDC Graphic Films, Inc..
 - 6. Solar Gard.
 - 7. Solyx.
- B. (WF-1) Decorative Film Overlays: Dimensionally stable, cast **PVC** film, 2 mils minimum thickness, with pressure-sensitive, clear adhesive backing.
 - 1. Basis of Design: As indicated on Material Identification List.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine glass substrate and surfaces receiving film overlay. Confirm that substrate condition and temperature, as well as ambient temperature and relative humidity are in accordance with requirements of film manufacturer's instructions.
- B. Clean and treat glass surfaces in accordance with film manufacturer's written instructions.

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- C. Application: Prepare glass surface and apply film in accordance with Manufacturers written instructions. Apply in single sheet completely overlaying , squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges.
 - D. Protection: Protect film from contact with contaminating substances. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace film that is damaged during construction period.

END OF SECTION

SECTION 091330 CONCRETE SURFACE TREATMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Surface-applied treatments for existing slabs or new slabs to be left exposed as finished floor.
 - 1. Clear, film-forming acrylic sealer (CST-1).

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: Submit 4 samples, each 12-inches by 12-inches, demonstrating range of concrete mixes and colors.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Applicator.
- B. Product Certificates: For each type of product.
 - 1. Include manufacturer's printed statement of VOC content.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Manual: Submit installer's maintenance manual, including maintenance and cleaning instructions for polished concrete floor system.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.
- B. Field Sample Panels: After approval of verification sample and before casting concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, approximately 48 by 48 inches minimum, to demonstrate the expected range of finish, color, and appearance variations.
 - 1. Locate panels as indicated or, if not indicated, as directed by Architect.
 - 2. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
 - 3. Demolish and remove field sample panels when directed.
- C. Mockups: Provide mockup of CST applied to typical vertical concrete surface, in accordance with Section 014300 - Mockups. Prepare mockups of each required water repellent on each type of substrate required to demonstrate aesthetic effects,[for preconstruction testing,] and to set quality standards for materials and execution.
 - 1. Size: 10 sq. ft. each.
 - 2. Locate mockups on existing surfaces where directed by Architect in locations that enable viewing under same conditions as the completed Work.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.6 SITE CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation and other conditions affecting installation performance.
- B. Slab Protection: Protect areas to receive concrete finish at all times during construction; prior to, during, and after polishing procedures.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Compatibility: Provide products that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer of chemicals based on testing and field experience.
- B. Source Limitations: System must consist of components produced by a single manufacturer, or as recommended by primary system manufacturer, and as approved by the Architect.
 - 1. Provide materials that are consistent from the same lot and batch for the entire project.
 - 2. Do not use calcium chloride additives.

2.2 ACRYLIC SEALER

- A. (CST-1) Clear, Acrylic Sealer: ASTM C309 Type 1, Class A&B and containing not less than 30 percent solids, non-yellowing.
 - 1. Basis of Design:
 - a. Dayton Superior Corp.: Safe Cure and Seal (J-19)
 - b. Euclid Chemical Co.: Super-Diamond Clear VOX.
 - c. L&M Construction Chemicals: Dress and Seal WB 30

2.3 AUXILLIARY MATERIALS

- A. Joint Filler: Rapid setting, 100% solids, flexible, two-part polyurea joint filler.
 - 1. Product: CreteFill Pro 75 Polyurea Joint Filler by Curecrete Distribution, Inc.
 - 2. Color: Manufacturer's standard gray, or as determined by architect
 - 3. Performance Criteria:
 - a. Tensile Strength: ASTM D412 - 740psi
 - b. Shore "A" Hardness: ASTM D2240 - 75-77
 - c. Elongation: ASTM D412 - 290%

PART 3 - EXECUTION

3.1 EXAMINATION

- A. With Applicator present, examine concrete slab for compliance with requirements, installation tolerances and other conditions affecting performance.
 - 1. Notify Architect of conditions that would adversely affect installation or subsequent use.
 - 2. Repair or otherwise correct unsatisfactory conditions.
 - 3. Proceed with finishing procedures only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Slab Repair: Employ same repair methods as demonstrated on mockup and approved by Architect.
 - 1. Mix patching compound or grout material with dust created by grinding operations, manufacturer's tint, or sand to match color of adjacent concrete surfaces.
 - 2. Fill surface imperfections including, but not limited to, holes, surface damage, small and micro cracks, air holes, pop-outs, and voids with grout to eliminate micro pitting in finished work.
 - 3. Work compound and treatment until color differences between concrete surface and filled surface imperfections are not reasonably noticeable when viewed from 10 feet away under lighting conditions that will be present after construction.
- B. Substrate Cleaning: Remove dirt, dust, rust, debris, oil, grease, curing agents, bond breakers, paint, coatings, and other surface contaminants which could adversely affect installation of floor finish system.

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1. Remove dirt, stains, measurement markings, oversprayed materials, tread marks and footprints that would remain visible in final Work.
 2. Verify that floor and joints are dry and free of debris and excessive dirt, dust, clay, sand and gravel
- C. Adjacent Surfaces: Protect adjacent surfaces as required to prevent damage by finishing procedures.

3.3 SEALER APPLICATION

- A. Apply concrete sealer in accordance with Manufacturer's requirements.

3.4 CHEMICAL STAIN AND SEALER APPLICATION

- A. Concrete surfaces shall be dry and properly prepared as described above. Protect surrounding areas from over-spray, run-off and tracking. If applicable, divide surfaces into small work sections using wall, joint lines, or other stationary breaks as natural stopping points.
- B. Stain Application: Apply chemical stains full strength (undiluted) at the coverage rate recommended by the manufacturer and use application equipment described in the manufacturer's printed technical literature.
1. Transfer chemical stain to the substrate by brush or spray and immediately scrub into surface.
 2. When multiple coats of one or more colors are required, washing and drying between colors.
 3. After the final coat of chemical stain has remained on the surface for a minimum of four hours, remove all residue by wet scrubbing with commercial grade detergent. Rinse surfaces after scrubbing until rinse water is completely clean. Protect adjacent areas from rinse run-off.
- C. Sealer Application:
1. Concrete substrate shall be completely dry.
 2. Test surface for proper PH level prior to applying sealer.
 3. Apply sealer according to manufacturer's written instructions at a rate of 300 to 500 square feet per gallon per coat.
 4. Maintain a wet edge at all times.
 5. Allow sealer to completely dry before applying additional coats.
 6. Apply second coat of sealer at 90 degrees to the direction of the first coat using the same application method and rates.
 7. Seal horizontal joints in areas subject to pedestrian or vehicular traffic.

3.5 JOINT TREATMENT

- A. Fill construction joints and cracks with filler products as specified in accordance with manufacturer's instructions colored to match with concrete color as specified by architect.
- B. Scoring: Score decorative jointing in concrete surfaces 1/16 inch deep with diamond blades to match pattern indicated. Rinse until water is clear.
1. Joint Width: As selected by Architect.

3.6 INSTALLED WORK

- A. Repair: Repair damaged areas of completed concrete floor system to satisfaction of Architect.
- B. Clean: Immediately remove mortar splatter, spilled liquids, oil, grease, paint, coatings, and other surface contaminants which could adversely affect completed concrete floor system.
- C. Slab Protection: Protect areas to receive concrete finish at all times during construction; prior to, during, and after procedures. Prevent oils, dirt, metal, excessive water and other potentially damaging materials from affecting the finished concrete surface.

END OF SECTION

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SECTION 092200 NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Non-structural metal framing systems for interior assemblies, including:
 - 1. Interior partitions.
 - 2. Interior suspended ceiling and soffit systems.
 - 3. Shaft wall systems.

1.2 COORDINATION

- A. Preinstallation Conference: Convene a pre-installation meeting at the beginning of the project to review acoustically-rated construction requirements and to coordinate penetrations.
 - 1. Architect, Contractor, Owner's representative and each trade that may need to penetrate acoustically rated construction or will be involved in construction of acoustically rated partitions and related systems must attend.
 - 2. Review layouts and routing for potential penetrating items, discuss reducing or eliminating penetrating items by considering alternate routing, review construction requirements, details and specifications for acoustically rated construction.
 - 3. A follow-up meeting should be scheduled as needed.
 - 4. This meeting can occur in conjunction with a regular construction progress meeting.
 - 5. Publish meeting minutes highlighting topics discussed, actions items and decision made.

1.3 ACTION SUBMITTALS

- A. Product Data: For each product, including installation accessories. Include the following for metal framing submittals:
 - 1. Submit statement indicating that metal stud manufacturer has reviewed Project documents and that framing supplied conforms to specified requirements.
 - 2. Submit list of completed projects of similar project type and similar wall loading where specific product recommended has been used.
 - 3. Submit material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - 4. Evaluation Reports: ICC-ES reports for metal studs and tracks, indicating compliance with specified requirements and building code in effect.
- B. Shop Drawings:
 - 1. Indicate on plans and elevations the locations of all metal backing.
 - a. Construction details, sizes of metal sections, thickness of metals, attachments and dimensions.
 - b. Welding: Indicate welded connections, both shop and field, using standard AWS welding symbols. Indicate net weld lengths.
- C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

1.4 INFORMATIONAL SUBMITTALS

- A. Shop Drawings: Indicating light gauge framing system. Indicate by plan and elevation, stud framing (spacing, sizes, thicknesses and types), openings, bracing and blocking, fastening and anchorage, strapping, bridging, connection details and reinforcement.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Design framing systems in accordance with American Iron and Steel Institute *AISI Standard S220-11 North American Specification for the Design of Cold-Formed Steel Framing - NonStructural Members*, except as otherwise shown or specified.
- B. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing metal framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- D. Shaft Wall Assemblies: Provide stud shaft wall system designed and tested by manufacturer to withstand lateral loading (air pressure) of 10 lbs per sq ft for maximum wall height required, and with deflection limited to 1/240 of partition height. Refer to Section 092900 - Gypsum Board for shaft wall construction.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
 - 1. Provide framing type, weight, grade and finish of materials in accordance with Manufacturer's recommendations, except where otherwise required by governing regulations and applicable standards.
 - 2. Provide clips, fasteners, ties, reinforcing, flat strap and backing plates, stiffeners, shoes, tracks, hangers, brackets, anchors, accessories, and trim as recommended by Manufacturer for application indicated.
 - 3. Steel Sheet Components: ASTM C 645, fabricated of steel meeting requirements of ASTM A1003.
 - 4. Protective Coating (Minimum): ASTM A653, G40 hot-dip galvanized zinc coating or coating with G40 equivalent corrosion resistance.
 - 5. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. (MET STUD-1) Metal Studs and Runners: ASTM C645, and meeting or exceeding flexural strength, allowable bending moment, and screw pull-out of a standard 33 mil thick stud.
- C. (MET STUD-2) Shaft Wall Metal Studs: ASTM C645, steel C-H, C-T or I studs hot-dipped galvanized.
- D. Double-Runners: ASTM C645 slip-type head joint; inside runner with 2-inch-deep flanges, and outer runner sized to friction fit inside runner.
- E. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- F. Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- G. Furring and Bracing Members: Provide members with protective galvanized coating, in depths as indicated.
 - 1. (MET FURG-1) Hat-Shaped, Rigid Furring Channels: ASTM C645; with minimum base-metal thickness of 0.033 inch
 - 2. (MET FURG-2) Z-Shaped Furring: With slotted or nonslotted web; with minimum base-metal thickness of 0.027 inch.
- H. Galvanized Flat Strap and Backing Plate at Interior Stud Walls: Steel sheet for blocking and bracing in length and width indicated.

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1. Minimum Base-Metal Thicknesses:
 - a. Typical: 0.054 inch.
 - b. For Heavy Equipment and Grab Bar Locations: 0.068 inch.
 2. Where Wood Backing and Blocking is Indicated: Refer to Section 061000 for wood requirements. Provide fire-resistant treatment.

2.3 SUSPENSION SYSTEMS

- A. General: Comply with ASTM C754 for conditions indicated.
- B. Metal Studs and Furring Channels: As specified above.
- C. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.0625 inch diameter wire, or double strand of 0.0475 inch diameter wire.
- D. Hanger Attachment to Anchors in Concrete: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E488 by a qualified independent testing agency.
 1. Cast-in-place anchor, designed for attachment to concrete forms.
 2. Postinstalled, chemical anchor.
 3. Postinstalled, expansion anchor.
- E. Wire Hangers: ASTM A641, Class 1 zinc coating, soft temper, 0.162 inch diameter.
- F. Rod Hangers: ASTM A510, mild carbon steel; ASTM A153, hot-dip galvanized; 0.25 inch diameter.
- G. Manufactured Suspension Grid System for Ceilings and Soffits: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 1. Products and Manufacturers:
 - a. Drywall Grid Systems by Armstrong World Industries, Inc..
 - b. Drywall Grid Systems by Chicago Metallic Corporation.
 - c. Drywall Suspension System by USG Corporation.

2.4 AUXILIARY MATERIALS

- A. Fasteners: Galvanized steel fasteners of type, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates; and of length suitable for adequate penetration of substrate
- B. Isolation Strip: Provide one of the following:
 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.
- C. Acoustic Sealant: In accordance with Section 092900 - Gypsum Board.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials on Steel:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standards: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
 - 2. **Portland Cement Plaster** Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
 - 3. **Gypsum Plaster** Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
 - 4. **Gypsum Veneer Plaster** Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Install bracing at terminations in assemblies.
- C. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
- D. Sound and Vibration Control Components (SVC): Install in accordance with manufacturer's instructions and as specified in Section 134833.
- E. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch from plane formed by faces of adjacent framing.

3.4 FRAMING INSTALLATION

- A. Framing Installation, General:
 - 1. Partition Heights: Extend partition stud system through suspended ceilings to structural support above, except where indicated to terminate at ceiling.
 - a. Provide additional bracing for partitions extending above ceiling where indicated.
 - b. Continue framing around ducts penetrating partitions above ceiling.
 - 2. Coordinate erection of studs with installation of service utilities. Align stud web openings. Coordinate installation of bucks, anchors, blocking, electrical and mechanical work which is to be placed in or behind partition framing. Allow such items to be installed after framing is complete.
 - 3. Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned joints to attain lateral support and avoid axial loading.

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4. Reinforce stud partitions and provide additional metal studs as indicated and required for installation of wall cabinets, wall mounted equipment, wall mounted mechanical and electrical fixtures, accessories, shelves and shelf standards. Provide thick steel plate to span minimum of 3 studs for installation of mirrors, toilet accessories or grab bars.
 5. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 6. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated on Drawings. Do not fasten or bridge inner and outer tracks at nested track construction. Verify that tracks are free of all bridging elements.
- B. Runners and Tracks: Secure runner tracks to floor and ceiling construction, and to structure above ceilings as recommended by manufacturer, with fastener spacing not to exceed 24 inches o.c.
1. Runner Tracks: Provide continuous track sized to match studs. Align runner tracks accurately to partition layout at both floor and ceiling. Provide fasteners at corners and ends of runner tracks.
 2. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 3. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 4. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
- C. Metal Studs: Install studs vertically at 16 inches o.c., unless otherwise indicated, and not more than 2 inches from abutting construction, each side of openings, and at corners.
1. Install metal studs in floor and ceiling runner tracks. Secure studs to runners. Anchor light gauge screw-type partition studs to runner tracks by screwing opposite flanges top and bottom, except screw end studs to both tracks at both flanges.
 2. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
 3. Provide additional studs at exterior corners and 2 inches from inside corners, terminations of partitions, and both sides of control joints.
 4. Where partitions abut other construction, provide vertical runner track securely attached to construction.
 5. Use full length studs between runner tracks.
 6. Stud Splicing: Not permitted.
- D. Door Openings:
1. Frame door openings with vertical studs attached to each jamb of door frame.
 2. Provide additional studs 2 inches from jamb studs.
 3. Frame head of door with horizontal section of runner track attached to jamb studs and provide vertical studs cut to fit between head and ceiling tracks and attach to tracks.
 4. Provide 3/4 inch cold-rolled steel channel stiffener at 6 inches above door head extending at least 2 stud spaces beyond jamb studs, and attach to studs.
 5. Fit runners under and above openings, secure intermediate studs at spacing of wall studs. Brace stud framing system and make rigid.
- E. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- F. Wall Furring Installation:
1. Erect wall furring directly attached to concrete block and concrete walls.
 2. Erect furring channels horizontally or vertically as indicated. Secure in place on alternate channel flanges at maximum 24 inches on center.
 3. Space furring channels maximum 24 inches on center, not more than 4 inches from floor and ceiling lines or abutting walls.
 4. Erect freestanding metal stud framing by means of adjustable furring brackets in accordance with manufacturer's directions.

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5. Splicing Members: Lap furring members 8 inches and runner channels 12 inches and wire-tie near each end of lap.

3.5 SHAFT WALL INSTALLATION

- A. Shaft Wall Installation, General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.
 1. Anchor components to comply with ratings and performance requirements, and with governing regulations.
 2. Isolate shaft system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
 3. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.
- B. Supplementary Framing: Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
- C. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
- D. Sprayed Fire-Resistive Materials: Coordinate gypsum board shaft system work with sprayed-on fireproofing of structure, so that both remain complete and undamaged. Patch or replace sprayed-on fireproofing removed or damaged during installation of shaft framing system.

3.6 SUSPENSION SYSTEM INSTALLATION

- A. Suspended Assemblies, General: ASTM C 754.
 1. Install ceiling framing independent of walls, columns, and above ceiling work.
 2. Do not bridge building expansion joints with support system.
 3. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet measured lengthwise on each member transversely between parallel members.
- B. Hangers: Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 1. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - a. Space hanger wires 48 inches o.c. along carrying channels and within 6 inches of ends of channel run. Anchor hanger wires to supporting structure. Do not attach hangers to metal deck tabs.
 2. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 3. Coordinate location of hangers with other work.
 - a. Do not attach hangers to steel roof deck.
 - b. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - c. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - d. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- C. Carrying Channels: Position channels at proper height and level, and secure with hanger wires.

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1. Space main carrying channels at maximum 48 inches on center, not more than 6 inches from perimeter walls.
 2. Lap splices minimum 12 inches and secure together 2 inches from each end of splice. Provide clearance between channels and abutting walls or partitions.
- D. Furring Channels: Comply with Gypsum Association GA-203.
1. Place furring channels perpendicular to carrying channels at 16 inches on center not more than 6 inches from perimeter walls.
 2. Lap splices minimum 8 inches and secure together one inch from each end of splice.
 3. Provide clearance between furring and abutting walls or partitions. Secure furring to carrying channels with clips.
 4. Frame both sides of joints with furring and other supports.
 5. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Lateral Bracing: Laterally brace entire suspension system where required. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.
- F. Manufactured Suspension Grid Systems: Install in accordance with Manufacturer's instructions.
1. Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces.
 2. Install main beams and cross tees at the on center spacing required for ceiling loading, and location of in-ceiling services.
 3. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
 4. Provide additional bracing as required by code.

END OF SECTION

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SECTION 092900 GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board (GYP BD).
 - 2. Acoustic insulation (INSUL-40) and sealant.
 - 3. Gypsum assembly accessories (GYPA).

1.2 DEFINITIONS

- A. Gypsum Board Terminology: Refer to ASTM C11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Convene a pre-installation meeting at the beginning of the project to review acoustically rated construction requirements and to coordinate penetrations.
 - 1. Architect, Contractor, Owner's representative and each trade that may need to penetrate acoustically rated construction or will be involved in construction of acoustically rated partitions and related systems must attend.
 - 2. Review layouts and routing for potential penetrating items, discuss reducing or eliminating penetrating items by considering alternate routing, review construction requirements, details and specifications for acoustically rated construction.
 - 3. A follow-up meeting should be scheduled as needed.
 - 4. This meeting can occur in conjunction with a regular construction progress meeting.
 - 5. Publish meeting minutes highlighting topics discussed, actions items and decision made.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For accessories exposed to view in final installation.
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation scheduled to receive Level 5 Finish, install panel mockup, 48 inches wide by 96 inches tall, demonstrating at least 2 vertical and 2 horizontal joints, for Architects review of aesthetic effects workmanship.
 - 1. Apply or install final finish indicated, including painting, on exposed surfaces for review of mockups.
 - 2. Simulate finished lighting conditions for review of mockups.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage.
 - 1. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum board.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
 - 1. Cold Weather Protection: When ambient outdoor temperatures are below 55 degrees F maintain continuous, uniform, comfortable building working temperatures of not less than 55 degrees F for minimum period of 48 hours prior to, during and following application of gypsum board and joint treatment materials or bonding of adhesives.
 - 2. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.
- C. Damaged Materials: Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory." GA-600, "Fire Resistance Design Manual."
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
 - 1. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."
- C. Shaft Wall Assemblies: Provide gypsum board shaft wall system design and tested by manufacturer to withstand lateral loading (air pressure) of 10 lbs per sq ft for maximum wall height required, and with deflection limited to 1/240.
 - 1. Refer to Section 092200 - Non-Structural Metal Framing for shaft wall studs.

2.2 GYPSUM PANEL PRODUCTS

- A. Manufacturers:
 - 1. United States Gypsum.
 - 2. National Gypsum Company.
 - 3. Georgia-Pacific.
 - 4. CertainTeed Corporation.
 - 5. Temple-Inland.
- B. Gypsum Board Products, General: In accordance with ASTM C 1396, and other specified requirements, and as follows:
 - 1. Provide products that do not contain asbestos.
 - 2. Provide products in accordance with recommendations of GA 216 - Application and Finishing of Gypsum Panel Products.
 - 3. Provide products in maximum lengths and widths available to minimize joints and to correspond with support system indicated.

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- C. (GYP BD-1) Fire-Rated Board: Type X, 5/8 inch thick.
 - D. (GYP BD-2) Moisture- and Mold-Resistant Board, Type X: With moisture- and mold-resistant paper surfaces and core. Provide mold and water-resistant gypsum board as required by local building code and as indicated
 - 1. Thickness: 5/8 inch.
 - 2. Mold Resistance: ASTM D 3273, score of 10.
 - 3. Products and Manufacturers:
 - a. ProRoc M2Tech by CertainTeed.
 - b. ToughRock Mold-Guard by Georgia-Pacific.
 - c. Sheetrock Mold Tough Firecode by United States Gypsum (USG).
 - E. (GYP BD-21) Gypsum Shaft Liner: One inch thick shaft wall liner panel with moisture resistant paper facing. Square edges designed for installation into I, C-H, E, or H metal studs.
 - 1. Acceptable Manufacturer, Paper Faced: ASTM C1396.
 - a. United States Gypsum Company: SHEETROCK Brand Gypsum Liner Panels.
 - b. National Gypsum Company: Gold Bond Brand Fire-Shield Shaftliner.
 - c. G-P Gypsum Corp.: ToughRock Shaftliner.
 - 2. Acceptable Manufacturer, Moisture and Mold Resistant Paper Faced, ASTM D3273 score of 10:
 - a. United States Gypsum Company: SHEETROCK Brand Mold Tough Gypsum Liner Panels.
 - b. National Gypsum Company: Gold Bond Brand Fire-Shield Shaftliner XP.
 - c. CertainTeed Corp.: M2Tech Shaftliner Type X.
 - 3. Acceptable Manufacturer, Glass Mat Faced, ASTM C1658:
 - a. CertainTeed Corp.: GlasRock Shaftliner Type X.
 - b. G-P Gypsum Co.: DensGlass Shaftliner.
 - c. National Gypsum Company: eXP Shaftliner.
 - d. United States Gypsum Company: SHEETROCK Brand Glass-Mat Liner Panels.
 - F. (GYP BD-38) Abuse-Resistant Mold-Resistant Board: ASTM C1396, ASTM D3272 score of 10 and ASTM C1629 for abuse resistance, manufactured to produce greater resistance to surface abrasion and indentation than standard gypsum panels.
 - 1. Products:
 - a. National Gypsum Company; Gold Bond Brand Hi-Abuse XP Gypsum Board.
 - b. United States Gypsum Co.; SHEETROCK Brand Mold Tough Abuse-Resistant Firecode X Panels.
 - c. CertainTeed Corp.: AirRenew Extreme Abuse Gypsum Board.
 - 2. ASTM C1629: Surface Abrasion Level 3, Indentation Level 1, Soft Body Impact Level 2.
 - 3. Core: 5/8 inch, Type X.
 - 4. Long Edges: Tapered.

2.3 TILE BACKER BOARDS

- A. General: Provide mold- and water-resistant tile backer boards specified.
 - 1. Mold Resistance Requirement: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 - 2. Provide cementitious tile backer boards for tile installation at showers and other high-moisture areas, and as indicated on Drawings.
 - 3. Contractor's Option: Provide water-resistant gypsum backing boards in lieu of cementitious backer boards for applications other than showers or high-moisture areas, and as submitted to and accepted by Architect.
- B. (GYP BD-25) Fire-Rated, Glass-Fiber-Faced, Water-Resistant Gypsum Board: ASTM C1178, fire-rated mold- and water-resistant gypsum wallboard, with coated glass-fiber mat at both faces and at long edges, with moisture retarding acrylic coating on one face.
 - 1. Core: 5/8 inch thick, Type X.
 - 2. Edges: Square.
 - 3. Manufacturers and Products:
 - a. DensShield Fireguard Type X Tile Backer Board by G-P Gypsum Corporation.

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- b. GlasRoc Diamondback Tile Backer Type X Board by CertainTeed Corporation.
 - c. eXP Tile Backer Fire-Shield Type X by National Gypsum Company
 - d. Durock Glass-Mat Tile Backerboard Type X by United States Gypsum Corp.

C. Tile Backer Board Accessories:

- 1. Fasteners: As recommended by backer board manufacturer.
- 2. Tile-Setting Mortar for Joint Treatment: As specified with Section 093000 - Tiling.
- 3. Joint Tape: Alkali-resistant fiberglass mesh tape, 2-inches wide, or as recommended by backer board manufacturer.
- 4. Sealants: As specified in Section 079200 - Joint Sealants.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Corner Trim, Edge Trim, Inside Corner Trim for Abuse Resistant Gypsum Board:

- 1. Provide fully bonded paper faced and joint tape backed copolymer tapered plastic trim at abuse resistant gypsum board.
- 2. Provide corner trim as recommended by manufacturer for each condition.
- 3. Manufacturer: Drywall Systems International No-Coat.

C. Joint Tape:

- 1. Interior Gypsum Wallboard: Paper.
- 2. Tile Backing Panels: As recommended by panel manufacturer.

D. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

- 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
- 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
- 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
- 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
- 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound, or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat compound to produce Level 5 finish.

2.5 ACCESSORIES

A. General: Provide auxiliary materials and accessories that comply with referenced installation standards and manufacturer's written instructions.

B. Trim Accessories: ASTM C 1047; galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet; in the following shapes as required:

- 1. Cornerbead.
- 2. Bullnose bead.
- 3. LC-Bead: J-shaped; exposed long flange receives joint compound.
- 4. L-Bead: L-shaped; exposed long flange receives joint compound.
- 5. U-Bead: J-shaped; exposed short flange does not receive joint compound.
- 6. Expansion (control) joint.
- 7. Curved-Edge Cornerbead: With notched or flexible flanges.

C. Fasteners and Anchorages: GA 216, type and size as recommended by board manufacturer.

D. Fasteners: Use self-tapping or appropriate threaded fastener, compatible with all materials fasteners will contact with and not causing galvanic corrosion.

E. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

- 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

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2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- F. Laminating Adhesive: Joint compound or adhesive as recommended by gypsum board manufacturer for laminating gypsum board face layer to gypsum board base layer.
1. Approved Product for Use at Noise Critical Spaces: Green Glue by Certainteed.
- G. Joint Sealant (Non-Acoustic): As specified in Section 079200 - Joint Sealants.

2.6 ACOUSTICAL INSULATION

- A. Acoustic Insulation, General:
1. Insulation is required to be formaldehyde-free or GreenGuard Indoor Air Quality Certified.
 2. Flamespread: Maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- B. (INSUL-40) Glass-Fiber Acoustic Insulation: ASTM C 665, Type I; unfaced fiberglass batts or blankets, free of formaldehyde and GreenGuard Indoor Air Quality Certified.
1. Basis of Design:
 - a. CertainTeed; NoiseReducer (FF)
 - b. Johns Manville: Formaldehyde-Free and Unfaced Sound Control Batts.

2.7 ACOUSTICAL SEALANT

- A. (SLNT) Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.
1. Provide permanently resilient, non-hardening, non-bleeding silicone or polyurethane caulking material. Use polyurethanes for joints that will be painted and silicone or polyurethane for unpainted joints. Do not use latex, siliconized latex, or siliconized acrylic sealants for acoustic purposes, unless the product is specifically listed below.
 2. Product Requirements:
 - a. Elongation: 100 percent, minimum.
 - b. Shore "A" Hardness: 45, maximum.
 - c. Movement Capability: 30% or higher.
 - d. Class: 35 or higher per ASTM C920.
- B. Acoustical Sealant for Exposed Joints: Manufacturer's standard nonsag, non-hardening, non-skinning, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
- C. Acoustical Sealant for Concealed Joints: Manufacturer's standard nonsag, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber acoustical sealant.

2.8 ARCHITECTURAL TRIM

- A. (GYPA) Extruded Aluminum Profile Trim, Reveals, and Moldings: Alloy 6063-T5, ASTM B 221.
1. Basis of Design: As indicated on Material Identification List.
 2. Finish: Prefinished or field-painted as indicated on Material Identification List.
- B. Manufacturers of Decorative Trim: Provide specified products or equivalent products by one of the following:
1. Gordon Incorporated.
 2. Fry Reglet Corporation.
 3. Pittcon Industries.

PART 3 - EXECUTION

3.1 GYPSUM BOARD INSTALLATION

- A. Install and finish gypsum board and accessories in accordance with manufacturer's printed instructions and comply with recommendations of GA 216 and ASTM C840, including appendixes. Verify control joint locations at walls and ceilings with Architect.
- B. Minimize butt joints by using gypsum board of maximum length possible. If cut butt joints are unavoidable, locate end butt joints as far from center of walls or ceilings as possible and stagger not less than 12 inches in alternate courses of board.
- C. Do not install imperfect, damaged, damp or wet gypsum board.
- D. Abut boards together for light contact at edges or ends with not more than 1/16 inch open space between boards. Do not force into place.
- E. Locate edges and joints over supports or back-blocking except in horizontal applications. Position gypsum board so that both tapered edge joints and cut edges abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partition/walls.
 - 1. Form curved surfaces by carefully bending and fastening board to smooth even curve, free of flat or distorted areas and other imperfections. Comply with manufacturer's instructions for dampening of sheets or scoring of back face, if required to form to radius shown.
 - 2. Hold gypsum board 1/4 inch above floor at each type of partition.
- F. Install solid and semisolid drywall partitions made-up of coreboard or gypsum board studs with face courses of exposed gypsum board, laminated with both adhesive and screws.
- G. Isolate gypsum surfaces with control joints or other stress relief where:
 - 1. Partition or furring abuts structural element (except floor) or dissimilar wall or ceiling.
 - 2. Ceiling abuts structural element, dissimilar wall or partition or other vertical penetration.
 - 3. Construction changes within plane of partition or ceiling.
 - 4. Partition or furring run exceeds 30 feet.
 - 5. Ceiling dimensions exceed 30 feet in either direction.
 - 6. Wings of "L", "U" and "T" shaped ceiling areas are joined.
 - 7. Expansion joints occur in exterior wall if expansion joints are not used.
 - 8. Where control joint is near a door opening, locate and align control joint with edge of door frame.
 - a. Ceiling height door frames may be used as control joints.
 - b. Where door frames are less than ceiling height, extend control joints to ceiling from both corners
 - 9. Review location of joints with Architect.
- H. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- I. Provide perimeter isolation where non-load-bearing partitions abut structural decks or ceilings, or vertical structural elements. Allow not less than 1/4 inch, or more than 1/2 inch gap between gypsum and structure. Finish edges of face layer with casing bead. Seal space between casing bead and structure with continuous acoustical sealant bead. Do not attach board directly to tracks.

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- J. Cutting, Fitting and Trimming: Accurately measure and precut gypsum drywall units prior to installation. Make cuts from face side by scoring and snapping away from face side or by sawing. Completely cut paper on back face; do not break paper by tearing. Maintain close tolerances for accurate fit at joints between sheets and at framed openings, and allow for covering of edges of cut-outs with plates and escutcheons. Cut edges smooth as required for neat and accurate fit.
 - K. Begin fastening from center portion of sheet and work toward edges and ends. Ensure contact of drywall with supports by applying pressure on surface adjacent to fastener being driven. Do not locate fasteners closer than 3/8 inch from edges or ends of sheets. Drive with shank approximately perpendicular to drywall surface.
 - L. Drive screws with power screwdriver recommended by drywall manufacturer. Do not hammer drive screws. Set screw heads slightly below surface of drywall, but do not break or strip paper face around screw. Stagger screws on edges and ends of adjacent sheets.
 - M. For fire-rated Walls: Fasten to metal framing and furring with screws. Comply with drywall manufacturer's instructions and UL requirements for fastening, but do not exceed 8 inches on center at perimeter and 12 inches on center spacing at the field. Space fasteners not less than 1/4 inch from edges and ends of gypsum drywall.
 - 1. For Non-rated Walls: Fasten perimeter and field at 12 inches on center.
 - 2. For multilayer fire-rated walls: Comply with UL requirements.
 - 3. For Acoustical Walls: Comply with fire-rated wall UL requirements.
 - N. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - 1. Z-Furring Members: Apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 - O. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.2 ACOUSTICALLY RATED PARTITIONS

- A. Where acoustically rated partitions are shown, provide complete air tight, acoustical rated assembly meeting or exceeding requirements of Sound Transmission Class (STC) ratings per manufacturer's requirements and GA 600 for sound control requirements.
- B. Do not penetrate acoustically rated partitions without authorization from Architect.
- C. Stagger joints between layers of gypsum board and install gypsum board to be continuous between adjacent rooms.
- D. Fit gypsum board tightly around structural elements.
- E. Install continuous acoustical sealant at:
 - 1. Entire perimeter of wall on each side of top, bottom and side of walls.
 - 2. Intersection at change of plane and change of material.
 - 3. Gaps between service outlets and gypsum board
 - 4. Each penetration.
 - 5. Structural elements.
 - 6. All penetrations of partition, wall, and floor construction by ductwork, conduit, piping, or structure.
 - 7. All termination of partitions enclosing Noise Critical Spaces to abutting construction (e.g. partitions, structure, etc.)
 - 8. Both sides of door frames to abutting construction where doors are scheduled to have acoustical seals.
 - 9. Both sides of window frames to adjacent construction.

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- 10. Perimeter of and penetrations through sound isolating ceilings, roof systems, and floor systems.
 - F. Seal entire back of service boxes.
 - G. Seal gaps around penetrations as follows:
 - 1. One inch or less gap filled tightly with batt insulation and apply sealant.
 - 2. One inch or greater gap fill with acoustical insulation and moldable putty.
 - H. Acoustical Sealant Installation: Provide acoustical sealant at the following locations:
 - 1. At penetrations of partition, wall, and floor construction by ductwork, conduit, piping, or structure.
 - 2. At termination of partitions enclosing Noise Critical Spaces to abutting construction (e.g. partitions, structure, etc.)
 - 3. At both sides of door frames to abutting construction where doors are scheduled to have acoustical seals.
 - 4. At both sides of window frames to adjacent construction
 - 5. At perimeter of and penetrations through sound isolating ceilings, roof systems, and floor systems.
 - 6. Provide backer rod at all acoustical sealant joints..

3.3 INSTALLATION OF TILE BACKER BOARD

- A. Comply with manufacturer's written instructions for installation and finishing.
 - 1. Cementitious Backer Boards: ANSI A108.11.
 - 2. Install backerboard, leaving a 1/8-inch to 3/16-inch gap at all joints and corners. Stagger board joints with those of adjacent rows.
 - 3. Fasten backerboard every 8-inches o.c. along framing members.
 - 4. Fill gaps solid with latex Portland cement mortar and embed 2-inch alkali resistant fiberglass tape.
- B. Tape joints in backer board as recommended by board manufacturer. Seal ends, cut-edges and penetrations of each piece with tile setting mortar or water-resistant adhesive, and then immediately imbed tape and level joints.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.
- D. Installation Tolerances: Board faces shall not vary from plane greater than 1/8-inch in 10 feet.
- E. Comply with backer board manufacturer's written instructions for installation and finishing, and as specified herein.
 - 1. Coordinate with Section 079200 - Joint Sealants and Section 093000 - Tiling.
 - 2. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.
- F. Cementitious Tile Backer Boards: Install in accordance with ANSI A108.11.
 - 1. Stagger board joints with those of adjacent rows.
 - 2. Place panels with 1/8-inch to 3/16-inch gap at all joints and corners.
 - 3. Drive nails or screws flush with surface. Do not countersink fasteners.
 - 4. Do not use drywall nails or screws. Do not use drywall joint tape or joint compound.
 - 5. Apply sealant to penetrations around pipes and fixtures.
 - 6. Grout solid all gaps with tile-setting mortar.
 - 7. Treat joints and corners with alkali-resistant mesh tape, embedded in skim coat of tile-setting mortar.
- G. Glass-Fiber-Faced Water-Resistant Gypsum Tile Backing Boards: Install in accordance with ASTM C840.
 - 1. Do not use water-resistant gypsum backing boards at showers or other high-moisture installations, or at exterior installations.
 - 2. Stagger board joints with those of adjacent rows.

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3. Drive nails or screws flush with surface. Do not countersink fasteners.
 4. Apply sealant to all cut edges of board and all fastener penetrations.
 5. Apply sealant to penetrations around pipes and fixtures.
 6. Grout solid all gaps with tile-setting mortar.
 7. Treat joints and corners with alkali-resistant mesh tape, embedded in skim coat of tile-setting mortar.

3.4 ACCESSORIES INSTALLATION

- A. Acoustical Insulation: Install blankets in accordance with manufacturer's printed instructions, with tight joints in blanket units. Use tape, adhesive or staples to hold blankets in place.
 1. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions and tight to items passing through partitions.
- B. Drywall Sealant: Seal perimeter of sound-rated partitions by filling open space between drywall and floor or ceiling construction with continuous bead of sealant. Fill open spaces between drywall and fixtures, cabinets and other flush or penetrating items with continuous bead of sealant. Seal sides and back of electrical boxes to completely close up openings and joints. Seal perimeter of wallboard shaft wall where it abuts other work.
 1. Apply joint sealant in accordance with Section 079200 - Joint Sealants.
- C. Adhesive Application: Use adhesive recommended by manufacturer for type of substrate indicated. Prepare substrate and laminate wallboard in accordance with manufacturer's printed instructions. Provide temporary fasteners or bracing as recommended until adhesive sets.
- D. Reinforce external corners of drywall with metal corner bead. Securely fasten metal corner beads, edge trim casing beads and control joints.

3.5 SHAFT WALL INSTALLATION

- A. Anchor and fasten materials and components to comply with ratings and performance requirements, and to comply with governing regulations.
- B. Coordinate gypsum board shaft system work with sprayed-on fireproofing of structure, so that both remain complete and undamaged. Patch or replace sprayed-on fireproofing removed or damaged during installation of shaft system.
- C. Seal perimeter of each section of gypsum board shaft work where it abuts other work. Install second bead of acoustical sealant in location and manner which will prevent dislocation by air pressure differential between shaft and external spaces. Seal joints and penetrations in work; comply with manufacturer's instructions.
- D. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.
- E. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.
- F. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
 1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
 2. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with **[0.033-inch]** <Insert dimension> minimum thickness of base metal (uncoated), accurately positioned and secured behind at least one layer of face panel.

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- G. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.
 - H. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.
 - I. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - J. Control Joints: Install control joints **[at locations indicated on Drawings] [according to ASTM C 840 and in specific locations approved by Architect]** while maintaining fire-resistance rating of gypsum board shaft wall assemblies.
 - K. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.
 - L. Cant Panels: At projections into shaft **[exceeding 4 inches] [where indicated]**, install 1/2- or 5/8-inch- thick gypsum board cants covering tops of projections.
 - 1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft wall framing.
 - 2. Where steel framing is required to support gypsum board cants, install framing at 24 inches o.c. and extend studs from the projection to shaft wall framing.
 - M. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.6 FINISHING

- A. Finish exposed drywall surfaces with joints, corners and exposed edges reinforced or trimmed and with joints, fastener heads, trim accessory flanges and surface defects filled with joint compound in accordance with drywall manufacturer's recommendations for smooth, flush surface. Form true, level or plumb lines, without joints, fastener heads, flanges of trim accessories or defects visible after application of field-applied decoration. Exposed metal trim (not filled) will not be acceptable.
- B. Use joint tape to reinforce joints formed by tapered edges or butt ends of drywall units and at interior corners and angles. Set tape in joint compound and apply skim coat over tape in one application. Do not use topping or finishing compounds for setting of tapes.
- C. Apply joint compound to joint. Apply joint compound to fill holes left from removal of screws at intermediate studs. Finish gypsum drywall thereafter, including sanding of final coat, in accordance with ASTM C840.
- D. Where open spaces of more than 1/16 inch width occur between abutting drywall units, except at control joints, prefill joints with joint compound and allow prefill to dry before application of joint tape.
- E. Finish Levels of Joints in Interior Gypsum Board Work:
 - 1. Level 0: No taping, finishing, or accessories required.
 - a. Use above suspended ceilings and within other concealed spaces, unless assembly is fire rated, sound rated, sound or smoke controlled, or unless space serves as air plenum.
 - 2. Level 1: At joints and interior angles embed tape in joint compound. Leave surface free of excess joint compound. Tool marks and ridges are acceptable.
 - 3. Level 2: At joints and interior angles embed tape in joint compound with one separate coat of joint compound applied over joints, angles, fastener heads, and accessories.
 - a. Use for mold and water resistant gypsum board indicated for use as a substrate for ceramic tile.
 - b. Use for gypsum board indicated for use as a substrate for wood paneling or acoustical panels.
 - c. Use above suspended ceilings and within other concealed spaces if gypsum board assembly is fire rated, sound rated, sound or smoke controlled, or space serves as air plenum.

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4. Level 3: At joints and interior angles embed tape in joint compound with 2 separate coats of joint compound applied over joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges.
 - a. Use where heavy grade wall covering is final decoration.
 - b. Use where gypsum board is base for acoustical ceiling tile.
 5. Level 4: At joints and interior angles embed tape in joint compound with 3 separate coats of joint compound applied over joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges.
 - a. Use for all locations, except those indicated for other finish levels.
 6. Level 5: At joints and interior angles embed tape in joint compound with 3 separate coats of joint compound applied over joints, angles, fastener heads, and accessories. Apply thin skim coat, as specified in Joint Treatment Materials Article above, to entire surface. Leave surface smooth and free of tool marks and ridges.
 - a. Use where semi-gloss or gloss finish coatings are final decoration.
 - b. Use for 2 story walls with direct natural day lighting (Lobbies, Entries, Rooms with large day lighting and long walls perpendicular to windows).
 - c. Use at ceilings in Lobbies, assembly areas with direct natural day lighting.
 - d. Use where skim coat finish is indicated.
 - e. On surfaces scheduled to receive wall coverings.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.
- G. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 2. Before notifying Architect, verify installation of mechanical, electrical and other facility services work and Installation of ceiling support framing in areas to receive gypsum board ceilings.

3.8 INSTALLED WORK

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

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SECTION 093000 TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ceramic tile.
 - 2. Setting Materials.
 - 3. Waterproofing and Crack Isolation Membrane
 - 4. Tiling Accessories.
 - 5. Installation Procedures.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product specified.
- B. Shop Drawings: Indicate tile patterns and accessory locations; width and locations of control, isolation, contraction and expansion joints in tile surface.
- C. Samples: For color selection and appearance acceptance.
 - 1. Full-size units of each type and size of tile and for each color and finish.
 - 2. Grout color samples.
 - 3. Full-size units of each type of ceramic tile accessory (CTA). Provide linear trim and profiles, 6 inches long.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: For each tile-setting and -grouting products.

1.4 CLOSEOUT SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage installer who has minimum 5 years' experience and who has completed tile installations similar in material, design, and extent to that indicated for this Project and with record of successful in-service performance.
- B. Pre-Installation Conference: At least three weeks prior to commencing the work attend a meeting at the jobsite to discuss conformance with requirements of specification and job site conditions. Representatives of owner, architect, general contractor, tile subcontractor, Tile Manufacturer, Installation System Manufacturer and any other parties who are involved in the scope of this installation must attend the meeting
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Mockup to demonstrate tile layout, and installation tolerances, lippage, grout joint color and width.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PROJECT CONDITIONS

- A. Provide sufficient heat and ventilation in areas where work of this section is being performed, so as to allow ceramic tile to properly set. Take precautionary measures necessary to ensure that excessive temperature changes do not occur.
- B. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.7 WARRANTY

- A. Mortar and Grout Warranty: Provide 20-year materials and installation.

PART 2 - PRODUCTS

2.1 TILE MATERIALS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer, and from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Factory-Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - a. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Ceramic Tile: Standard Grade complying with ANSI A137.1. All-purpose porcelain type units with manufacturer's standard back-mounting.
 - 1. Refer to Material Identification List for product selections and product information such as colors, finishes, and accessories. General product type and materials information as specified herein.
 - a. (CTF) Ceramic Floor Tiles.
 - b. (CTW) Ceramic Wall Tiles.
 - c. (CTB) Ceramic Wall Base Tiles.
 - d. (LB) Glass Liner Bar.
 - 2. Tile Trim and Special Shapes: Rounded external corners and trim shapes at head, jamb and sills of openings.
 - 3. Slip-Resistant Units: Abrasive-surfaced tile with aluminum oxide abrasive uniformly distributed on face of tile to achieve minimum coefficient of friction of 0.60, ASTM C1028. Provide where indicated.

2.2 SETTING MATERIALS

- A. Tile-Setting System Manufacturer: Provide complete tile-setting system consisting of materials by a single Manufacturer. Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer. Provide tile setting system by one of the following:
 - 1. Custom Building Products.
 - 2. LATICRETE International Inc..
 - 3. MAPEI Corporation.

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- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.
 - C. Setting Materials at Terrazzo Tiling (TER): Laticrete 254R Platinum Rapid.
 - D. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
 - 1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
 - 2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.
 - 3. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.
 - E. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:
 - 1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
 - 2. Prepackaged dry-mortar mix combined with styrene-butadiene-rubber liquid-latex additive.
 - a. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.
 - 3. Flexible Latex-Cement Mortar: Add flexible latex additive to dry mortar mix as recommended by porcelain tile manufacturer.
 - F. Mortar for Large Format Floor Tile: Polymer modified portland cement mortar, designed for large format tile for thin-bed or medium-bed applications, complying with ANSI A118.4 and ANSI A118.11, and "Extra Heavy" rating using ASTM C-627 Robinson Floor Test.
 - 1. Basis of Design:
 - a. Laticrete International, Sure-Set.
 - b. Mapei, comparable product.
 - c. ProLite Tile and Stone Mortar by Custom Building Products.
 - G. Polymer-Modified Cement Grout: ANSI A118.7. Provide Either ethylene vinyl acetate, in dry, redispersible form, prepackaged with other dry ingredients; or acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix. Color as indicated.
 - 1. Color: As selected by Architect from manufacturer's full range to match tile.
 - H. Sanded Polymer-Modified Portland Cement Grout: ANSI A118.6 and ANSI 118.7; and meeting the requirements of ISO 13007 Classification CG2WAF.
 - 1. Product and Manufacturer: Ultracolor Plus by Mapei.
 - 2. Use sanded polymer-modified cement grout for setting (CTW-1/-2) and (LB-1).
 - 3. Color: Custom colors as selected by Architect.
 - I. Epoxy Grout:
 - 1. Water-Cleanable, Tile-Setting and -Grouting Epoxy: ANSI A118.3.
 - 2. Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy: ANSI A118.3.
 - 3. Color: As selected by Architect from manufacturer's full range to match tile.
 - 4. At floor, provide 2-part epoxy grout type (not epoxy-additive type).

2.3 ACCESSORIES

- A. Fluid-Applied Waterproofing and Crack Isolation Membrane System: Provide continuous and seamless waterproofing and crack isolation system, including premixed or single-component self-curing liquid-latex rubber or elastomeric-polymer membrane; complying with ANSI A118.10 for waterproofing and ANSI 118.12 for crack isolation; ASTM C627 Extra Heavy Service rating; IAPMO-approved as shower pan liner; and recommended by the manufacturer for the application indicated.
 - 1. Products and Manufacturers:
 - a. Redgard Waterproofing and Crack Prevention Membrane by Custom Building Products
 - b. Hydro Ban by Laticrete International, Inc..
 - c. Mapelastac AquaDefense by Mapei Corporation.

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2. Pre-treat control joints and cracks in accordance with membrane manufacturer's instructions.
 3. Provide reinforcement and accessories as recommended by manufacturer for complete system.
- B. (CTA-#) Ceramic Tile Trim and Transition Strips: Basis of Design as indicated on Material Identification List.
1. Basis of Design: As indicated on Material Identification List.
- C. (TS-2) Solid Polymer Thresholds: Made from homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without precoated finish. Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
1. Basis of Design: As indicated on Material Identification List.
- D. Sealant: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 079200 - Joint Sealants.
1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.
 3. Provide sanded elastomeric joints to match sanded grout joints.
- E. Adhesives: As recommended by tile manufacturer and complying with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Sealant and Backer Rod: As specified in Section 079200 - Joint Sealants.

2.4 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that concrete substrates for tile floors comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces to receive tile as recommended by mortar or adhesive manufacturer; and in compliance with TCA's "Handbook for Ceramic Tile Installation".
 - 1. Roughen surfaces that are glossy or which have loose surface material by sanding or scarifying.
 - 2. Remove surface material that is not compatible with adhesive.
 - 3. Use primer when recommended by adhesive manufacturer.
 - 4. Clean thoroughly to remove oil, dirt and dust.

3.3 WATERPROOFING INSTALLATION

- A. Waterproofing Installation: Install waterproofing membrane to comply with ANSI A108.13, ANSI A108.17 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
 - 1. Do not install tile or setting materials over waterproofing membrane until membrane has cured and been tested to determine that it is watertight.
 - 2. Pre-treat control joints and cracks in accordance with membrane manufacturer's instructions.
 - a. Apply extra fabric-reinforcing at control joints and cracks.
 - 3. Apply liquid waterproofing membrane full height of shower walls.
- B. At Showers: Apply two separate layers. Apply first layer to cover base floor substrate below mortar bed continuous from drain and covering entire wall surface to ceiling on each wall. Second layer is applied over the mortar bed and is continuous overlapping into drain and extending 2 feet above water line onto vertical wall surface.
- C. Field Quality Control: Upon completion of waterproof membrane work and prior to tile installation, plug drain or dam areas and fill with water. After 24 hours, inspect for leakage. Make necessary adjustments to stop leakage and re-test until watertight.
- D. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
 - 1. Provide waterproofing membrane CTA-1 at shower floor and full-height of shower walls.
- E. Crack Isolation Membrane: Install to isolate and suppress substrate cracks according to manufacturer's written instructions. Prepare and prefill substrate cracks with membrane material. Install membrane to produce full substrate coverage in areas to receive terrazzo tiling.

3.4 TILE INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. Achieve 100 percent bond in tile work. Back butter units 12 inch by 12 inch and larger.
- B. Extend tile work into recesses and under equipment and fixtures, to form complete covering without interruptions. Terminate work neatly at obstructions, edges and corners without disruption of pattern or joint alignment.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish or built-in items for straight, aligned joints.
 - 1. Fit tile closely to electrical outlets, piping and fixtures so that plates, collars or covers overlap tile.
- D. Perimeter: Provide for expansion at perimeter with non-grouted and non-sealed perimeter expansion joint.
- E. Expansion Joints: Locate expansion joints and other sealant filled joints, including control, contraction and isolation joints, where indicated, or if not indicated, at spacings and locations recommended in TCA Handbook for Ceramic Tile Installation, and approved by Architect.

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1. Width of expansion joints in tile to match width of aligned joints in substrate slab.
- F. Grout Jointing Pattern: Unless otherwise shown, lay ceramic tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields both directions in each space or on each wall area.
1. Adjust to minimize tile cutting. Provide uniform joint width.
 2. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - a. Ceramic Mosaic Tile: 1/8 inch.
 - b. Quarry Tile: 1/4 inch.
 - c. Glazed Wall Tile: 1/8 inch.
 - d. Porcelain Tile: 1/8 inch.
- G. Grout Sealer: Apply grout sealer as recommended by sealer and grout material manufacturers.
- H. Tile Accessories: Install at locations indicated, in accordance with Manufacturer's recommendations.

3.5 INSTALLED WORK

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
1. Remove grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protection: Protect installed tile work with heavy covering during construction period to prevent damage and wear.
1. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
 - a. Setting materials for large format tile require longer curing time.
 2. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION

SECTION 095100 ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Acoustical panel ceilings and exposed suspension system (SAT).
 - 2. Acoustical panel perimeter trim (ACTR).

1.2 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension members.
 - 2. Method of attaching hangers to building structure.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1/8 inch equals 1 foot.
- C. Samples: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of manufacturers standard size samples of each type, color, pattern, and texture.
 - 2. Suspension System Members, Moldings, and Trim: Set of 12 inch long samples of each type, finish, and color.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports per ICC-ES: For each seismically qualified acoustical tile ceiling suspensions system used in lieu of the industry standard design.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to [2] percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.
 - 4. Impact Clips: Equal to 2 percent of quantity installed.

1.6 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm experienced in application or installation of systems similar in complexity to those required for this Project, including specific requirements indicated; acceptable to or certified by manufacturer

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.8 SITE CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Install ceiling tile after carpeting and other interior materials that off-gas has been installed and odors and VOC fumes have dissipated.
 - 2. Permit wet work to dry prior to commencement of installation.
- B. Maintain uniform temperatures of minimum 60 degrees F and humidity as recommended by acoustical ceiling manufacturer prior to, during and after installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Design Requirements: Design and construction ceiling system, including attachments to structure, to withstand seismic forces in any direction.
- B. Seismic Standard: Provide acoustical panel ceilings designed and constructed in accordance with the following industry or seismic certification standard:
 - 1. ASTM E580: "Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions," Section 5 – Seismic Design Category E.
 - 2. Seismically qualified in accordance with the International Code Council – Evaluation Services – AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components, acceptable to the authority having jurisdiction and approved by the Structural Engineer of Record.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A according to ASTM E 1264.
 - 2. Smoke-Developed Index: 50 or less.

2.2 PRODUCTS AND MANUFACTURERS

- A. Source Limitations for Ceiling Units and Suspension Systems: Obtain each acoustical ceiling panel and suspension system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying Work.
- B. Products and Manufacturers: Provide specified Basis of Design or approved equivalent product by one of the following:
 - 1. Armstrong World Industries, Inc.;
 - 2. USG Interiors, Inc.;
 - 3. Ecophon CertainTeed, Inc.;
 - 4. Chicago Metallic Corporation;

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- C. (SAT) Panel and Grid Configurations and Basis-of-Design: As indicated on the Material Identification List.

2.3 SUSPENDED ACOUSTICAL TILES

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.
1. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 40 percent by weight.
 2. Surface-Burning Characteristics: Provide acoustical panels with surface-burning characteristics complying with ASTM E 1264 for Class A materials with flame spread of 0-25, as determined by testing identical products per ASTM E 84.
- B. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.
- C. Metal Suspension System: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
1. Double-Web, Exposed Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653, not less than G30 coating designation, with prefinished metal caps on flanges.
 - a. Structural Classification: Heavy-duty system.
 - b. Face Design: Flat, flush.
 - c. Cap Material: Steel cold-rolled sheet.
 - d. Face Width: As indicated on Material Identification list.
 2. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.
- D. Accessories: Provide stabilizer bars, furring clips, splices, edge moldings and hold down clips as required to complete and complement suspended ceiling grid system.
1. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
 2. Edge Moldings and Trim: Provide Roll-formed sheet metal type in profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, [formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners, and complying with seismic design requirements.
 3. Touch-up Paint: Manufacturer's touch-up paint for field cut tegular or other reveal edge tiles.
- E. Carrying Channels and Hangers: Primed steel, size and type to suit application and to rigidly secure complete acoustic unit ceiling system, with maximum deflection of 1/360.
- F. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate lateral forces.
- H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.
- I. Seismic Separation Joints: For ceiling areas exceeding 2,500 sqft in accordance with ASTM E580

2.4 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. (ACTR-1) Basis of Design: Axiom by Armstrong. See Material Identification List for more information.
 - 2. Provide manufacturer's edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 - 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half-width units at borders, and comply with reflected ceiling plans.

3.3 SUSPENSION GRID INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C636 **[and seismic requirements indicated]**, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 6. Do not attach hangers to steel deck tabs.
 - 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - a. Provide alternate framing method if structural members are spaced too far apart.
 - 8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

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9. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
 - D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
 - E. Tolerances: Erect ceiling system level within 1/8 inch in 12'-0" in any direction.

3.4 ACOUSTICAL PANEL INSTALLATION

- A. Fit acoustic lay-in panels in place, free from damaged edges or other defects detrimental to appearance and function. Lay directional patterned tile one way with pattern parallel to shortest room axis.
 1. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 2. Field recess units with tegular or reveal edge at border or ceiling edge.
 3. 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.
- B. Install lay-in panels level, in uniform plane and free from twist, warp and dents with straight joints, edges in alignment, and edges and corners flush.

3.5 INSTALLED WORK

- A. Adjusting: Adjust sags or twists that develop in ceiling systems and replace part which is damaged or faulty.
- B. Cleaning: Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.
- C. Replace: Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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SECTION 096001 FLOORING TRANSITION STRIPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Floor transition strips (FTRS).

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of transition strip indicated.
- C. Product Schedule & Layout: Use same designations indicated on Drawings.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient Transition Strips: Furnish not less than 10 percent of total length installed, for each profile type and color.

1.4 COORDINATION & FIELD CONDITIONS

- A. Coordinate installation of floor transitions strips with installation of associated floor finishes. Install flooring after other finishing operations, including painting, have been completed. Close spaces to traffic during installation.

PART 2 - PRODUCTS

2.1 FLOORING TRANSITION STRIPS

- A. (FTRS) Flooring Transition Strips: As indicated on Material Identification List.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by product manufacturers to suit flooring and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

END OF SECTION

SECTION 096500 RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient sheet flooring (RF).
 - 2. Integral wall base (IB).
 - 3. Resilient wall base (RB).
 - 4. Resilient flooring accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

- A. Slab Moisture Content and Calcium Chloride Test Results.
- B. Compatibility Certification: Submit approval documentation by both flooring manufacturer and adhesive manufacturer as compatible with substrate, flooring, project conditions, use, expected traffic, equipment loads and surface conditions including alkalinity, moisture emission levels, slab relative humidity, and other factors that may affect flooring and adhesive performance.
- C. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices for each type of resilient flooring.
- D. Product Test Reports: For static-control resilient flooring, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Materials (Attic Stock): Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sheet Floor Covering: Furnish not less than 10 linear ft. for every 500 linear ft., or fraction thereof, in roll form and in full roll width for each color, pattern, and type of sheet floor covering installed.
 - 2. (RB) Resilient Base: Furnish not less than 5 percent of total linear feet installed.
 - 3. Other Replacement Materials: Furnish not less than one percent of total project quantity of each type, size and color of material to Owner for replacement materials. Clearly identify each container of replacement materials.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation.

1.6 FIELD CONDITIONS

- A. Deliver resilient flooring materials in manufacturer's protective packaging. Store and handle flooring with care to prevent damage.
- B. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor coverings during the following time periods:
 - 1. 72 hours before installation.

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2. During installation.
 3. 72 hours after installation.
- C. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
 - D. Install floor coverings after other finishing operations, including painting, have been completed.
 - E. Close spaces to traffic during floor covering installation and for 72 hours after floor covering installation.
 - F. General Contractor shall be responsible for conducting one calcium chloride test for every 1,000 square feet (minimum of 3 tests) to insure concrete moisture emissions do not exceed 5.0 lbs per 1,000 square feet within a 24-hour period.

PART 2 - PRODUCTS

2.1 RESILIENT PRODUCTS

- A. Products, General:
 1. Basis of Design: Refer to Material Identification List for product selections and product information such as colors, finishes, and accessories.
 2. Single Source: Provide each type of resilient flooring produced by single manufacturer, single run.
 3. [Slip Resistance of Flooring Materials: Provide materials with 0.6 coefficient of friction or greater when tested in accordance with ASTM 2047.]

2.2 VINYL FLOORING

- A. (RF) Vinyl Sheet Flooring: ASTM F1913 Installed with heat-welded seams, if applicable.
 1. Refer to Material ID.

2.3 WALL BASE

- A. (RB-1) Rubber Wall Base: ASTM F 1861, Type TS, Group 1, Styles A and B. Provide in 120-feet long rolls. Provide standard top-set cove base, except provide straight base at carpet.
 1. Basis of Design: As indicated on Material Identification Codes List.
 2. ASTM E 84; Class B rating with smoke density of 150-200.
- B. (IB-1) Integral Wall Base: Refer to Material ID.

2.4 ACCESSORIES

- A. Heat-Welding Bead: Solid-strand product of linoleum floor covering manufacturer.
 1. As selected by Architect from manufacturer's full range.
- B. Integral-Flash-Cove-Base Accessories:
 1. Cove Strip: 1-inch radius provided or approved by manufacturer.
 2. Cove-Base Cap Strip: Square metal, provided or approved by manufacturer.

2.5 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Skim Coat: Portland cement-based, trowel-applied skim coat intended for thin application over rough or abrasive surfaces to create a smooth prepared surface to receive resilient flooring.
 1. Extent: At stair treads and landings in P1, P2 and P3.
 2. Primer: As recommended by and manufactured by concrete topping Manufacturer.

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- 3. Aggregate: Well washed, graded, fine gravel or larger aggregate as recommended by Manufacturer.
 - C. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.
 - E. Sealer and Wax: Type recommended by resilient flooring material manufacturer for material type and location.
 - F. Accessories for Sheet Vinyl Flooring **at Showers**: Provide accessories for seamless installation with integral coved base at showers.
 - 1. Sloped Mortar Bed: As specified in Section 093000 - Tiling.
 - 2. Adhesive: Manufacturer's two-part urethane adhesive.
 - 3. Joint Treatment: As recommended by flooring Manufacturer.
 - 4. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Color: As selected by Architect from manufacturer's full range.
 - 5. Integral-Flash-Cove-Base Accessories:
 - a. Cove Strip: $\frac{3}{4}$ inch radius provided or approved by resilient sheet flooring manufacturer.
 - b. Cap Strip: Square metal strip provided or approved by resilient sheet flooring manufacturer.
 - c. Corners: Metal inside and outside corners and end stops provided or approved by resilient sheet flooring manufacturer.
 - 6. Transition Strips: Manufacturer's Gulley Angle type sheet termination. Color and finish as selected by Architect.
 - 7. Sealant: As specified in Section 079200 - Joint Protection.
 - G. Floor Polish: Provide protective, static-control liquid floor polish products recommended in writing by floor-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

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- b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
 - C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
 - D. Do not install floor coverings until they are same temperature as space where they are to be installed. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.
 - E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for installing floor coverings.
- B. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- C. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- D. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.
- E. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT SHEET FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient sheet flooring.
- B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- C. Lay out resilient sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.
 - 4. Avoid cross seams.
- D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.5 INSTALLED WORK

- A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.
- B. Perform the following operations immediately after completing floor covering installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor coverings from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

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- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor coverings before applying liquid floor polish.

END OF SECTION

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SECTION 099000 PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Painting and finishing of new and existing materials (P)
 - 2. Preparation of surfaces for painting and finishing.
 - 3. Repainting and refinishing of existing surfaces as indicated and as specified in Section 017329 - Cutting and Patching. Preparation of existing surfaces for repainting and refinishing.
 - 4. Wall-identification signs for fire and smoke assemblies.

1.2 ACTION SUBMITTALS

- A. Product Data: For each paint system specified, all coats, including block fillers and primers.
 - 1. Submit Manufacturer's certifications that products comply with specified requirements and with local regulations for VOC content.
- B. Samples: Submit three 4 inch by 6 inch samples of each specified finish to be reviewed for color and sheen. Architect reserves right to select color or finish from any manufacturer, herein specified, as necessary to achieve desired color or finish.
- C. Product Schedule: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations and cross-reference each material by manufacturer's catalog number and general classification.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Materials (Attic Stock): Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
 - 1. Quantity: Furnish Owner with extra paint materials in quantities indicated below:
 - a. Interior, Paint: **3 gal.** of each color applied.

1.4 QUALITY ASSURANCE

- A. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
- B. Applicator Qualifications: Engage experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with record of successful in-service performance.
- C. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

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4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver paint materials in sealed original labeled containers, bearing manufacturer's name, type of paint, brand name, color designation and instructions for mixing or reducing.
- B. Provide adequate storage facilities. Store paint materials at minimum ambient temperature of 45 degrees F in well ventilated area. Restrict storage to paint materials and related equipment.
- C. Take precautionary measures to prevent fire hazards and spontaneous combustion. Comply with health and fire regulations.

1.6 PROJECT CONDITIONS

- A. Environmental Requirements: Comply with manufacturer's recommendations as to environmental conditions under which painting and finishing can be applied. Do not apply finish in areas where dust is being generated.
- B. Measure moisture content of surfaces using electronic moisture meter. Do not apply finishes unless moisture contents of surfaces are below following maximums:
 1. Gypsum Wallboard: 12 percent.
 2. Masonry, Concrete and Concrete Block: 12 percent.
 3. Interior Wood: 15 percent.
- C. Ensure surface temperature and surrounding air temperature is above 40 degrees F before applying finishes. Minimum application temperature for latex paints for interior work shall be 45 degrees F and 50 degrees F for exterior work. Minimum application temperature for transparent finish shall be 65 degrees F, or surface and air temperature shall be 5 degrees above dew point.
- D. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 45 degrees F for 24 hours before, during and 48 hours after application of finishes.
- E. Provide minimum 25 foot candles of lighting on surfaces to be finished.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Manufacturers:
 1. Sherwin-Williams Company
 2. Benjamin Moore & Co.
 3. ICI Paints
 4. Mythic Paint
 5. PPG Industries
 6. Hirshfield's Inc.
 7. Diamond Vogel Paints.
 8. Rust-Oleum.
 9. Valspar.
- B. Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- C. Single-Source Responsibility: Provide primers and undercoat coating produced by same manufacturer as finish coats. No Exceptions.
- D. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- E. Painting and Finishing Schedules: Refer to Painting and Finishing Schedules in Part 3 of this Section.

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1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
 2. Sheen: When one of following terms is used to denote specific sheen for coating listed, following index shall apply:
 - a. Flat: Less than 15 units based on 85 degrees of sheen.
 - b. Eggshell: 5 to 20 units based on 60 degrees of sheen.
 - c. Satin/Low Lustre: 15 to 35 units based on 60 degrees of sheen.
 - d. Semi-gloss: 30 to 65 units based on 60 degrees of sheen.
 - e. Gloss: Above 65 units based on 60 degrees of sheen.
- F. (P), (EP), (SP) Paint Colors: Provide specified color in paint type as scheduled in this Section
1. Refer to Material Identification List for color selections.
 2. Mixing and Tinting: Deliver paints ready-mixed to job site. Job mixing and job tinting is not acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive paint and transparent finishes for conditions that would adversely affect execution, permanence or quality of work and which cannot be put into acceptable condition through preparatory work. Do not proceed with surface preparation or coating application until conditions are suitable.

3.2 PREPARATION OF SURFACES

- A. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as specified, for each particular substrate condition.
1. Remove mildew, by scrubbing with solution of detergent, bleach and warm water. Rinse with clean water and allow surface to dry completely.
 2. Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of anticipated problems in using specified coating systems with substrate primed by others.
- B. Remove hardware, hardware accessories, plates, lighting fixtures, and similar items in-place and not to be finish painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items by workmen skilled in trades involved.
- C. Clean surfaces to be painted before applying paint or surface treatment. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program cleaning and painting so that dust and other contaminants from cleaning process will not fall in wet, newly painted surfaces.
1. Remove dirt, grease and oil from canvas and cotton insulated coverings.
- D. Cementitious Surfaces: Prepare cementitious surfaces of concrete, concrete block and cement plaster to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint.
1. Remove contamination, acid etch and rinse new concrete floors with clear water. Ensure required acid alkali balance is achieved. Allow to thoroughly dry. Repeat procedure if necessary to achieve a medium sandpaper-like profile.
 2. Remove dirt, loose mortar, scale, powder and other foreign matter from concrete and concrete block surfaces which are to be painted or to receive clear seal. Remove oil and grease with solution of trisodium phosphate, rinse well and allow to thoroughly dry.

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3. Remove stains from concrete and concrete block surfaces caused by weathering of corroding metals with solution of sodium metasilicate after being thoroughly wetted with water. Allow to thoroughly dry.
- E. Gypsum Wallboard: Remove contamination from gypsum wallboard surfaces and prime to show defects, if any. Paint after defects have been remedied.
 - F. Plaster Surfaces: Fill hairline cracks, small holes and imperfections on plaster surfaces with patching plaster. Smooth off to match adjacent surfaces. Wash and neutralize high alkali surfaces where they occur.
 - G. Galvanized Surfaces: Clean free of oil and surface contaminants with acceptable non-petroleum based solvent.
 - H. Ferrous Metals: Clean non-galvanized, ferrous surfaces that have not been shop-coated of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning, complying with Steel Structures Painting Council (SSPC)-SP3.
 1. Touch-up shop-applied prime coats which have damaged or bare areas. Wire-brush, solvent-clean, and touch-up with same primer as shop coat.
 2. Clean unprimed steel surfaces by washing with solvent. Apply treatment of phosphoric acid solution, ensuring weld joints, bolts and nuts are similarly cleaned. Prime surfaces to indicate defects, if any. Paint after defects have been remedied.
 3. Sand and scrape shop primed steel surfaces to remove loose primer and rust. Feather out edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime steel including shop primed steels.
 - I. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off.
 1. Prime or seal wood required to be job painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood.
 2. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
 - J. Existing Surfaces to be Repainted or Refinished: Wash surfaces to remove grease, oil, soil or other matter which will interfere with proper bond of new materials. Scrape and wire brush loose or flaking paint. Fill cracks, voids or other defects.

3.3 MATERIALS PREPARATION

- A. Mix and prepare painting materials and transparent finish materials in accordance with manufacturer's directions.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce mixture of uniform density, and as required during application of materials. Do not stir any film that may form on surface into material. Remove film and, if necessary, strain material before using.

3.4 APPLICATION

- A. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
 1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
 4. Apply each coat at proper consistency.

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5. Each coat of paint shall be slightly darker than preceding coat unless otherwise approved by Architect.
 6. Provide finish coats which are compatible with prime paints used.
- B. Do not apply succeeding coats until previous coat has completely dried. Sand between each enamel or varnish coat application with fine sandpaper, or rub surfaces with pumice stone where required to produce even, smooth surface in accordance with coating manufacturer's directions.
1. Allow each coat of finish to dry before following coat is applied, unless directed otherwise by manufacturer.
- C. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive film thickness equivalent to that of flat surfaces.
- D. Finish doors on tops, bottoms, and side edges same as exterior faces, unless otherwise indicated.
- E. Film Thickness: Apply materials in accordance to paint manufacturer's recommendations and spreading rates to provide total dry film thickness as recommended.
1. Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated
 2. Use precision instruments designed for measuring and evaluation wet and dry films of paints and coatings.
 3. Results measuring less than recommended thickness will require additional material application.
 4. Use of poor hiding colors may require application of additional coats in order to achieve proper coverage and hiding.
- F. Apply first-coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
- G. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of undercoat.
- H. Prime Coats: Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure finish coat with no burn-through or other defects due to insufficient sealing.
- I. Transparent Finish: On exposed portions, use multiple coats to produce glass-smooth surface film continuity of even luster. Provide finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats, unless otherwise indicated.
- J. Painting and Repainting of Existing Surfaces: Where repainting of existing surfaces is required, repaint wall and ceiling surfaces in their entirety, patch or spot painting is not acceptable.
- K. Paint surfaces behind movable equipment or furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.5 MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Refer to mechanical and electrical documents with respect to field painting and finishing requirements. Painting of mechanical and electrical work is not required in pipe chases, tunnels, and mechanical rooms with unpainted walls.
- B. Remove grilles, covers and access panels for mechanical and electrical systems from location and paint separately.
- C. Finish paint primed equipment to color selected.

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- D. Prime and paint insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars and supports, except where items are plated or covered with prefinished coating, or where they are not in finished space or room.
 - E. Paint interior surfaces of air ducts, convector and baseboard heating cabinets that are visible through grilles and louvers before installation of equipment with 1 coat of flat black paint, to limit of sight line. Paint dampers exposed immediately behind louvers, grilles, convector and baseboard cabinets to match face panels.
 - F. Paint exposed piping, insulated piping and conduit occurring in finished areas. Color and texture to match adjacent surfaces.
 - G. Paint both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.

3.6 CLEANING

- A. As work proceeds and upon completion, promptly remove paint where spilled, splashed or spattered. Touch up and restore damaged or defaced painted areas.
- B. During progress of work keep premises free from unnecessary accumulation of tools, equipment, surplus materials and debris. Remove at end of each workday.
- C. Upon completion of work clean window glass and other paint-spattered surfaces and leave premises neat and clean, to satisfaction of Architect.

3.7 PROTECTION

- A. Adequately cover or otherwise protect finished work of other trades and other surfaces from paint and damage. Repair damage as result of inadequate or unsuitable protection as acceptable to Architect.
 - 1. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation area.
- B. Place cotton waste, cloths and material which may constitute fire hazard in closed metal containers and remove daily from site.
- C. Remove electrical plates, surface hardware, fittings and fastenings, prior to painting operations. These items shall be carefully stored, cleaned and replaced on completion of work in each area. Do not use solvent to clean hardware that may remove permanent lacquer finish.
- D. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.8 INTERIOR PAINTING AND FINISHING SCHEDULE

- A. Interior Ferrous and Non-Ferrous Metal Surfaces:
 - 1. Surfaces Included:
 - a. Prime painted hardware.
 - b. Fire extinguisher cabinet trim.
 - c. Radiator, convector and other heating unit covers.
 - d. Uninsulated piping and ductwork.
 - e. Metal access panels.
 - f. Metal louvers and grilles.
 - g. Electric panels (over factory finish).
 - h. Metal supports for counters, benches and shelves.
 - i. Exposed and miscellaneous metals.
 - j. Other exposed to view interior ferrous metals not factory finished.
 - 2. Waterborne Low VOC, Low-Odor System: Zero-VOC, Low-Odor Acrylic over Waterborne Metal Primer:
 - a. VOC Content:<50g/L

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- b. Primer: Acrylic Concrete & Masonry Primer
 - 1) 1 coat S-W Pro Industrial Pro-Cryl Universal Acrylic Primer, B66-1300 Series
 - c. Finish: Water-based, 100 percent acrylic.
 - 1) 2 coats S-W Pro Industrial Acrylic Matte, B66-670 Series
 - 2) 2 coats S-W Pro Industrial Acrylic Eg-Shel, B66-1661 Series
 - 3) 2 coats S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series.
 - 4) 2 coats S-W Pro Industrial Acrylic Gloss, B66-600 Series.
- B. Interior Ferrous and Non-Ferrous Metal Enamel:
- 1. Surfaces Include:
 - a. Metal handrails, guardrails, ladders, stairs.
 - b. Hollow metal doors and frames.
 - 2. Water-Based Alkyd Urethane Enamel System:
 - a. VOC Content:<50g/L
 - b. Primer: Acrylic metal primer.
 - 1) 1 coat S-W Pro Industrial Pro-Cryl Universal Acrylic Metal Primer, B66-1300 Series.
 - c. Finish: Acrylic gloss enamel.
 - 1) 2 coats S-W Pro Industrial Waterbased Alkyd Urethane Enamel Low Sheen (Eg-Shel), B53-2250 Series .
 - 2) 2 coats S-W Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-1150/2150 Series
 - 3) 2 coats S-W Pro Industrial Waterbased Alkyd Urethane Enamel Gloss, B53-2050 Series
- C. Interior Galvanized Metal Enamel:
- 1. Surfaces Include:
 - a. Galvanized.
 - b. Hollow metal doors and frames.
 - 2. Water-Based Alkyd Urethane Enamel System:
 - a. VOC Content:<50g/L
 - b. Primer: .
 - 1) 1 coat S-W Pro Industrial Pro-Cryl Universal Acrylic Metal Primer, B66-1300 Series.
 - c. Finish: Acrylic gloss enamel.
 - 1) 2 coats S-W Pro Industrial Waterbased Alkyd Urethane Enamel Low Sheen (Eg-Shel), B53-2250 Series .
 - 2) 2 coats S-W Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-1150/2150 Series
 - 3) 2 coats S-W Pro Industrial Waterbased Alkyd Urethane Enamel Gloss, B53-2050 Series
- D. Interior Ferrous Aluminum & Stainless-Steel Metal:
- 1. Surfaces Include:
 - a. Stainless steel & aluminum.
 - b. Hollow metal doors and frames.
 - 2. Water-Based Alkyd Urethane Enamel System:
 - a. VOC Content:<100g/L
 - b. Primer:
 - 1) 1 coat S-W DTM Wash Primer, B71Y00001
 - c. Finish: Water-Based Alkyd Urethane Enamel.
 - 1) 2 coats S-W Pro Industrial Waterbased Alkyd Urethane Enamel Low Sheen (Eg-Shel), B53-2250 Series .
 - 2) 2 coats S-W Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-1150/2150 Series
 - 3) 2 coats S-W Pro Industrial Waterbased Alkyd Urethane Enamel Gloss, B53-2050 Series
- E. Gypsum Wallboard, Gypsum Plaster and Gypsum Veneer Plaster Surfaces:
- 1. Surfaces Included:
 - a. Gypsum wallboard, including over skim coat of joint compound.
 - b. Apply additional coat of primer under deep tone finish paint.
 - c. Veneer plaster.
 - 2. Sheens, General: Unless noted otherwise on Room Finish Schedule.

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- a. Walls: Eggshell
 - b. Ceilings and Soffits: Flat
 - c. Walls where indicated on Room Finish Schedule: Semi-gloss.
 3. Waterborne Zero-VOC, Low-Odor System: Zero-VOC, Low-Odor Acrylic Finish over Zero-VOC, Low-Odor Acrylic Primer - not more than 50 grams VOCs per liter, not less than 35 percent solids, ammonia free coating.
 4. Acrylic with Air Purify or Sanitizing Technology System:
 - a. VOC Content: <50g/L
 - b. Primer:
 - 1) S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600
 - c. Finish: Water-based, premium quality acrylic latex with Air Purifying Technology,
 - 1) 2 coats S-W SuperPaint Air Purify Interior Latex Flat, A86-60 Series.
 - 2) 2 coats S-W SuperPaint Air Purify Interior Latex Satin, A87-60 Series.
 - 3) 2 coats S-W SuperPaint Air Purify Interior Latex Semi-Gloss, A88-60 Series.
 - 4) 2 coats S-W SuperPaint Interior Latex Satin with Sanitizing Technology
 5. Zero VOC Vinyl Acrylic System:
 - a. VOC Content: 0g/L
 - b. Primer: Water-based vinyl acrylic primer and sealer.
 - 1) S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600
 - c. Finish: Water-based acrylic, not less than 35 percent solids, ammonia free.
 - 1) 2 coats S-W ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series.
 - 2) 2 coats S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2600 Series.
 - 3) 2 coats S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series.
 6. Water Based Polyamine Epoxy System:
 - a. VOC Content: <50g/L
 - b. Primer:
 - 1) 1 coat S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600
 - 2) 2 coats S-W Pro Industrial Water Based Epoxy Eg-Shel, B73-300 Series.
 - 3) 2 coats S-W Pro Industrial Water Based Epoxy Gloss, B73-300 Series.
 7. Metallic or Pearlescent Low VOC Acrylic w Water-Based Polyurethane Finish.
 - a. VOC Content: <50g/L Acrylic, <100g/L Polyurethane
 - b. Primer:
 - 1) 1 coat S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600
 - c. Finish
 - 1) 2 coats S-W supplier Crescent Bronze Acrylic Metallic 10503 Series
 - (a) Color selection per finish schedule
 - d. High Performance Water-based Polyurethane *Optional for increased durability
 - 1) 1 coat S-W Pro Industrial Acrolon 100 Polyurethane Gloss, B65 Series.

F. Non-Metal Ceilings and Soffits:

1. Surfaces Included:
 - a. Gypsum board assemblies.
 - b. Plaster assemblies.
 - c. Spray fireproofing (SFRM)
2. Dry Fall Spray-Applied Waterborne System: Waterborne Multi-Surface Acrylic with Dryfall attributes over Waterborne Bonding Primer.
 - a. Primer (touch up if pre-primed): 1 coat S-W Extreme Bond Primer B51W01150 or S-W Multi-Purpose Interior-Exterior Latex Primer-Sealer, B51-450 Series.
 - b. Finish:
 - 1) 1-2 coats S-W Pro Industrial Multi-Surface Acrylic Matte, B66W01570 Series
 - 2) 1-2 coats S-W Pro Industrial Multi-Surface Acrylic Eg-Shel, B66W01560 Series
 - 3) 1-2 coats S-W Pro Industrial Multi-Surface Acrylic Semi-Gloss, B66W01550 Series
 - 4) 1-2 coats S-W Pro Industrial Multi-Surface Acrylic Gloss, B66W01500 Series

3.9 SPECIAL SURFACES

A. Insulation-Wrapped Piping and Equipment:

1. Surfaces Included: Piping, ducts, tanks, and equipment.

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2. Waterborne System: Premium Quality Acrylic Latex finish over -Acrylic Primer.
 - a. Primer: 1 coat S-W Moisture Vapor Barrier Primer, B72W1.
 - b. Finish: 2 coats S-W ProMar 200 Zero-VOC Interior Latex Eg-Shel, B20-2600 Series.
 - B. Black Enamel Finish:
 1. Surfaces Included: Duct throats for visible distance but not less than approximately 24 inches behind supply or return air grilles, registers, louvers.
 - a. Wood blocking exposed at reveals.
 2. Water-Based Systems, Low-VOC: Acrylic Latex Finish.
 - a. Finish: 1 coat S-W ProMar 400 Latex Flat Black, B30W400 Series.
 - C. Plastic and Fiberglass Fabrication Substrates: Insulation-wrapped piping, and miscellaneous plastics.
 1. (PT) Latex System:
 - a. Prime Coat: Primer, bonding, water-based.
 - 1) Valspar, Interior/Exterior Bonding Primer, 11289 Series.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, flat.
 - 1) Valspar, Perennial 100% Acrylic Latex House Paint.
 - 2) Valspar, Emblem Exterior Flat.
 - 3) Valspar, Professional Exterior Latex Flat House Paint.

3.10 REPAINTING OF EXISTING SURFACES

- A. Existing Surfaces:
 1. Surfaces Included:
 - a. Existing surfaces where indicated to be repainted.
 - b. Existing metal lockers (casework) (metal toilet compartments) where indicated to be repainted.
 2. Low-VOC Latex System:
 - a. Primer/Finish: 2 coats paint similar to type listed above.
 3. Electrostatic System:
 - a. Primer/Finish: 2 coats electrostatic paint finish.

3.11 SMOKE AND FIRE PARTITIONS

- A. Stenciling: Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions to be stenciled with the appropriate Hour-rating/Minute rating, i.e., "SMOKE and/or FIRE (1 HR /2 HR) – Protect All Openings," etc. as indicated on the Life Safety Plan, above ceilings on both sides of walls in letters not less than 3 inches high and 3/8 inch wide stroke. Refer to IBC Article 703 for additional information.
 1. Stenciling shall be located above every door and no more than fifteen feet on center.
 2. Stencil every change in direction of rated walls.
 3. Indicate the end of a rated wall with a 2-inch vertical red line with an arrow pointing to the direction of the rated wall.
- B. Latex Primer/Finish System: Provide red semi-gloss paint. S-W 0 VOC Acrylic Semi-Gloss, B66-650 Series.
- C. Stenciling: Smoke and Fire partitions shall be stenciled with the appropriate Hour-rating/Minute rating, i.e., "SMOKE and/or FIRE (1 HR /2 HR)," etc., above ceilings on both sides of walls in letters not less than 2-1/2 inches high.
 1. Stenciling shall be located above every door and no more than ten feet on center.
 2. Stencil every change in direction of rated walls.
 3. Indicate the end of a rated wall with a 2-inch vertical red line with an arrow pointing to the direction of the rated wall.
- D. Latex System:
 1. Primer/Finish: Provide red semi-gloss paint. S-W 0 VOC Acrylic Semi-Gloss, B66-650 Series.

3.12 MARKING FIRE AND SMOKE ASSEMBLIES

- A. Wall-Identification Sign: Sign applied directly on indicated substrate to identify fire and smoke assemblies, including preparatory treatment as required.
 - 1. Sign Material: Stenciled-on [**alkyd**] [**latex**] [**or**] [**VOC-compliant spray-applied**] paint or preprinted, self-adhesive decals.
 - 2. Font: Minimum **3 inches** high characters in a contrasting color, with minimum **0.375-inch** wide strokes.
 - 3. Text:
 - a. "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS."
 - b. "1-HOUR FIRE BARRIER - PROTECT ALL OPENINGS."
 - c. "2-HOUR FIRE BARRIER - PROTECT ALL OPENINGS."
 - d. "SMOKE BARRIER - PROTECT ALL OPENINGS."
- B. Wall-Identification Signs: Permanently identify both sides of each fire and smoke assembly indicated on Drawings. Place signs in accessible, concealed floor, floor-ceiling, or attic space at maximum **15 feet** from end of wall and at maximum intervals of **30 feet**, measured horizontally along the assembly. Locate signs for greatest visibility in the space.

END OF SECTION

SECTION 102123 HOSPITAL TRACKS & CUBICLE CURTAINS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fabric curtains and mesh cloth (CC-1).
 - 2. Curtain tracks and carriers.
- B. Related Sections:
 - 1. Section 055000 - Metal Fabrications: Above ceiling supports for track.
 - 2. Section 095100 - Acoustical Ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product specified.
- B. Shop Drawings:
 - 1. Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
 - 2. Include details on blocking.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches in size.
 - 1. Track: Submit 12 inch length of curtain track including wall and ceiling hanger and escutcheon.
 - 2. Curtain: Submit 12 inch by 12 inch sample patch of curtain cloth with representative hem stitch detail, heading with reinforcement, carrier attachment to curtain header.

1.3 CLOSEOUT SUBMITTAL

- A. Operation and Maintenance Data: For curtains, track, and hardware to include in operation and maintenance manuals.
- B. Maintenance Materials (Attic Stock): Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Curtain Carriers and Track End Caps: Full-size units equal to **[3]** percent of amount installed **[for each size indicated]**, but no fewer than **[10]** units.
 - 2. Curtains: Full-size units equal to **[10]** percent of amount installed **[for each size indicated]**, but no fewer than **[two]** units.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects **[and set quality standards for materials and execution]**.
 - 1. Build mockup of typical cubicle, complete with track, curtain **[, and IV hanger]**, as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 HOSPITAL TRACKS (CC-1)

- A. Manufacturers:

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1. Refer to Material Identification Code.

2.2 CUBICAL CURTAINS (CC-1)

- A. Curtains: Provide curtain fabrics with the following characteristics: Refer to Material ID.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install curtain track secure and rigid, true to ceiling line. Provide track to support vertical test load of 50 lbs without visible deflection of track or damage to supports. Do not suspend track from suspended ceiling system.
- B. Install curtains on carriers ensuring smooth operation.

3.3 INSTALLATION

- A. General: Install tracks level and plumb, according to manufacturer's written instructions.
- B. Up to 20 feet in length, provide track fabricated from single, continuous length.
 1. Curtain Track Mounting: As indicated on Drawings.
- C. Surface-Track Mounting: Fasten tracks to ceilings at intervals recommended by manufacturer. Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:
 1. Mechanically fasten directly to bottom of concrete deck with post-installed anchors.
 2. Mechanically fasten directly to finished ceiling with toggle bolts.
 3. Mechanically fasten to furring through suspended ceiling with screw and tube spacer.
 4. Mechanically fasten to suspended ceiling grid with screws.
 5. Attach track to suspended ceiling grid with manufacturer's proprietary clip.
- D. Suspended-Track Mounting: Install track with manufacturer's standard tubular aluminum suspended supports at intervals and with fasteners recommended by manufacturer. Fasten supports to structure. Provide supports at each splice and tangent point of each corner. Secure ends of track to wall with flanged fittings or brackets.
- E. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.
- F. Curtain Carriers: Provide curtain carriers adequate for 6-inch spacing along full length of curtain plus an additional carrier.
- G. Curtains: Hang curtains on each curtain track. Secure with curtain tieback.

END OF SECTION

SECTION 102600 WALL & DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall corner guards (CG).
 - 2. Wall guards (WGS) and (WP).
 - 3. Wall rails (HR).

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For each type of wall and door protection showing locations and extent.
- C. Samples: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified. Include Samples of accent strips and accessories to verify color selection.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Deliver wall and corner guards in manufacturer's protective covering. Handle finished surfaces with care to prevent damage.

PART 2 - PRODUCTS

2.1 PETG PRODUCTS

- A. Manufacturers Products:
 - 1. InPro Corporation.
 - 2. Tepromark International Inc..
 - 3. Construction Specialties (C/S Group).
 - 4. Pawling Corporation, Standard Products Division.
 - 5. Korogard Wall Protection Systems.
 - 6. Institutional Products Corporation, IPC.
 - 7. ConWall, Division of Iowa Paint Manufacturing.
- B. PETG Material: PVC-free thermoplastic polyester, Textured, chemical and stain resistant, high-impact, thickness as indicated.
 - 1. Fire performance characteristics when tested in accordance with ASTM E84 for Class A/1 characteristics listed below:
 - a. Flame spread: 25 or less.
 - b. Smoke development: 450 or less.
- C. (WP), (WGS), and (WPG) Wall Guard: Refer to Material Identification List.
 - 1. Size: As indicated on Drawings.
- D. (CG-1/-2) Wall Corner Guard: Surface mounted guards consisting of a continuous retainer with snap-on 0.078 inch thick PETG cover and color matched end caps.
 - 1. Refer to Material Identification List for colors and other information.
- E. (HR-1) Wall Rail: Surface, bumper, or extended mounted assembly
 - 1. Refer to Material ID.
- F. PETG Product Accessories
 - 1. Attachment Hardware: As recommended by manufacturer for wall construction type.

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2. Aluminum Retainers: Extruded 6063-T6 alloy aluminum retainers. Minimum strength and durability properties complying with ASTM B221.
 3. Trim and Accessories: Edge and corner trim as required for a complete finished installation as approved by Architect.

2.2 INSTALLATION ACCESSORIES

- A. Fasteners: Non-corrosive and compatible with aluminum retainers, supplied by wall protection manufacturer.
- B. Adhesives: As recommended by signage manufacturer for use with material being adhered to substrate indicated and as follows:
 1. Adhesive and Sealant VOC Limits: In accordance with South Coast Air Quality Management District Rule 1168 and GS-36 for aerosols.
 2. VOC Limits: As tested using U.S. EPA Reference Test Method 24 and as defined by South Coast Air Quality Management District Rules SCAQMD Rule 1168, Adhesive and Sealant Applications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examination: Examine areas and conditions in which wall surface protection components and wall protection systems will be installed. Do not proceed with installations until unsatisfactory conditions have been corrected.
- B. Installation: Install wall protection and corner guards and accessories in accordance with reviewed shop drawings and manufacturer's printed instructions. Install true, plumb and level, securely and rigidly anchored to substrate.
- C. Cleaning: Clean metal components in accordance with manufacturer's recommendations. Remove excess adhesive using methods and materials recommended by manufacturer.

END OF SECTION

SECTION 102813 TOILET & BUILDING ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Washroom accessories.
 - 2. Shower accessories.
 - 3. Healthcare accessories.
 - 4. Installation of Owner-furnished accessories (OFCl).
- B. Section Includes:
 - 1. Coat Hooks (CH).
 - 2. Washroom Accessories:
 - a. Grab Bars (GB)
 - b. Mirrors (MIR).
 - c. Paper Towel Cabinets (PTD).
 - d. Soap Dispenser (SDISP).
 - e. Toilet Paper Holder (TPH).
 - f. Utility Shelf (US).
 - 3. Shower Accessories:
 - a. Shower Curtain (SC).
 - b. Shower Curtain Rod (SHCR).
 - c. Shower Seat (SHFS).
 - d. Shower Pan (SHPN).
 - e. Towel Bar (TB).
 - 4. Installation of Owner-furnished accessories (OFCl).

1.2 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples:
 - 1. Finish Samples: Submit samples of each exposed finish type.
 - 2. Unit Samples: Full size, for each accessory item to verify design, operation, and finish requirements. Approved full-size Samples will be returned and may be used in the Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver accessories to site until rooms in which they are to be installed are ready to receive them.
- B. Pack accessories individually in manner to protect accessory and its finish.

1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specified Basis of Design products.
 - 1. Products of other manufacturers listed in Part 2 with equal characteristics, as judged solely by Architect, may be provided.
 - 2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
- B. Names and labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- C. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Products and Manufacturers: Subject to compliance with specified requirements, provide Basis of Design products as indicated in Product Schedule, or approved equivalent products by one of the following manufacturers:
 - 1. Washroom Equipment:
 - a. Bobrick Washroom Equipment Inc.
 - b. American Specialties Inc.
 - c. Bradley Corporation
 - d. GAMCO
 - e. Tork

2.2 SCHEDULE OF CUSTODIAL AND TOILET ACCESSORIES

- A. Schedule: Subject to compliance with specified requirements, provide Basis of Design products as indicated on Material Identification List or equivalent products, as approved by Architect.
 - 1. CH COAT HOOK
 - 2. GB GRAB BARS
 - 3. MIR MIRROR (Framed)
 - 4. PTD PAPER TOWEL CABINETS
 - 5. SDISP SOAP DISPENSER
 - 6. SHCR SHOWER CURTAIN ROD, RINGS AND CURTAIN

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- 7. SHFS SHOWER SEAT
 - 8. SHPN SHOWER PAN
 - 9. TB TOWEL BAR
 - 10. TPH TOILET PAPER HOLDER
 - 11. US UTILITY SHELF

2.3 GENERAL ACCESSORIES

- A. Coat Hooks:
 - 1. (CH-2) Double Hook: Stainless steel, satin finish.
 - a. Refer to Material ID.

2.4 WASHROOM ACCESSORIES

- A. (GB) Grab Bars: In accordance with requirements of 2019 California Building Code (CBC), capable of withstanding load of 250 lbf applied in any direction and at any point on the grab bar, fastener, mounting device or supporting device; in accordance with ASTM F 446.
 - 1. Basis of Design:
 - a. Bobrick B-6806 Series.
 - b. Bradley 812 Series
 - 2. Material and Finish: Type 304 stainless steel pipe, 18 ga., 1-1/2" outer diameter, with satin finish on ends and slip-resistant texture in grip area.
 - 3. Mounting: Flanges with concealed fasteners and gasketed stainless steel escutcheon.
 - 4. Configurations: As indicated on Drawings. Refer to grab bar schedule in Drawings.
- B. Mirrors:
 - 1. (MIR-1/-2) Framed Mirror No Shelf:
 - a. Bobrick B-290 Series.
 - b. Bradley 780 Series.
 - c. Sizes: Refer to Material ID.
- C. Automatic Paper Towel Dispenser Cabinets:
 - 1. (PTD-1) Paper Towel Cabinet: Touchless auto dispenser;
 - a. Basis of Design: Refer to Material ID.
- D. Soap Dispensers:
 - 1. (SDISP-1) Soap Dispensers: Refer to Material ID.
- E. Toilet Paper Holders:
 - 1. (TPH-5) Toilet Tissue (Roll) Dispenser: Refer to Material ID.
- F. Utility Shelves:
 - 1. (US-1) Stainless Steel Shelf: surface-mounted.
 - a. Bobrick B-298. 8" deep x 18" long.
 - b. Bradley 758-036.
- G. Waste Receptacles:
 - 1. (WAST-1) Waste Receptacles: recessed with 4 inch projection
 - a. Bobrick B-3644.

2.5 SHOWER ACCESSORIES

- A. [Refer to the Material Identification List for products.]
- B. Shower Curtains and Hooks:
 - 1. (SC-1) Shower Curtain: Refer to Material ID.
- C. Shower Curtain Rod:
 - 1. (SHCR-1) Shower Curtain Rod:
 - a. Basis of Design: Bobrick B-6047 (Extra Heavy Duty).

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- b. Description: 1-inch OD; fabricated from nominal 1.0 mm thick stainless steel.
 - c. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
 - d. Finish: No. 4 (satin).

D. Shower Folding Seats:

- 1. (SHFS-1) Folding Shower Seat: Refer to Material ID.

E. Shower Pan: Refer to Material ID for size and criteria.

- 1. Model P26331A, V2, by Best Bath Systems, Inc.

F. Towel Bars:

- 1. (TB-2) Towel Bars: heavy duty type.
 - a. Bobrick 6806 x 18" long.

2.6 HEALTHCARE ACCESSORIES

A. Hand Sanitizer Dispenser:

- 1. (HSD-1).
 - a. Owner-Furnished, Contractor-Installed (OFCI).

B. Healthcare Waste Receptacles:

- 1. (HCWR-2): Surface-mounted, plastic.
 - a. Owner-Furnished, Owner-Installed (OFOI).

C. Glove Dispensers.

- 1. (GDISP-1) Surface-mounted stainless steel
 - a. Owner-Furnished, Contractor-Installed (OFCI).

2.7 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated..
- B. Steel Sheet: ASTM A 1008, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- C. Steel Sheet: ASTM A 366, cold rolled, commercial quality, 0.0359-inch minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Sheet: ASTM A 653, G60.
- E. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- F. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.
- G. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
 - 1. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- H. Fasteners and Mounting Devices: Provide concealed fasteners where possible.
 - 1. Where fasteners remain exposed to view, provide tamper-resistant and theft-resistant fasteners, of material and finish to match accessory unit.
 - 2. Screws, bolts, and other devices of same material as unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
 - 3. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication
- I. Fasteners, Screws, and Bolts: Hot dip galvanized.
- J. Expansion Shields: Fiber, lead or rubber as recommended by accessory manufacturer for component and substrate. Provide exposed fasteners with finish to match accessories.
- K. Adhesive: Epoxy type contact cement

2.8 FABRICATION

- A. General:
 - 1. Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
 - 2. Shop assemble components and package complete with anchors and fittings.
 - 3. Keys: Provide universal keys for internal access to accessories for servicing and resupplying.
- B. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- C. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- D. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.
- E. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
- F. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.
- G. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
 - 1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - 2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- H. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Deliver inserts and rough-in frames to jobsite at appropriate time for building-in. Provide templates and rough-in measurements as required.
- B. Before starting work notify Architect in writing of conflicts detrimental to installation or operation of units.
- C. Verify exact location of accessories with Architect. Verify blocking is in place prior to gypsum board installation.
- D. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

3.2 INSTALLATION

- A. Install fixtures, accessories and items in accordance with manufacturer's printed instructions.
- B. Install true, plumb and level, securely and rigidly anchored to substrate and sealed to protect structural elements of wall from moisture.
- C. Use tamper proof (security) type fasteners.

3.3 INSTALLED WORK

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish exposed surfaces in accordance with manufacturer's recommendations after removing labels and protective coatings.

END OF SECTION

SECTION 105113 METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Welded metal locker units with hinged doors (LKR-1).
 - 2. Base, top and filler panels.
 - 3. Hooks, latches, and hardware.
 - 4. Attachment hardware.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of metal locker.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.
- B. Shop Drawings: For metal lockers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Show locker trim and accessories.
 - 3. Include locker identification system and numbering sequence.
- C. Samples: For each exposed finish type..

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Engage experienced Installer who is authorized representative of metal locker manufacturer for installation of type of lockers required for this Project.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver lockers until spaces to receive them are clean, dry and ready for locker installation.
- B. Protect lockers from damage during delivery, handling, storage, and installation.
- C. Deliver master keys, control keys, and combination control charts to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers, locker benches, and accessories from single source from single locker manufacturer.
 - 1. Obtain locks from single lock manufacturer.
- B. Manufacturers: Provide Basis of Design or approved equal by one of the following manufacturers:
 - 1. ASI
 - 2. Republic Steel.
 - 3. Hollowell.
 - 4. Interior Medart.
 - 5. Lyon Metal Products.
 - 6. Penco Products.
 - 7. List Industries.

2.2 METAL LOCKERS

- A. Metal Lockers: Welded corridor lockers, prefinished, on continuous zee base, with sloped tops and vented doors.

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1. Basis of Design: Refer to Material ID.
 2. (LKR-1) Configuration: 5-tiered, 12 inches wide by 18 inches deep by 72 inches high.
- B. Continuous Zee Base: Fabricated in manufacturer's standard thickness, but not less than 0.060-inch nominal-thickness steel sheet, height as shown on Drawings. Provide matching end caps.
- C. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B, suitable for exposed applications.
- D. Factory-Finish: Baked enamel or powder coat.
1. Color: Custom color as indicated on Material Identification List (PT).
- E. Doors: One piece; fabricated from 0.075-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
 2. Door Style: Unperforated panel.
- F. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops, Bottoms, and Sides: 0.060-inch nominal thickness.
 2. Backs: 0.048-inch nominal thickness.
 3. Shelves: 0.060-inch nominal thickness, with double bend at front and single bend at sides and back.
- G. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
- H. Hinges: Manufacturer's standard, steel, continuous or knuckle type. Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
- I. Projecting Door Handle and Latch: Finger-lift latch control designed for use with either built-in combination locks or padlocks; positive automatic latching, chromium plated; pry and vandal resistant.
1. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.105-inch nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
 2. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- J. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high. Provide each locker with an identification plate.
- K. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated. Provide one double-prong ceiling hook and two single-prong wall hooks for each locker.
- L. Combination Padlocks: Provided by Owner or User.
- M. Continuous Sloping Tops: Fabricated from nominal 18 ga. steel sheet, with a pitch of approximately 20 degrees. Finish into inside corners and provide vertical exposed endcaps.
- N. Boxed End Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
- O. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet; 2 inch filler at endwalls, and inside corners.

2.3 INSTALLATION ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

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- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
 - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.
 - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.4 FABRICATION

- A. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.
- B. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- C. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- D. Accessible Lockers: Fabricate as follows:
 - 1. Locate bottom shelf no lower than 15 inches above the floor.
 - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
 - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
- B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.
- C. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - 1. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 - 2. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach recess trim to recessed metal lockers with concealed clips.
 - 2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 - 3. Attach sloping-top units to metal lockers, with closures at exposed ends.
- E. Freestanding Locker Benches: Place benches in locations indicated on Drawings.

3.3 INSTALLED WORK

- A. Repair: Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.
- B. Adjusting: Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.
- C. Protection: Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

END OF SECTION

SECTION 115200 AUDIO-VISUAL EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Brackets for flat screen displays (AV EQ-1)

1.2 COORDINATION

- A. Coordinate layout and installation of projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show layouts and types of front-projection screens. Include the following:
 - 1. Drop lengths.
 - 2. Location of seams in viewing surfaces.
 - 3. Location of screen centerline relative to ends of screen case.
 - 4. Anchorage details, including connection to supporting structure for suspended units.
 - 5. Details of juncture of exposed surfaces with adjacent finishes.
 - 6. Location of wiring connections for electrically operated units.
 - 7. Wiring diagrams for electrically operated units.
 - 8. Accessories.
- C. Samples for Initial Selection: For finishes of surface-mounted screen cases.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications:

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver projection screens in manufacturer's protective covering. Handle finished surfaces with care to prevent damage.
- B. Environmental Limitations: Do not deliver or install projection screens until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- C. Pack miscellaneous specialties individually in manner to protect accessory and its finish. Replace damaged units.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

- A. Source Limitations for Projection Screens: Obtain each type of projection screen from single manufacturer. Obtain accessories, including necessary mounting hardware, from screen manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. UL-Listed Products: Provide projection screens that are UL-listed and bear re-examination markers of UL.

2.2 BRACKETS FOR FLAT SCREEN DISPLAYS

- A. General:
 - 1. Products and Manufacturers: Subject to compliance with specified requirements, provide Basis of Design product or approved equal.
 - 2. Provide all hardware and accessories as recommended by bracket manufacturer for complete bracket assembly installation.
- B. (AV EQ-1) Wall-Mounted Brackets for Flat Screen Display: Low-profile mounting bracket assembly; with pre-wire in-wall box and all hardware and accessories for complete installation; and in compliance with the following:
 - 1. Basis of Design: LSTU by Chief, a division of Milestone AV Technologies; or approved equal.
 - 2. Certifications: UL Approved
 - 3. Weight Capacity: 125 lbs..
 - 4. Solution Type: Universal
 - 5. Finish: Baked-on-powder coating in Black color.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates and rough-in measurements as required.
- B. Before starting work notify Architect in writing of conflicts detrimental to installation or operation of units.
- C. Verify with Architect exact location of accessories.

3.2 INSTALLATION

- A. Install wall bracket in accordance with reviewed shop drawings and manufacturer's printed instructions.
- B. Install true, plumb and level, securely and rigidly anchored to substrate.
- C. Adjust installed unit for smooth operation.

3.3 DEMONSTRATION

- A.

END OF SECTION

① Product iQ will be unavailable on Saturday, October 26th from 7:00am to 11:00am CST due to site maintenance. We apologize for any inconvenience.

UL Product iQ®



Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

[See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States Design Criteria and Allowable Variances](#)

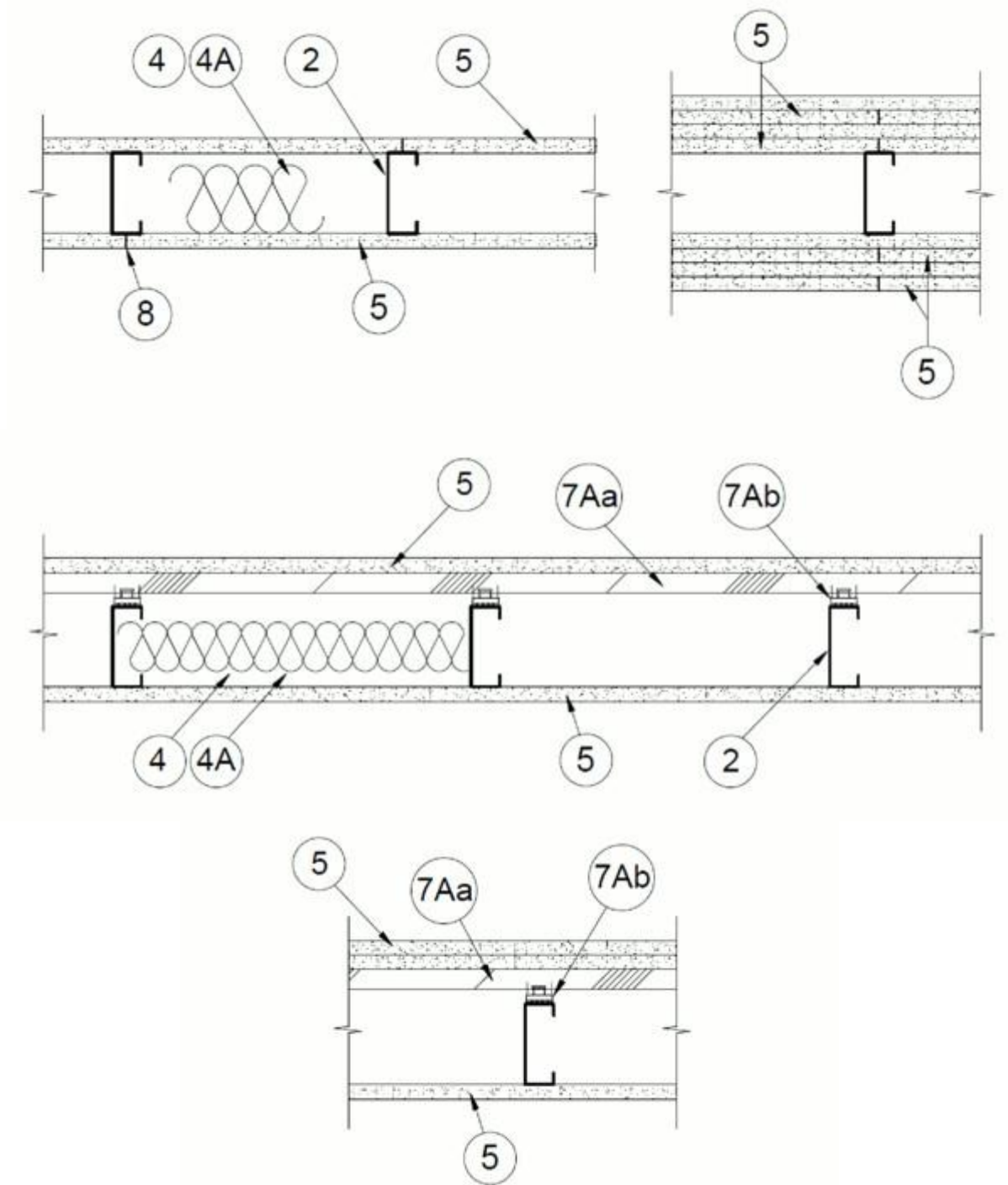
[See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada Design Criteria and Allowable Variances](#)

Design No. **U419**

June 14, 2024

Nonbearing Wall Ratings — 1, 2, 3 or 4 Hr (See Items 4 & 5 through 5J)

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**



1. Floor and Ceiling Runners — (Not Shown) — For use with Item 2 — Channel shaped, fabricated from min 25 MSG corrosion-protected steel, min depth to accommodate stud size, with min 1-1/4 in. long legs, attached to floor and ceiling with fasteners 24 in. OC max.

1A. Framing Members* — Floor and Ceiling Runner — Not Shown — In lieu of Item 1 — For use with Item 2B, proprietary channel shaped runners, 3-5/8 in. deep attached to floor and ceiling with fasteners 24 in. OC max.

CEMCO, LLC — Viper25™ Track

CRACO MFG INC — SmartTrack25™

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper25™ Track

IMPERIAL MANUFACTURING GROUP INC — Viper25™ Track

1B. Framing Members* — Floor and Ceiling Runner — Not Shown — In lieu of Item 1 — For use with Item 2C, proprietary channel shaped runners, 1-1/4 in. wide by 3-5/8 in. deep fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

CEMCO, LLC — Viper20™ Track

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track

IMPERIAL MANUFACTURING GROUP INC — Viper20™ Track

1C. Framing Members* — Floor and Ceiling Runners — (Not Shown) — In lieu of Item 1 — Channel shaped, attached to floor and ceiling with fasteners 24 in. OC. max.

ALLSTEEL & GYPSUM PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV — Type SUPREME D24/30EQD and Type SUPREME D20

QUAIL RUN BUILDING MATERIALS INC — Type SUPREME D24/30EQD and Type SUPREME D20

SCAFCO STEEL STUD MANUFACTURING CO — Type SUPREME D24/30EQD and Type SUPREME D20

STEEL CONSTRUCTION SYSTEMS INC — Type SUPREME D24/30EQD and Type SUPREME D20

TELLING INDUSTRIES L L C — Type SUPREME D24/30EQD and Type SUPREME D20

UNITED METAL PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

1D. Floor and Ceiling Runners — (Not Shown) — For use with Item 2A — Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, min depth to accommodate stud size, with min 1 in. long legs, attached to floor and ceiling with fasteners spaced max 24 in. OC.

1E. Framing Members* — Floor and Ceiling Runners — (Not Shown, As an alternate to Item 1) — For use with Items 2E, 5F or 5G or 5I only, channel shaped, fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, attached to floor and ceiling with fasteners 24 in. OC. max.

CLARKDIETRICH BUILDING SYSTEMS — CD ProTRAK

DMFCWBS L L C — ProTRAK

MBA METAL FRAMING — ProTRAK

RAM SALES L L C — Ram ProTRAK

STEEL STRUCTURAL PRODUCTS L L C — Tri-S ProTRAK

1F. Framing Members* — Floor and Ceiling Runner — Not Shown — In lieu of Item 1 — For use with Item 2F, proprietary channel shaped runners, minimum width to accommodate stud size, with 1- 1/8 in. long legs fabricated from min 0.015 in. (min bare metal thickness) galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

SUPER STUD BUILDING PRODUCTS — The Edge

1G. Framing Members* — Floor and Ceiling Runner — For use with Item 2G, proprietary channel shaped runners, minimum width to accommodate stud size attached to floor and ceiling with fasteners 24 in. OC max.

STUDCO BUILDING SYSTEMS — CROCSTUD Track

1H. Floor and Ceiling Runners — (Not Shown) — Channel shaped, fabricated from min 0.02 in. galv steel, min width to accommodate stud size, with min 1 in. long legs, for use with studs specified below and fabricated from min 0.018 in. galv steel or thicker, attached to floor and ceiling with fasteners spaced max 24 in. OC.

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track VT100

IMPERIAL MANUFACTURING GROUP INC — Viper20™ Track VT100

1I. Framing Members* — Floor and Ceiling Runners — (Not Shown, As an alternate to Item 1) — For use with Items 2H, channel shaped, fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, attached to floor and ceiling with fasteners 24 in. OC. max.

TELLING INDUSTRIES L L C — TRUE-TRACK™

1J. Framing Members* — Floor and Ceiling Runner — Not Shown — In lieu of Item 1 — For use with Item 2I, proprietary channel shaped runners, 3-5/8 in. deep attached to floor and ceiling with fasteners 24 in. OC max.

1K. Framing Members* — Floor and Ceiling Runner — Not Shown — In lieu of Item 1 — For use with Item 2J, proprietary channel shaped runners, 1-1/4 in. wide by 3-5/8 in. deep fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

1L. Framing Members* — Floor and Ceiling Runner — Not Shown — In lieu of Item 1 — For use with Item 2N, proprietary channel shaped runners, 1-1/4 in. wide by min. 3-1/2 in. deep fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

RESCUE METAL FRAMING, L L C — AlphaTRAK

1M. Framing Members* — Floor and Ceiling Runners — Not Shown — As an alternate to Item 1 — For use with Item 2O, proprietary channel shaped runners, min width to accommodate stud size, galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

RONDO BUILDING SERVICES PTY LTD — Rondo Wall Track

1N. Framing Members* — Floor and Ceiling Runners — Not Shown — As an alternate to Item 1 — For use with Item 2P, proprietary channel shaped runners, min width to accommodate stud size, galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

OEG BUILDING MATERIALS — OEG Track

1O. Framing Members* — Floor and Ceiling Runner — Not Shown — In lieu of Item 1 — For use with Item 2Q, proprietary channel shaped runners, min width to accommodate stud size, fabricated from min. 25 MSG (0.018 in. min. bare metal thickness), attached to floor and ceiling with fasteners spaced 24 in. OC max.

CEMCO, LLC — Viper X Track

1P. Framing Members* — Floor and Ceiling Runner — (Not Shown — Alternate to Item 1) — For use with Item 2R, channel shaped runners pre-equipped with proprietary attachment clips. Min. 3-5/8 in. wide. Legs of top runners minimum 3-1/4 in. wide. Legs of bottom runners minimum 1-1/2 in. wide. Runners attached to floor and ceiling with fasteners 24 in. OC max.

HYPERFRAME INC - Hypertrack

1Q. Framing Members* — Floor and Ceiling Runner — Not Shown — In lieu of Item 1 — For use with Item 2S, proprietary channel shaped runners, min width to accommodate stud size, fabricated from min. 20 EQ/22 mils. (min. 0.0221 in. thick) galvanized steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

JJC INTERNATIONAL DISTRIBUTORS — Non-structural Tracks 3-5/8" and 6".

1R. Framing Members* — Floor and Ceiling Runner — Not Shown — In lieu of Item 1 — For use with Item 2T, proprietary channel shaped runners, min width to accommodate stud size, fabricated from min. 25 MSG (0.018 in. min. bare metal thickness), attached to floor and ceiling with fasteners spaced 24 in. OC max

IRONLINE METALS LLC — Bantam Track.

2. **Steel Studs** — Channel shaped, fabricated from min 25 MSG corrosion-protected steel, min depth as indicated under Item 5, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.

2A. **Steel Studs** — (As an alternate to Item 2, For use with Items 5B, 5E, 5H, 5J or Type ULIX) — Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, 3-1/2 in. min depth, spaced a max of 16 in. OC. Studs friction-fit into floor and ceiling runners. Studs to be cut 5/8 to 3/4 in. less than assembly height.

2B. **Framing Members* - Steel Studs** — (As an alternate to Item 2, For use with Items 5C, 5I or Type ULIX) — Proprietary channel shaped studs, 3-5/8 in. deep spaced a max of 24 in. OC. Studs to be cut 3/4 in less than the assembly height and installed with a 1/2 in. gap between the end of the stud and track at the bottom of the wall. For direct attachment of gypsum board only.

CEMCO, LLC — Viper25™

CRACO MFG INC — SmartStud25™

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper25™

IMPERIAL MANUFACTURING GROUP INC — Viper25™

2C. **Framing Members* — Steel Studs** — Not Shown — In lieu of Item 2 — proprietary channel shaped steel studs, min depth as indicated under Item 5, spaced a max if 24 in. OC, fabricated from min 0.018 in. thick galv steel. Studs cut 3/8 in. to 3/4 in. less in lengths than assembly heights.

CEMCO, LLC — Viper20™

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™

IMPERIAL MANUFACTURING GROUP INC — Viper20™

2D. **Framing Members* — Steel Studs** — In lieu of Item 2 — Channel shaped studs, min depth as indicated under Item 5, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.

ALLSTEEL & GYPSUM PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV — Type SUPREME D24/30EQD and Type SUPREME D20

QUAIL RUN BUILDING MATERIALS INC — Type SUPREME D24/30EQD and Type SUPREME D20

SCAFCO STEEL STUD MANUFACTURING CO — Type SUPREME D24/30EQD and Type SUPREME D20

STEEL CONSTRUCTION SYSTEMS INC — Type SUPREME D24/30EQD and Type SUPREME D20

TELLING INDUSTRIES L L C — Type SUPREME D24/30EQD and Type SUPREME D20

UNITED METAL PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

2E. **Framing Members* — Steel Studs** — (Not Shown, As an alternate to Item 2) — For use with Items 5F or 5G or 5I or Type ULIX only, channel shaped studs, min depth as indicated under Item 5F, 5G or 5I, fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.

CLARKDIETRICH BUILDING SYSTEMS — CD ProSTUD

DMFCWBS L L C — ProSTUD

MBA METAL FRAMING — ProSTUD

RAM SALES L L C — Ram ProSTUD

STEEL STRUCTURAL PRODUCTS L L C — Tri-S ProSTUD

2F. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 — proprietary channel shaped steel studs, minimum width indicated under Item 5, 1-1/4 in. deep fabricated from min 0.015 in. (min bare metal thickness) galvanized steel. Studs 3/8 in. to 3/4 in. less in lengths than assembly heights.

SUPER STUD BUILDING PRODUCTS — The Edge

2G. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 — proprietary channel shaped studs, minimum width indicated under Item 5, Studs to be cut 3/8 to 3/4 in less than the assembly height.

STUDCO BUILDING SYSTEMS — CROCSTUD

2H. Framing Members* — Steel Studs — (Not Shown, As an alternate to Item 2) — Fabricated from min. 0.015 in. (min bare metal thickness) galvanized steel, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.

TELLING INDUSTRIES L L C — TRUE-STUD™

2I. Framing Members* — Steel Studs —

2J. Framing Members* — Metal Studs — Not Shown — In lieu of Item 2 — proprietary channel shaped steel studs, min depth as indicated under Item 5, spaced a max if 24 in. OC, fabricated from min 0.018 in. thick galv steel. Studs cut 3/8 in. to 3/4 in. less in lengths than assembly heights

2K. Framing Members* — Steel Studs — As an alternate to Item 2 — For use with Item 1, channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, min depth as indicated under Item 5, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.

EB METAL INC — NITROSTUD

2L. Framing Members* — Steel Studs — As an alternate to Item 2 — For use with Item 1, channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, min depth as indicated under Item 5, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.

OLMAR SUPPLY INC — PRIMESTUD

2M. Framing Members* — Steel Studs — As an alternate to Item 2 — For use with Item 1, channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, min depth as indicated under Item 5, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.

MARINO/WARE, DIV OF WARE INDUSTRIES INC — StudRite™

2N. Framing Members* — Steel Studs — As an alternate to Item 2 — proprietary channel shaped steel studs, min depth 3-1/2 in. and as indicated under Item 5, spaced a max of 24 in. OC, fabricated from min 0.018 in. thick galv steel. Studs cut 3/8 in. to 3/4 in. less in length than assembly height.

RESCUE METAL FRAMING, L L C — AlphaSTUD

2O. Framing Members* — Steel Studs — As an alternate to Item 2 — proprietary channel shaped steel studs, min width as indicated under Item 5, galv steel. Studs to be cut 3/8 to 3/4 in. less in lengths than assembly height. Spaced 24 in. OC max.

RONDO BUILDING SERVICES PTY LTD — Rondo Lipped Wall Stud

2P. Framing Members* — Steel Studs — As an alternate to Item 2 — proprietary channel shaped steel studs, min width as indicated under Item 5, min 25 MSG galv steel. Studs to be cut 3/8 to 3/4 in. less in lengths than assembly height. Spaced 24 in. OC max.

OEG BUILDING MATERIALS — OEG Stud

2Q. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 — For use with Item 1O, proprietary channel shaped steel studs, min depth as indicated under Item 5, spaced a max of 24 in. OC, fabricated from min 25 MSG (0.018 in. min. bare metal thickness). Studs cut 3/8 in. to 3/4 in. less in lengths than assembly heights.

CEMCO, LLC — Viper X

2R. Framing Members* — Steel Studs — (Not Shown — Alternate to Item 2, For use with Item 1P) — Channel shaped steel studs with attachment clips at top and bottom, min 3-5/8 in. depth, spaced a max of 24 in. OC. Studs clipped into floor and ceiling runners (Item 1P). Max 2-3/8 in. extension reveal from top of stud to inside of ceiling runner.

HYPERFRAME INC — Hyperstud

2S. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 — For use with Item 1Q, proprietary channel shaped steel studs, min depth as indicated under Item 5, spaced a max of 24 in. OC, fabricated from min. 20 EQ/22 mils. (min. 0.0221 in. thick) galvanized steel. Studs cut 3/8 in. to 3/4 in. less in lengths than assembly heights.

JJC INTERNATIONAL DISTRIBUTORS — Non-structural Studs 3-5/8" and 6".

2T. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 — For use with Item 1R, proprietary channel shaped steel studs, min depth as indicated under Item 5, spaced a max of 24 in. OC, fabricated from min 25 MSG (0.018 in. min. bare metal thickness). Studs cut 3/8 in. to 3/4 in. less in lengths than assembly heights.

IRONLINE METALS LLC — Bantam Stud.

3. Wood Structural Panel Sheathing — (Optional, For use with Item 5 Only) — (Not Shown) — 4 ft wide, 7/16 in. thick oriented strand board (OSB) or 15/32 in. thick structural 1 sheathing (plywood) complying with DOC PS1 or PS2, or APA Standard PRP-108, manufactured with exterior glue, applied horizontally or vertically to the steel studs. Vertical joints centered on studs, and staggered one stud space from wallboard joints. Attached to studs with flat-head self-drilling tapping screws with a min. head diam. of 0.292 in. at maximum 6 in. OC. in the perimeter and 12 in. OC. in the field. When used, gypsum panels attached over OSB or plywood panels and fastener lengths for gypsum panels increased by min. 1/2 in.

4. Batts and Blankets* — (Required as indicated under Item 5) — Mineral wool batts, friction fitted between studs and runners. Min nom thickness as indicated under Item 5.

See **Batts and Blankets** (BKNV or BZJZ) Categories for names of Classified companies.

4A. Batts and Blankets* — (Optional – as an alternate to item 4) — Placed in stud cavities, any glass fiber or mineral wool insulation bearing the UL Classification Marking as to Surface Burning Characteristics and/or Fire Resistance.

See **Batts and Blankets** (BKNV or BZJZ) Categories for names of Classified companies.

4B. Fiber, Sprayed* — (Optional – as an alternate for items 4 or 4A, for use with Type ULIX) Where insulation is required - Spray applied granulated mineral fiber material. The fiber is applied with adhesive at a minimum density of 4.0 pcf to completely fill the wall cavity in accordance with the application instructions supplied with the product. See **Fiber, Sprayed** (CCAZ).

AMERICAN ROCKWOOL MANUFACTURING, LLC — Type Rockwool Premium Plus

4C. Foamed Plastic* — (As an alternate for items 4, 4A or 4B, for use with Item 5K) — Spray applied, foamed plastic insulation, at any thickness from partial fill to completely filling stud cavity, for 2 hour rated assemblies only. When foamed plastic is used, minimum stud depth shall be 3-1/2 in. with minimum 20 MSG steel thickness.

CARLISLE SPRAY FOAM INSULATION — Types SealTite ONE, SealTite Pro Closed Cell (CC), SealTite Pro Open Cell (OC), SealTite Pro OCX, SealTite Pro No Trim 21, SealTite Pro One Zero, Foamsulate Closed Cell, Foamsulate OCX, Foamsulate 70, and Foamsulate HFO.

4D. Foamed Plastic* — (As an alternate for items 4, 4A or 4B, for use with Item 5K) — Spray applied, foamed plastic insulation, at any thickness from partial fill to completely filling stud cavity, for up to 2 hour rated assemblies only. When foamed plastic is used, minimum stud depth shall be 3-1/2 in. with minimum 20 MSG steel thickness.

BASF CORP - Enertite® NM, Enertite® G, FE178®, Spraytite® 178, Spraytite® 81206, Walltite® 200, Walltite® US, Walltite® US-N, Walltite HP+, FE137®, FE158®, Spraytite® 158, Spraytite® SP, Spraytite® 81205, Spraytite® Comfort XL, Walltite® XL, Walltite® MAX, Walltite® LWP, Walltite® Plus and Enertite® Max

5. Gypsum Board* — Gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Vertical joints in adjacent layers (multilayer systems) staggered one stud cavity. Horizontal joints need not be backed by steel framing. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered. Horizontal edge joints and horizontal butt joints in adjacent layers (multilayer systems) staggered a min of 12 in. Horizontal edge joints and horizontal butt joints in adjacent layers (multilayer systems) with Type ULIX need not be staggered. The thickness and number of layers for the 1 hr, 2 hr, 3 hr and 4 hr ratings are as follows:

Gypsum Board Protection on Each Side of Wall

Rating, Hr	Min Stud Depth, in. Items 2, 2C, 2D, 2F, 2G, 2O	No. of Layers & Thkns of Panel	Min Thkns of Insulation (Item 4)
1	3-1/2	1 layer, 5/8 in. thick	Optional
1	2-1/2	1 layer, 1/2 in. thick	1-1/2 in.
1	1-5/8	1 layer, 3/4 in. thick	Optional
2	1-5/8	2 layers, 1/2 in. thick	Optional
2	1-5/8	2 layers, 5/8 in. thick	Optional
2	3-1/2	1 layer, 3/4 in. thick	3 in.
3	1-5/8	3 layers, 1/2 in. thick	Optional
3	1-5/8	2 layers, 3/4 in. thick	Optional
3	1-5/8	3 layers, 5/8 in. thick	Optional
4	1-5/8	4 layers, 5/8 in. thick	Optional
4	1-5/8	4 layers, 1/2 in. thick	Optional
4	2-1/2	2 layers, 3/4 in. thick	2 in.

CGC INC — 1/2 in. thick Type C, IP-X2 or IPC-AR; WRC, 5/8 in. thick Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULIX, WRX or WRC; 3/4 in. thick Types IP-X3 or ULTRACODE

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — 1/2 in. thick Type C and 5/8 in. thick Type SCX

UNITED STATES GYPSUM CO — 1/2 in. thick Type C, IP-X2, IPC-AR or WRC; 5/8 in. thick Type SCX, SGX, SHX, ULIX, WRX, IP-X1, AR, C, WRC, FRX-G, IP-AR, IP-X2, IPC-AR; 3/4 in. thick Types IP-X3 or ULTRACODE

USG BORAL DRYWALL SFZ LLC — 1/2 in. Type C; 5/8 in. Types C, SCX, SGX, ULTRACODE

USG MEXICO S A DE C V — 1/2 in. thick Type C, IP-X2, IPC-AR or WRC; 5/8 in. thick Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, WRX, WRC or; 3/4 in. thick Types IP-X3 or ULTRACODE

When Item 7B, **Steel Framing Members***, is used, Nonbearing Wall Rating is limited to 1 Hr. Min. stud depth is 3-1/2 in., min. thickness of insulation (Item 4) is 3 in., and two layers of gypsum board panels (1/2 in. or 5/8 in. thick) shall be attached to furring channels as described in Item 6. One layer of gypsum board panels (1/2 in. or 5/8 in. thick) attached to opposite side of stud without furring channels as described in Item 6.

5A. Gypsum Board* — (As an alternate to Item 5) — 5/8 in. thick, 24 to 54 in. wide, applied horizontally as the outer layer to one side of the assembly. Secured as described in Item 6.

CGC INC — Type SHX.

UNITED STATES GYPSUM CO — Type FRX-G, SHX.

USG MEXICO S A DE C V — Type SHX.

5B. Gypsum Board* — (Not Shown) — As an alternate to Item 5 when used as the base layer on one or both sides of wall when 5/8 in. or 3/4 in. thick products are specified. For direct attachment only to steel studs Item 2A, (not to be used with Item 3) — Nom 5/8 in. or 3/4 in. may be used as alternate to all 5/8 in. or 3/4 in. shown in Item 5, Wallboard Protection on Each Side of Wall table. Nom 5/8 in. or 3/4 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Gypsum board secured to 20 MSG steel studs Item 2A with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. To be used with Lead Batten Strips (see Item 11) or Lead Discs or Tabs (see Item 12).

RAY-BAR ENGINEERING CORP — Type RB-LBG

5C. Gypsum Board* — (For Use With Item 2B) — Rating Limited to 1 Hour. 5/8 in. thick, 48 in. wide, Gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. (Vertical Application) - The gypsum board is to be installed on each side of the studs with 1 in. long Type S coated steel screws spaced 8 in. OC starting 4 in. from the edge of the board at the vertical edges and 12 in. OC starting 6 in. from the edge of the board at the center of each board. Gypsum boards are to be secured to the top and bottom track with screws spaced 8 in. OC starting 4 in. from the board edge. Fasteners shall not penetrate through both the stud and the track at the same time. Vertical joints are to be centered over studs and staggered one stud cavity on opposite sides of studs. (Horizontal Application) - The gypsum board is to be installed on each side of the studs with 1 in. long Type S coated steel screws spaced 8 in. OC starting 4 in. from the edge of the board at the vertical edges and 12 in. OC starting 6 in. from the edge of the board at the center of each board. Gypsum boards are to be secured to the top and bottom track with screws spaced 8 in. OC starting 4 in. from the board edge. Fasteners shall not penetrate through both the stud and the track at the same time. All horizontal joints are to be backed as outlined under section VI of Volume 1 in the Fire Resistive Directory.

CGC INC — Type SCX, ULIX.

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — Type SCX

UNITED STATES GYPSUM CO — Type SCX, SGX, ULIX.

USG BORAL DRYWALL SFZ LLC — Type SCX

USG MEXICO S A DE C V — Type SCX

5D. Gypsum Board* — (As an alternate to Item 5) — 5/8 in. thick, 48 in. wide, applied vertically or horizontally. Secured as described in Item 6. For use with Items 1 and 2 only.

CGC INC — Type USGX

UNITED STATES GYPSUM CO — Type USGX

USG BORAL DRYWALL SFZ LLC — Type USGX

USG MEXICO S A DE C V — Type USGX

5E. Gypsum Board* — (Not Shown) — (As an alternate to Item 5 when used as the base layer on one or both sides of wall when 1/2 in. or 5/8 in thick products are specified, For direct attachment only to steel studs Item 2A, not to be used with Item 3). Nominal 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and

staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-1/4 in. long Type S-12 (or No. 6 by 1-1/4 in. long bugle head fine driller) steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field.

NEW ENGLAND LEAD BURNING CO INC, DBA NELCO — Nelco

5F. Gypsum Board* — (As an alternate to Item 5) — For use with Items 1E and 2E and limited to 1 Hour Rating only, Gypsum panels with beveled, square or tapered edges, applied vertically, and fastened to the steel studs with 1 in. long Type S screws spaced 8 in. OC along vertical and bottom edges and 12 in. OC in the field. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Steel stud depth shall be a minimum 3-5/8 in.

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — Type SCX

UNITED STATES GYPSUM CO — 5/8 in. thick Type SCX, SGX, ULIX

USG BORAL DRYWALL SFZ LLC — 5/8 in. thick Type SCX, SGX

5G. Gypsum Board* — (As an alternate to Item 5) — For use with Items 1E and 2E only, Gypsum panels with beveled, square or tapered edges, applied vertically or horizontally, as specified in the table below and fastened to the steel studs as described in Item 6. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Vertical joints in adjacent layers (multilayer systems) staggered one stud cavity. Horizontal joints need not be backed by steel framing. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered. Horizontal edge joints and horizontal butt joints in adjacent layers (multilayer systems) staggered a min of 12 in. The thickness and number of layers for the 2 hr, 3 hr and 4 hr ratings are as follows:

Gypsum Board Protection on Each Side of Wall

Rating, Hr	Min Stud Depth, in. Item 2E	No. of Layers & Thickness of Panel	Min Thkns of Insulation (Item 4)
2	1-5/8	2 layers, 1/2 in. thick	Optional
2	1-5/8	2 layers, 5/8 in. thick	Optional
3	1-5/8	3 layers, 1/2 in. thick	Optional
3	1-5/8	3 layers, 5/8 in. thick	Optional
4	1-5/8	4 layers, 5/8 in. thick	Optional
4	1-5/8	4 layers, 1/2 in. thick	Optional

CGC INC — 1/2 in. thick Type C, IP-X2 or IPC-AR; 5/8 in. thick Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULIX or 3/4 in. thick Types IP-X3 or ULTRACODE

THE SIAM GYPSUM INDUSTRY (SONGKHLA) CO — 1/2 in. thick Types C and 5/8 in. thick SCX

UNITED STATES GYPSUM CO — 1/2 in. thick Type C, IP-X2, IPC-AR or; 5/8 in. thick Type SCX, SGX, SHX, IP-X1, AR, C, , FRX-G, IP-AR, IP-X2, IPC-AR, ULIX; 3/4 in. thick Types IP-X3 or ULTRACODE

USG BORAL DRYWALL SFZ LLC — 1/2 in. Type C; 5/8 in. Types C, SCX, SGX, ULTRACODE

USG MEXICO S A DE C V — 1/2 in. thick Type C, IP-X2, IPC-AR or; 5/8 in. thick Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, or; 3/4 in. thick Types IP-X3 or ULTRACODE

5H. Gypsum Board* — (Not Shown) — (As an alternate to Item 5 when used as the base layer on one or both sides of wall when 5/8 or 3/4 in thick products are specified. For direct attachment only to steel studs Item 2A, (not to be used with Item 3) - Nom 5/8 or 3/4 in. may be used as alternate to all 5/8 or 3/4 in. shown in Item 5, Wallboard Protection on Each Side of Wall table. Nom 5/8 or 3/4 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over 20 MSG steel studs and staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-1/4 in. long Type S-12 steel

screws spaced 8 in. OC at perimeter and 12 in. OC in the field. Gypsum board secured to 20 MSG steel studs Item 2B with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. For Joint Compound see Item 5. To be used with Lead Batten Strips (see Item 11A) or Lead Discs (see Item 12A).

MAYCO INDUSTRIES INC — Type X-Ray Shielded Gypsum

5I. **Gypsum Board*** — (As an alternate to Item 5) — Nom. 5/8 in. thick gypsum panels with beveled, square or tapered edges installed as described in Item 5. Steel stud minimum depth shall be as indicated in Item 5.

CGC INC — Type ULIX, ULX

UNITED STATES GYPSUM CO — Type ULIX, ULX

USG MEXICO S A DE C V — Type ULX

5J. **Gypsum Board*** — (Not Shown) — (As an alternate to Item 5 when used as the base layer on one or both sides of wall when 1/2 in. or 5/8 in thick products are specified, For direct attachment only to steel studs Item 2A, not to be used with Item 3). Nom 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-1/4 in. long Type S-12 steel screws gypsum panel steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. Lead batten strips required behind vertical joints of lead backed gypsum wallboard and optional at remaining stud locations. Lead batten strips, min 2 in. wide, max 8 ft long with a max thickness of 0.14 in. placed on the face of studs and attached to the stud with construction adhesive and two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead discs, nominal 3/8 in. diam by max 0.085 in. thick. Compression fitted or adhered over the screw heads. Lead batten strips and discs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".

RADIATION PROTECTION PRODUCTS INC — Type RPP - Lead Lined Drywall

5K. **Gypsum Board*** — (As an alternate to Item 5 when Foam Plastic insulation (Items 4C or 4D) is used) — Any 5/8 in. thick, 4 ft. wide, Gypsum Board listed in Item 5 above. Applied vertically with vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Gypsum panels secured to studs with 1-1/4 in. long Type S steel screws spaced 8 in. OC at perimeter and in the field. For 2 layer assemblies outer layer will be attached to studs over inner layer with the 1-7/8 in. long steel screws spaced 8 in. OC.

6. **Fasteners** — (Not Shown) — For use with Items 2 and 2F - Type S or S-12 steel screws used to attach panels to studs (Item 2) or furring channels (Item 7). **Single layer systems:** 1 in. long for 1/2 and 5/8 in. thick panels or 1-1/4 in. long for 3/4 in. thick panels, spaced 8 in. OC when panels are applied horizontally, or 8 in. OC along vertical and bottom edges and 12 in. OC in the field when panels are applied vertically. **Single layer system with Type ULIX:** 1 in. long, spaced 12 in. OC in the field and perimeter, when panels are applied horizontally or vertically. **Two layer systems:** First layer- 1 in. long for 1/2 and 5/8 in. thick panels or 1-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels or 2-1/4 in. long for 3/4 in. thick panels, spaced 16 in. OC with screws offset 8 in. from first layer. **Three-layer systems:** First layer- 1 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Third layer- 2-1/4 in. long for 1/2 in., 5/8 in. thick panels or 2-5/8 in. long for 5/8 in. thick panels, spaced 12 in. OC. Screws offset min 6 in. from layer below. **Four-layer systems:** First layer- 1 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Second layer- 1-5/8 in. long for 1/2 in., 5/8 in. thick panels, spaced 24 in. OC. Third layer- 2-1/4 in. long for 1/2 in. thick panels or 2-5/8 in. long for 5/8 in. thick panels, spaced 24 in. OC. Fourth layer- 2-5/8 in. long for 1/2 in. thick panels or 3 in. long for 5/8 in. thick panels, spaced 12 in. OC. Screws offset min 6 in. from layer below.

7. **Furring Channels** — (Optional, Not Shown, for single or double layer systems) — Resilient furring channels fabricated from min 25 MSG corrosion-protected steel, spaced vertically a max of 24 in. OC. Flange portion attached to each intersecting stud with 1/2 in. long Type S-12 steel screws. Not for use with Item 5A.

7A. **Framing Members*** — (Optional on one or both sides, not shown, for single or double layer systems) — As an alternate to Item 7, furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. 2-9/16 in. or 2-23/32 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board attached to furring channels as described in

Item 6. Not for use with Item 5A.

b. **Steel Framing Members*** — Used to attach furring channels (Item 7Aa) to studs (Item 2). Clips spaced max. 48 in. OC. RSIC-1 and RSIC-1 (2.75) clips secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. RSIC-V and RSIC-V (2.75) clips secured to studs with No. 8 x 9/16 in. minimum self-drilling, S-12 steel screw through the center hole. Furring channels are friction fitted into clips. RSIC-1 and RSIC-V clips for use with 2-9/16 in. wide furring channels. RSIC-1 (2.75) and RSIC-V (2.75) clips for use with 2-23/32 in. wide furring channels.

PAC INTERNATIONAL L L C — Types RSIC-1, RSIC-V, RSIC-1 (2.75), RSIC-V (2.75).

7B. **Framing Members*** — (Optional, Not Shown) — As an alternate to Item 7, for single or double layer systems, furring channels and Steel Framing Members on only one side of studs as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel, spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Batts and Blankets placed in stud cavity as described in Item 5. Two layers of gypsum board attached to furring channels as described in Item 5. Not for use with Item 5A.

b. **Steel Framing Members*** — Used to attach furring channels (Item 7Ba) to one side of studs (Item 2) only. Clips spaced 48 in. OC., and secured to studs with two No. 8 x 2-1/2 in. coarse drywall screws, one through the hole at each end of the clip. Furring channels are friction fitted into clips.

KINETICS NOISE CONTROL INC — Type Isomax

7C. **Framing Members*** — (Not Shown) — (Optional on one or both sides, not shown, for single or double layer systems) — As an alternate to Item 7, furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. 2-3/8 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board attached to furring channels as described in Item 6. Not for use with Item 5A.

b. **Steel Framing Members*** — Used to attach furring channels (Item 7Ca) to studs (Item 2). Clips spaced max. 48 in. OC. GENIECLIPS secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. Furring channels are friction fitted into clips.

PLITEQ INC — Type GENIECLIP

7D. **Steel Framing Members*** — (Optional on one or both sides, not shown, for single or double layer systems) — Furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire.. Gypsum board attached to furring channels as described in Item 6. Not for use with Item 5A.

b. **Steel Framing Members*** — Used to attach furring channels (Item 7Da) to studs. Clips spaced 48 in. OC., and secured to studs with 2 in. coarse drywall screw with 1 in. diam washer through the center hole. Furring channels are friction fitted into clips

STUDCO BUILDING SYSTEMS — RESILMOUNT Sound Isolation Clips - Type A237 or A237R

7E. **Steel Framing Members*** — (Optional on one or both sides, not shown, for single or double layer systems) — Furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item 7Eb. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire.. Gypsum board attached to furring channels as described in Item 6. Not for use with Item 5A and 5E.

b. **Steel Framing Members*** — Used to attach furring channels (Item 7Ea) to studs. Clips spaced 48 in. OC., and secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center hole. Furring channels are friction fitted into clips.

REGUPOL AMERICA — Type SonusClip

7F. Steel Framing Members* — (Optional on one or both sides, not shown, for single or double layer systems) — Resilient channels and Steel Framing Members as described below:

a. **Resilient Channels** — Formed of No. 25 MSG galv steel, spaced 24 in. OC, and perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and secured in place with two No. 8 15 x 1/2 in. Philips Modified Truss screws spaced 2-1/2 in. from the center of the overlap. Gypsum board attached to resilient channels as described in Item 5. Not for use with Item 5A and 5E.

b. **Steel Framing Members*** — Used to attach resilient channels (Item 7Fa) to studs. Clips spaced 48 in. OC., and secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center hole. Resilient channels are secured to clips with one No. 10 x 1/2 in. pan-head self-drilling screw.

KEENE BUILDING PRODUCTS CO INC — Type RC+ Assurance Clip

7G. Framing Members* — (Optional on one or both sides, not shown, for single or double layer systems) — As an alternate to Item 7, furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. 2-23/32 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board attached to furring channels as described in Item 6. Not for use with Item 5A.

b. **Steel Framing Members*** — Used to attach furring channels (Item 7Ga) to studs (Item 2). Clips spaced max. 48 in. OC. Clips secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center hole. Furring channels are friction fitted into clips.

CLARKDIETRICH BUILDING SYSTEMS — Type ClarkDietrich Sound Clip

8. Joint Tape and Compound — Vinyl or casein, dry or premixed joint compound applied in two coats to joints and screw heads of outer layers. Paper tape, nom 2 in. wide, embedded in first layer of compound over all joints of outer layer panels. Paper tape and joint compound may be omitted when gypsum panels are supplied with a square edge.

9. Siding, Brick or Stucco — (Optional, Not Shown) — Aluminum, vinyl or steel siding, brick veneer or stucco, meeting the requirements of local code agencies, installed over gypsum panels. Brick veneer attached to studs with corrugated metal wall ties attached to each stud with steel screws, not more than each sixth course of brick.

10. Caulking and Sealants* — (Optional, Not Shown) — A bead of acoustical sealant applied around the partition perimeter for sound control.

UNITED STATES GYPSUM CO — Type AS

11. Lead Batten Strips — (Not Shown, For Use With Item 5B) — Lead batten strips, min 1-1/2 in. wide, max 10 ft long with a max thickness of 0.125 in. Strips placed on the interior face of studs and attached from the exterior face of the stud with two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead batten strips to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 5B) and optional at remaining stud locations. Required behind vertical joints.

11A. Lead Batten Strips — (Not Shown, For Use With Item 5H) — Lead batten strips, 2 in. wide, max 10 ft long with a max thickness of 0.140 in. Strips placed on the face of studs and attached to the stud with two min. 1 in. long min. Type S-8 pan head steel screws, one at the top of the strip and one at the bottom of the strip or with one min. 1 in. long min. Type S-8 pan head steel screw at the top of the strip. Lead batten strips to have a purity of 99.5% meeting the Federal specification QQ-L-201f, Grades "B, C or D". Lead batten strips required behind vertical joints of lead backed gypsum wallboard and optional at remaining stud locations.

12. Lead Discs or Tabs — (Not Shown, For Use With Item 5B) — Used in lieu of or in addition to the lead batten strips (Item 11) or optional at other locations - Max 3/4 in. diam by max 0.125 in. thick lead discs compression fitted or adhered over steel screw heads

or max 1/2 in. by 1-1/4 in. by max 0.125 in. thick lead tabs placed on gypsum boards (Item 5B) underneath screw locations prior to the installation of the screws. Lead discs or tabs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".

12A. **Lead Discs** — (Not Shown, for use with Item 5H) — Max 5/16 in. diam by max 0.140 in. thick lead discs compression fitted or adhered over steel screw heads. Lead discs to have a purity of 99.5% meeting the Federal Specification QQ-L-201f, Grades "B, C or D".

13. **Lead Batten Strips** — (Not Shown, For Use With Item 5E) — Lead batten strips, 2 in. wide, max 10 ft long with a max thickness of 0.142 in. Strips placed on the face of studs and attached to the stud with two min. 1 in. long min. Type S-8 pan head steel screws, one at the top of the strip and one at the bottom of the strip or with one min. 1 in. long min. Type S-8 pan head steel screw at the top of the strip. Lead batten strips to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 5E) and optional at remaining stud locations.

14. **Lead Tabs** — (Not Shown, For Use With Item 5E) — 2 in. wide, 5 in. long with a max thickness of 0.142 in. Tabs friction-fit around front face of stud, the stud folded back flange, and the back face of the stud. Tabs required at each location where a screw (that secures the gypsum boards, Item 5E) will penetrate the steel stud. Lead tabs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead tabs may be held in place with standard adhesive tape if necessary.

15. **Barrier Mesh** — (Optional, Not Shown) - Attached to steel studs on one or both sides of the wall using Barrier Mesh Clips spaced at maximum 12 inches on center vertically, using a flat head type screw penetrating through the steel at least 3/8 of an inch. For Steel Studs less than 0.033 inches in thickness, use self-piercing screws. For Steel Studs equal to or greater than 0.033 inches in thickness, use steel drill screws (self-tapping). Gypsum Board (Item 5) to be installed directly over the Barrier Mesh using prescribed screw patterns with lengths increased by a minimum 1/8 in. Barrier Mesh may be installed with the long dimension of the diamond pattern positioned vertically or horizontally. Barrier Mesh joints may occur as butt joints at the framing members and secured using the Barrier Mesh Clips or occur in between framing members as overlapping joints secured using 18 SWG wire ties spaced a maximum 12 in. on center.

CLARKDIETRICH BUILDING SYSTEMS — Barrier Mesh, Barrier Mesh Clips

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2024-06-14

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- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

BXUV - Fire Resistance Ratings - ANSI/UL 263 Certified for United States

BXUV7 - Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada

See General Information for Fire-resistance Ratings - ANSI/UL 263 Certified for United States
Design Criteria and Allowable Variances

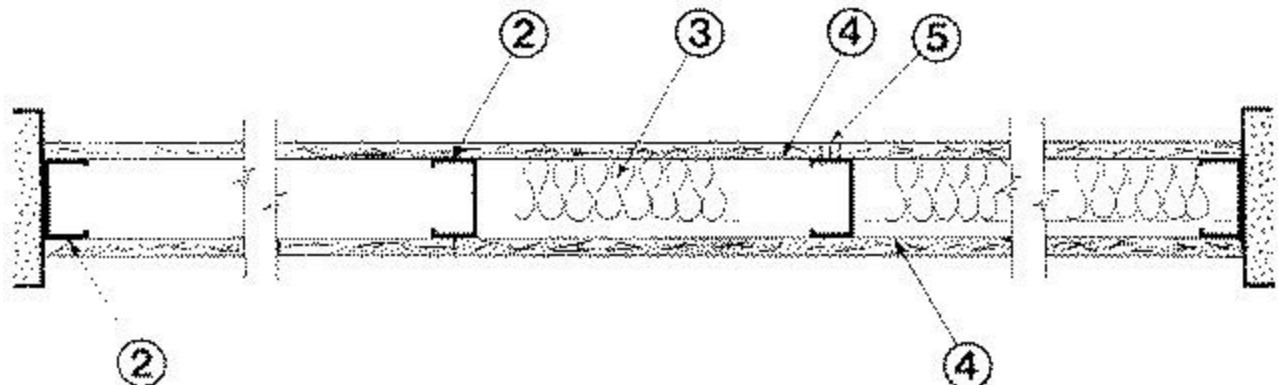
See General Information for Fire Resistance Ratings - CAN/ULC-S101 Certified for Canada
Design Criteria and Allowable Variances

Design No. **U465**

June 14, 2024

Nonbearing Wall Rating — 1 HR.

* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



1. Floor and Ceiling Runners — (Not Shown) — Channel shaped runners, 3-5/8 in. deep (min), 1-1/4 in. legs, formed from min No. 25 MSG galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

1A. Framing Members* — Floor and Ceiling Runners — (Not Shown) — As an alternate to Item 1 — Channel shaped, min 3-5/8 in. deep, attached to floor and ceiling with fasteners 24 in. OC. max.

ALLSTEEL & GYPSUM PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV — Type SUPREME D24/30EQD and Type SUPREME D20

QUAIL RUN BUILDING MATERIALS INC — Type SUPREME D24/30EQD and Type SUPREME D20

SCAFCO STEEL STUD MANUFACTURING CO — Type SUPREME D24/30EQD and Type SUPREME D20

STEEL CONSTRUCTION SYSTEMS INC — Type SUPREME D24/30EQD and Type SUPREME D20

TELLING INDUSTRIES L L C — Type SUPREME D24/30EQD and Type SUPREME D20

UNITED METAL PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

1B. Framing Members* — Floor and Ceiling Runners — Not Shown — In lieu of Item 1 — For use with Item 2B, proprietary channel shaped runners, 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 0.020 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

CEMCO, LLC — Viper20™ Track

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track

IMPERIAL MANUFACTURING GROUP INC — Viper20™ Track

1C. Floor and Ceiling Runners — (Not Shown) — For use with Item 2C — Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, min depth to accommodate stud size, with min 1 in. long legs, attached to floor and ceiling with fasteners spaced max 24 in. OC.

1D. Framing Members* — Floor and Ceiling Runners — Not Shown — In lieu of Items 1 through 1C — For use with Item 2D and 4G only, proprietary channel shaped runners, 1-1/4 in. deep by min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

CLARKDIETRICH BUILDING SYSTEMS — CD ProTRAK

DMFCWBS L L C — ProTRAK

MBA METAL FRAMING — ProTRAK

RAM SALES L L C — Ram ProTRAK

STEEL STRUCTURAL PRODUCTS L L C — Tri-S ProTRAK

1E. Framing Members* — Floor and Ceiling Runners — Not Shown — In lieu of Items 1 through 1D — For use with Item 2E and 4I only, proprietary channel shaped runners, 1-1/4 in. deep by min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

TELLING INDUSTRIES L L C — TRUE-TRACK™

1F. Framing Members* — Floor and Ceiling Runners — Not Shown — In lieu of Items 1 through 1E — For use with Item 2, channel shaped runners, 1-1/4 in. deep by min 3-5/8 in. wide fabricated from min 25 MSG steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

KIRII (HONG KONG) LTD — Type KIRII

1G. Framing Members* — Floor and Ceiling Runners — Not Shown — In lieu of Items 1 through 1F — For use with Item 2, channel shaped runners, 1-1/4 in. deep by min 3-5/8 in. wide, attached to floor and ceiling with fasteners spaced 24 in. OC max.

STUDCO BUILDING SYSTEMS — CROCSTUD Track

1H. Floor and Ceiling Runners — (Not Shown) — Channel shaped, fabricated from min 0.02 in. galv steel, min width to accommodate stud size, with min 1 in. long legs, for use with studs specified below and fabricated from min 0.02 in. galv steel or thicker, attached to floor and ceiling with fasteners spaced max 24 in. OC.

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track VT100

IMPERIAL MANUFACTURING GROUP INC — Viper20™ Track VT100

1I. Framing Members* — Floor and Ceiling Runners — Not Shown — In lieu of Item 1 — For use with Item 2H, proprietary channel shaped runners, 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 0.020 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™ Track

1J. Framing Members* — Floor and Ceiling Runners — Not Shown — In lieu of Items 1 — For use with Item 2 L, proprietary channel shaped runners, 1-1/4 in. deep by min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

RESCUE METAL FRAMING, L L C — AlphaTRAK

1K. Framing Members* — Floor and Ceiling Runners — Not Shown — In lieu of Item 1 — For use with Item 2M, proprietary channel shaped runners, 1-1/4 in. wide by min 3-5/8 in. deep, fabricated from min 25 MSG (0.018 in. min. bare metal thickness), attached to floor and ceiling with fasteners spaced 24 in. OC max.

CEMCO, LLC — Viper X Track

1L. Framing Members* — Floor and Ceiling Runners — Not Shown — In lieu of Item 1 — For use with Item 2N, proprietary channel shaped runners, 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 0.020 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

CRACO MFG INC — SmartTrack20™

1M. Framing Members* - Floor and Ceiling Runners – Not shown – In lieu of Items 1 through 1L – For use with Item 2O, proprietary channel shaped runners, min 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 20 MSG galv steel (0.0329 in. min bare metal thickness), attached to floor and ceiling with fasteners spaced 24 in. OC max.

PANEL REY S A – SUPRA Track 20/33 mil

1N. Framing Members* — Floor and Ceiling Runner — Not Shown — In lieu of Item 1 – For use with Item 2P, proprietary channel shaped runners, 1-1/4 in. wide by min. 3-5/8 in. deep fabricated from min 0.019 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

PANEL REY S A – SUPRA Track 20EQ/19 mil

1O. Framing Members* — Floor and Ceiling Runner — (Not Shown — Alternate to Item 1) — For use with Item 2Q, channel shaped runners pre-equipped with proprietary attachment clips. Min. 3-5/8 in. wide. Legs of top runners minimum 3-1/4 in. wide. Legs of bottom runners minimum 1-1/2 in. wide. Runners attached to floor and ceiling with fasteners 24 in. OC max.

HYPERFRAME INC - Hypertrack

1P. Framing Members* — Floor and Ceiling Runner — Not Shown — In lieu of Item 1 — For use with Item 2R, proprietary channel shaped runners, 1-1/4 in. wide by min. 3-5/8 in. deep fabricated from min. 20 EQ/22 mils. (min. 0.0221 in. thick) galvanized steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

JJC INTERNATIONAL DISTRIBUTORS — Non-structural Tracks 3-5/8" and 6".

1Q. Framing Members* — Floor and Ceiling Runners — Not Shown — In lieu of Items 1 — _For use with Item 2R, proprietary channel shaped runners, 1-1/4 in. deep by min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, attached to floor and ceiling with fasteners spaced 24 in. OC max.

IRONLINE METALS LLC — Bantam Track.

2. Steel Studs — Channel shaped, 3-5/8 in. deep (min), formed from min No. 25 MSG galv steel spaced 24 in. OC max. Studs to be cut 3/4 in. less than assembly height.

2A. Framing Members* — Steel Studs — As an alternate to Item 2 — Channel shaped studs, min 3-5/8 in. deep, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.

ALLSTEEL & GYPSUM PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

CONSOLIDATED FABRICATORS CORP, BUILDING PRODUCTS DIV — Type SUPREME D24/30EQD and Type SUPREME D20

QUAIL RUN BUILDING MATERIALS INC — Type SUPREME D24/30EQD and Type SUPREME D20

SCAFCO STEEL STUD MANUFACTURING CO — Type SUPREME D24/30EQD and Type SUPREME D20

STEEL CONSTRUCTION SYSTEMS INC — Type SUPREME D24/30EQD and Type SUPREME D20

TELLING INDUSTRIES L L C — Type SUPREME D24/30EQD and Type SUPREME D20

UNITED METAL PRODUCTS INC — Type SUPREME D24/30EQD and Type SUPREME D20

2B. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 — For use with Item 1B, proprietary channel shaped steel studs, 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 0.020 in. thick galv steel. Studs cut 3/4 in. less in length than assembly height.

CEMCO, LLC — Viper20™

CRACO MFG INC — SmartStud20™

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™

IMPERIAL MANUFACTURING GROUP INC — Viper20™

2C. Steel Studs — (As an alternate to Item 2, For use with Item 1C) — Channel shaped, fabricated from min 20 MSG corrosion-protected or galv steel, 3-1/2 in. min depth, spaced a max of 16 in. OC. Studs friction-fit into floor and ceiling runners. Studs to be cut 5/8 to 3/4 in. less than assembly height. See materials in Item(s) 4 that require Item 2C studs.

2D. Framing Members* — Steel Studs — As an alternate to Items 2 through 2C — For use with Item 1D and 4G only, channel shaped studs, min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, spaced a max of 24 in. OC. Studs to be cut 1/2 in. less than assembly height.

CLARKDIETRICH BUILDING SYSTEMS — CD ProSTUD

DMFCWBS L L C — ProSTUD

MBA METAL FRAMING — ProSTUD

RAM SALES L L C — Ram ProSTUD

STEEL STRUCTURAL PRODUCTS L L C — Tri-S ProSTUD

2E. Framing Members* — Steel Studs — As an alternate to Items 2 through 2D — For use with Item 1E and 4I only, channel shaped studs, min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, spaced a max of 24 in. OC. Studs to be cut 1/2 in. less than assembly height.

TELLING INDUSTRIES L L C — TRUE-STUD™

2F. Framing Members* — Steel Studs — As an alternate to Items 2 through 2E — For use with Item 1F, channel shaped studs, min 3-5/8 in. wide fabricated from min 25 MSG steel, spaced a max of 24 in. OC. Studs to be cut 1/2 in. less than assembly height.

KIRII (HONG KONG) LTD — Type KIRII

2G. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 through 2F — For use with Item 1G. Proprietary channel shaped studs, minimum 3-5/8 in. wide, Studs to be cut 1/2 in. less than the assembly height.

STUDCO BUILDING SYSTEMS — CROCSTUD

2H. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 — For use with Item 1I, proprietary channel shaped steel studs, 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 0.020 in. thick galv steel. Studs cut 3/4 in. less in length than assembly height.

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Viper20™

2I. Framing Members* — Steel Studs — In lieu of Item 2 — For use with Item 1, channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, 3-5/8 in. deep (min), spaced 24 in. OC max. Studs to be cut 3/4 in. less than assembly height.

EB METAL INC — NITROSTUD

2J. Framing Members* — Steel Studs — In lieu of Item 2 — For use with Item 1, channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, 3-5/8 in. deep (min), spaced 24 in. OC max. Studs to be cut 3/4 in. less than assembly height.

OLMAR SUPPLY INC — PRIMESTUD

2K. Framing Members* — Steel Studs — As an alternate to Item 2 — For use with Item 1B (3-5/8 in. wide track), channel shaped studs, fabricated from min 25 MSG corrosion-protected steel, 1-1/4 in. wide by 3-5/8 in. deep, spaced a max of 24 in. OC. Studs to be cut 3/8 to 3/4 in. less than assembly height.

MARINO/WARE, DIV OF WARE INDUSTRIES INC — StudRite™

2L. Framing Members* — Steel Studs — As an alternate to Items 2 — For use with Item 1J, channel shaped studs, min 3-5/8 in. wide fabricated from min 0.018 in. thick galv steel, spaced a max of 24 in. OC. Studs to be cut 3/4 in. less than assembly height.

RESCUE METAL FRAMING, L L C — AlphaSTUD

2M. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 — For use with Item 1K, proprietary channel shaped steel studs, min 1-1/4 in. wide by min 3-5/8 in. deep, fabricated from min 25 MSG (0.018 in. min. bare metal thickness). Studs cut 3/4 in. less in length than assembly height.

CEMCO, LLC — Viper X

2N. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 — For use with Item 1L, proprietary channel shaped steel studs, 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min 0.020 in. thick galv steel. Studs cut 3/4 in. less in length than assembly height.

CRACO MFG INC — SmartStud20™

2O. Framing Members* - Steel Studs – Not Shown – In lieu of Items 2 through 2N – For use with Item 1M, proprietary channel shaped steel studs, min 1-5/8 in. wide by min 3-5/8 in. deep fabricated from min 20 MSG galv steel (0.0329 in. min bare metal thickness) spaced 24 in. OC max. Studs cut 3/4 in. less in length than assembly height.

PANEL REY S A – SUPRA Stud 20/33 mil

2P. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 – For use with Item 1N, proprietary channel shaped steel studs, min 1-1/4 in. wide by min 3-5/8 in. deep with 1/4 in. return lips fabricated from min 0.019 in. thick galv steel, spaced 24 in. OC max. Studs cut 3/4 in. less in length than assembly height.

PANEL REY S A – SUPRA Stud 20EQ/19 mil

2Q. Framing Members* — Steel Studs — (Not Shown — Alternate to Item 2, For use with Item 1O) — Channel shaped steel studs with attachment clips at top and bottom, min 3-5/8 in. depth, spaced a max of 24 in. OC. Studs clipped into floor and ceiling runners (Item 1O). Max 2-3/8 in. extension reveal from top of stud to inside of ceiling runner.

HYPERFRAME INC— Hyperstud

2R. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 – For use with Item 1P, proprietary channel shaped steel studs, min 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min. 20 EQ/22 mils. (min. 0.0221 in. thick) galvanized steel, spaced 24 in. OC max. Studs cut 3/4 in. less in length than assembly height.

JJC INTERNATIONAL DISTRIBUTORS — Non-structural Studs 3-5/8" and 6".

2R. Framing Members* — Steel Studs — Not Shown — In lieu of Item 2 – For use with Item 1Q, proprietary channel shaped steel studs, min 1-1/4 in. wide by min 3-5/8 in. deep fabricated from min. min. 0.018 in. thick galvanized steel, spaced 24 in. OC max. Studs cut 3/4 in. less in length than assembly height.

IRONLINE METALS LLC — Bantam Stud.

3. Batts and Blankets* — (Optional) — Mineral wool or glass fiber batts partially or completely filling stud cavity. See **Batts and Blankets** (BZJZ) category for names of Classified companies.

ROCKWOOL — Type AFB, min. density 1.69 pcf / 27.0 kg/m³

ROCKWOOL MALAYSIA SDN BHD — Type Acoustical Fire Batts

3A. Fiber, Sprayed* — As an alternate to Batts and Blankets (Item 3) — (100% Borate Formulation) — Spray applied cellulose material. The fiber is applied with water to completely fill the enclosed cavity in accordance with the application instructions supplied with the product with a nominal dry density of 2.7 lb/ft³. Alternate Application Method: The fiber is applied without water or adhesive at a nominal dry density of 3.5 lb/ft³, in accordance with the application instructions supplied with the product.

Applegate Greenfiber Acquisition LLC — Insulmax and SANCTUARY for use with wet or dry application.

3B. Fiber, Sprayed* — As an alternate to Batts and Blankets (Item 3) — Spray applied cellulose insulation material. The fiber is applied with water to interior surfaces in accordance with the application instructions supplied with the product. Applied to completely fill the enclosed cavity. Minimum dry density of 4.3 pounds per cubic ft.

NU-WOOL CO INC — Cellulose Insulation

3C. Fiber, Sprayed* — As an alternate to Batts and Blankets (Item 3) — Spray applied cellulose fiber. The fiber is applied with water to completely fill the enclosed cavity in accordance with the application instructions supplied with the product. The minimum dry density shall be 4.30 lbs/ft³.

INTERNATIONAL CELLULOSE CORP — Celbar-RL

3D. Batts and Blankets* — For use with Item 8. Nom 3 in. thick, minimum 3.4 pcf mineral wool batts, friction fit between the studs and floor and ceiling runners.

See **Batts and Blankets** (BZJZ) category for names of manufacturers.

3E. Batts and Blankets* — For use with Item 4R and 4S. Placed in stud cavities, any min. 3-1/2 in. thick glass fiber insulation bearing the UL Classification Marking as to Surface Burning Characteristics and/or Fire Resistance.

See **Batts and Blankets** (BKNV or BZJZ) Categories for names of Classified companies.

3F. Fiber, Sprayed* — As an alternate to Batts and Blankets (Item 3) — Spray-applied cellulose material. The fiber is applied with water to completely fill the enclosed cavity in accordance with the application instructions supplied with the product. To facilitate the installation of the material, any thin, woven or non-woven netting may be attached by any means possible to the outer face the studs. The material shall reach equilibrium moisture content before the installation of materials on either face of the studs. The minimum dry density shall be 5.79 lbs/ft³.

Applegate Greenfiber Acquisition LLC — Applegate Advanced Stabilized Cellulose Insulation

3G. Foamed Plastic* — As an alternate to Batts and Blankets (Items 3-3F), for use with Item 4U — Spray applied, foamed plastic insulation, at any thickness from partial fill to completely filling stud cavity. When foamed plastic is used, minimum stud depth shall be 3-1/2 in. with min. 20 MSG thickness.

CARLISLE SPRAY FOAM INSULATION — Types SealTite ONE, SealTite Pro Closed Cell (CC), SealTite Pro Open Cell (OC), SealTite Pro OCX, SealTite Pro No Trim 21, SealTite Pro One Zero, Foamsulate Closed Cell, Foamsulate OCX, Foamsulate 70, and Foamsulate HFO.

3H. Foamed Plastic* — As an alternate to Batts and Blankets (Items 3-3F), for use with Item 4U — Spray applied, foamed plastic insulation, at any thickness from partial fill to completely filling stud cavity. When foamed plastic is used, minimum stud depth shall be 3-1/2 in. with min. 20 MSG thickness.

BASF CORP - Enertite® NM, Enertite® G, FE178®, Spraytite® 178, Spraytite® 81206, Walltite® 200, Walltite® US, Walltite® US-N, Walltite® HP+, FE137®, FE158®, Spraytite® 158, Spraytite® SP, Spraytite® 81205, Spraytite® Comfort XL, Walltite® XL, Walltite® MAX, Walltite® LWP, Walltite® Plus and Enertite® Max.

4. Gypsum Board* — 5/8 in. thick, 4 ft wide, attached to steel studs and floor and ceiling track with 1 in. long, Type S steel screws spaced 8 in. OC. along edges of board and 12 in. OC in the field of the board. Joints oriented vertically and staggered on opposite sides of the assembly. When Steel Framing Members* (Item 6 or any alternate clips) are used, gypsum board is screw attached to furring channels with 1 in. long, Type S steel screws spaced 12 in. OC.

AMERICAN GYPSUM CO — Types AG-C, AGX-1, M-Glass, LightRoc

BEIJING NEW BUILDING MATERIALS PUBLIC LTD CO — Type DBX-1

CABOT MANUFACTURING ULC — Type X, 5/8 Type X, Type Blueglass Exterior Sheathing

CGC INC — Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULIX, USGX, WRC or WRX (Joint tape and compound, Item 5, optional for use with Type USGX)

CERTAINTED GYPSUM INC — Types EGRG, GlasRoc, Type X-1, Type C, 5/8" Easi-Lite Type X, Easi-Lite Type X-2, Type LWTX

CERTAINTED GYPSUM INC — Types LGFC2A, LGFC6A, LGFC-C/A, LGFC-WD, LGLLX

GEORGIA-PACIFIC GYPSUM L L C — Types 5, 6, 9, C, DAP, DD, DA, DAPC, DGG, DS, GPFS6, LS, Type X, Veneer Plaster Base - Type X, Water Rated - Type X, Sheathing - Type X, Soffit - Type X, TG-C, GreenGlass Type X, Type X ComfortGuard Sound Deadening Gypsum Board, Type LWX, Veneer Plaster Base-Type LWX, Water Rated-Type LWX, Sheathing Type-LWX, Soffit-Type LWX, Type DGLW, Water Rated-Type DGLW, Sheathing Type-DGLW, Soffit-Type DGLW, Type LW2X, Veneer Plaster Base - Type LW2X, Water Rated - Type LW2X, Sheathing - Type LW2X, Soffit - Type LW2X, Type DGL2W, Water Rated - Type DGL2W, Sheathing - Type DGL2W

NATIONAL GYPSUM CO — Types eXP-C, FSK, FSK-C, FSK-G, FSMR-C, FSW-C, FSW-G, FSW, FSW-3, FSW-5, FSW-6, FSW-8, FSL, RSX.

NATIONAL GYPSUM CO — Riyadh, Saudi Arabia — Type FR, or WR

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Types PG-C, PG-9, PG-11, PGS-WRS, PGI

PANEL REY S A — Types GREX, GRIX, PRC, PRC2, PRX, RHX, MDX, ETX, PRX2

SAINT-GOBAIN GYPROC MIDDLE EAST FZE — Type Gyproc FireStop, Gyproc FireStop MR, Gyproc FireStop M2TECH, Gyproc FireStop ACTIV'Air, Gyproc FireStop MR ACTIV'Air, Gyproc FireStop M2TECH ACTIV'Air, Gyproc DuraLine, Gyproc DuraLine MR, Gyproc DuraLine M2TECH, Gyproc DuraLine ACTIV'Air, Gyproc DuraLine MR ACTIV'Air, Gyproc DuraLine M2TECH ACTIV'Air

SIAM GYPSUM INDUSTRY (SARABURI) CO LTD — Type EX-1

THAI GYPSUM PRODUCTS PCL — Type X and Type C, M2Tech Type C

UNITED STATES GYPSUM CO — Type AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULIX, USGX, WRC, WRX, (Joint tape and compound, Item 5, optional for use with Type USGX)

USG BORAL DRYWALL SFZ LLC — Types C, SCX, USGX (Joint tape and compound, Item 5, optional for use with Type USGX)

USG MEXICO S A DE C V — Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, USGX, WRC or WRX (Joint tape and compound, Item 5, optional for use with Type USGX)

4A. Gypsum Board* — (As alternate to Item 4) — Nom 5/8 in. thick gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered or backed by steel framing. Panels attached to steel studs and floor runner with 1 in. long Type S steel screws spaced 8 in. OC when applied horizontally, or 8 in. OC along vertical and bottom edges and 12 in. OC in the field when panels are applied vertically. When used in widths other than 48 in., gypsum panels to be installed horizontally. When using ULIX, panels need not be staggered in horizontal applications and screw spacing can be increased to 12 in. OC in field and perimeter.

CERTAINTED GYPSUM INC — Type X-1, Type C, Type EGRG/ GlasRoc, GlasRoc-2, Type SilentFX, Easi-Lite Type X-2

CGC INC — Types AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULIX, USGX, WRC or WRX (Joint tape and compound, Item 5, optional for use with Type USGX)

CERTAINTED GYPSUM INC — Types LGFC2A, LGFC6A, LGFC-C/A, LGFC-WD

GEORGIA-PACIFIC GYPSUM L L C — Types DAP, DAPC, DGG, DS

SAINT-GOBAIN GYPROC MIDDLE EAST FZE — Type Gyproc FireStop, Gyproc FireStop MR, Gyproc FireStop M2TECH, Gyproc FireStop ACTIV'Air, Gyproc FireStop MR ACTIV'Air, Gyproc FireStop M2TECH ACTIV'Air, Gyproc DuraLine, Gyproc DuraLine MR, Gyproc DuraLine M2TECH, Gyproc DuraLine ACTIV'Air, Gyproc DuraLine MR ACTIV'Air, Gyproc DuraLine M2TECH ACTIV'Air

THAI GYPSUM PRODUCTS PCL — Type X and Type C, M2Tech Type C

UNITED STATES GYPSUM CO — Types AR, C, FRX-G, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, ULIX, USGX, WRC, WRX (Joint tape and compound, Item 5, optional for use with Type USGX)

USG BORAL DRYWALL SFZ LLC — Types C, SCX, USGX (Joint tape and compound, Item 5, optional for use with Type USGX)

USG MEXICO S A DE C V — Type AR, C, IP-AR, IP-X1, IP-X2, IPC-AR, SCX, SHX, USGX, WRC or WRX (Joint tape and compound, Item 5, optional for use with Type USGX)

4B. Gypsum Board* — (As an alternate to Items 4 or 4A) — Nom 3/4 in. thick, 4 ft wide, installed as described in Item 4A with screw length increased to 1-1/4 in.

CGC INC — Types AR, IP-AR

UNITED STATES GYPSUM CO — Types AR, IP-AR

USG MEXICO S A DE C V — Types AR, IP-AR

4C. Gypsum Board* — As an alternate to Items 4, 4A, and 4B — Nom. 5/8 in. thick gypsum panels, with square edges, applied horizontally. Gypsum panels fastened to framing with 1 in. long bugle head steel screws spaced a max 8 in. OC, with last 2 screws 3/4 in. and 4 in. from each edge of board. Horizontal joints need not be backed by steel framing. Horizontal edge joints and horizontal butt joints on opposite sides of studs on interior walls need not be staggered or backed by steel framing.

GEORGIA-PACIFIC GYPSUM L L C — Type DGG, GreenGlass Type X

4D. Gypsum Board* — As an alternate to Items 4, 4A, 4B, 4C, 4G — Nom. 5/8 in. thick gypsum panels applied vertically or horizontally. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered or backed by steel framing. Gypsum panels fastened to framing with 1 in. long Type S steel screws 12 in. OC along vertical edges and in the field, and 12 in. along the top and bottom of the wall. When used in widths other than 48 in., gypsum panels to be installed horizontally. When studs (Item 2) spaced a max 16 in. OC, 5/8 in. thick gypsum panels applied vertically or horizontally, 1 in. long spaced 16 in. OC along vertical edges and in the field, and 16 in. OC along top and bottom of wall.

NATIONAL GYPSUM CO — Types eXP-C, FSK, FSK-C, FSK-G, FSW-C, FSW-G, FSW, FSW-3, FSW-5, FSW-6, FSMR-C

4E. Gypsum Board* — (As an Alternate to Items 4 through 4D) — Installed as described in item 4. 5/8 in. thick, 4 ft wide, applied vertically only and fastened to the studs and plates with 1 in. long Type S steel screws spaced 12 in. OC. When studs (Item 2) spaced a max 16 in. OC, 5/8 in. thick gypsum panels applied vertically or horizontally with 1 in. long Type S steel screws spaced 16 in. OC along vertical edges and in the field, and 16 in. OC along top and bottom of wall.

NATIONAL GYPSUM CO — Type SBWB

4F. Gypsum Board* — (Not Shown) — (As an alternate to Item 4 when used as the base layer on one or both sides of wall. For direct attachment only to steel studs Item 2C) - Nom 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Gypsum board secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field.

RAY-BAR ENGINEERING CORP — Type RB-LBG

4G. Gypsum Board* — (As an alternate to Items 4 through 4F) — For use with Items 1D and 2D only, 5/8 in. thick, 4 ft wide, attached to steel studs and floor and ceiling track with 1 in. long, Type S steel screws spaced 8 in. OC. along edges of board and 12 in. OC in the field of the board. Joints oriented vertically and staggered on opposite sides of the assembly. When using Types eXP-C, FSK, FSK-C, FSK-G, FSW-C, FSW-G, FSW, FSW-3, FSW-5, FSW-6, FSMR-C and ULIX, panels need not be staggered in horizontal applications and screw spacing can be increased to 12 in. OC in field and perimeter.

CGC INC — Type SCX, ULIX

CERTAINTED GYPSUM INC — Type LGFC6A, LGFC-C/A

NATIONAL GYPSUM CO — Types eXP-C, FSK, FSK-C, FSK-G, FSW-C, FSW-G, FSW, FSW-3, FSW-5, FSW-6, and FSMR-C

UNITED STATES GYPSUM CO — Type SCX, ULIX

USG BORAL DRYWALL SFZ LLC — Type SCX

4H. Gypsum Board* — (As an alternate to Items 4 through 4G) — Nominal 5/8 in. thick, 4 ft wide panels, applied vertically and secured as described in Item 4.

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type QuietRock ES

4I. Gypsum Board* — (As an alternate to Items 4 through 4F) — 5/8 in. thick, 4 ft wide, attached to steel studs and floor and ceiling track with 1 in. long, Type S steel screws spaced 8 in. OC. along edges of board and 12 in. OC in the field of the board. Joints oriented vertically and staggered on opposite sides of the assembly. When using ULIX, panels need not be staggered in horizontal applications and screw spacing can be increased to 12 in. OC in field and perimeter. When using ULIX, panels need not be staggered in horizontal applications and screw spacing can be increased to 12 in. OC in field and perimeter.

CGC INC — Types SCX, ULIX

UNITED STATES GYPSUM CO — Types SCX, ULIX

USG BORAL DRYWALL SFZ LLC — Type SCX

4J. Gypsum Board* — (Not Shown) — (As an alternate to Item 4 when used as the base layer on one or both sides of wall. For direct attachment only to steel studs Item 2C) — Nom 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Gypsum board secured to studs with 1-1/4 in. long Type S-12 steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. To be used with Lead Batten Strips (see Item 9A) or Lead Discs (see Item 10A).

MAYCO INDUSTRIES INC — Type X-Ray Shielded Gypsum

4K. Gypsum Board* — (As an alternate to Item 4 and 4A, not for use with Items 1D, 1E, 2D and 2E) — Nom. 5/8 in. thick gypsum panels with beveled, square or tapered edges installed as described in Item 4 and 4A.

CGC INC — Type ULX

UNITED STATES GYPSUM CO — Type ULX

USG MEXICO S A DE C V — Type ULX

4L. Gypsum Board* — (Not Shown) — (As an alternate to Item 4 when used as the base layer on one or both sides of wall. For direct attachment only to steel studs Item 2C). Nom 5/8 in. thick lead backed gypsum panels with beveled, square or tapered edges, applied vertically. Vertical joints centered over studs and staggered min 1 stud cavity on opposite sides of studs. Wallboard secured to studs with 1-1/4 in. long Type S-12 steel screws gypsum panel steel screws spaced 8 in. OC at perimeter and 12 in. OC in the field. Lead batten strips required behind vertical joints of lead backed gypsum wallboard and optional at remaining stud locations. Lead batten strips, min 2 in. wide, max 8 ft long with a max thickness of 0.14 in. placed on the face of studs and attached to the stud with construction adhesive and two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead discs, nominal 3/8 in. diam by max 0.085 in. thick. Compression fitted or adhered over the screw heads. Lead batten strips and discs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".

RADIATION PROTECTION PRODUCTS INC — Type RPP - Lead Lined Drywall

4M. Gypsum Board* — (For use with Item 8) — 5/8 in. thick, 4 ft wide, applied vertically over Mineral and Fiber Board (Item 8) with vertical joints located anywhere over stud cavities. Secured to mineral and fiber boards with 1-1/2 in. Type G Screws spaced 8 in. OC along edges of each vertical joint and 12 in. OC in intermediate field of the Mineral and Fiber Board (Item 8). Secured to outermost studs and floor and ceiling runners with 2 in. long Type S screws spaced 8 in. OC. Gypsum Board joints covered with paper tape and joint compound. Screw heads covered with joint compound.

AMERICAN GYPSUM CO — Type AG-C

CERTAINTED GYPSUM INC — Type C

CGC INC — Types C, IP-X2, IPC-AR

CERTAINTED GYPSUM INC — Type LGFC-C/A

GEORGIA-PACIFIC GYPSUM L L C — Types 5, DAPC, TG-C

NATIONAL GYPSUM CO — Types eXP-C, FSK-C, FSW-C

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type PG-C

PANEL REY S A — Types PRC, PRC2

SAINT-GOBAIN GYPROC MIDDLE EAST FZE — Type Gyproc FireStop, Gyproc FireStop MR, Gyproc FireStop M2TECH, Gyproc FireStop ACTIV'Air, Gyproc FireStop MR ACTIV'Air, Gyproc FireStop M2TECH ACTIV'Air, Gyproc DuraLine, Gyproc DuraLine MR, Gyproc DuraLine M2TECH, Gyproc DuraLine ACTIV'Air, Gyproc DuraLine MR ACTIV'Air, Gyproc DuraLine M2TECH ACTIV'Air

THAI GYPSUM PRODUCTS PCL — Type C, M2Tech Type C

UNITED STATES GYPSUM CO — Types C, IP-X2, IPC-AR, ULIX

USG BORAL DRYWALL SFZ LLC — Type C

USG MEXICO S A DE C V — Types C, IP-X2, IPC-AR

4N. Wall and Partition Facings and Accessories* — (As an alternate to Item 4) — Nominal 5/8 in. thick, 4 ft wide panels, applied vertically and secured as described in Item 4.

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type QuietRock 527

4O. Gypsum Board* — As an alternate to Items 4, 4A, 4B, and 4C — Two layers Nom. 5/16 in. thick gypsum panels applied vertically or horizontally. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered or backed by steel framing. Horizontal joints on the same side need not be staggered. When applied horizontally, both layers of gypsum board fastened to each side of framing with 1 in. long Type S steel screws spaced 8 in. OC and staggered 4 in. OC between layers. When applied vertically, both layers of gypsum board fastened to each side of framing with 1 in. long Type S steel screws spaced 8 in. OC along vertical edges and 12 in. OC in the field, staggered 4 in. OC between layers. Screws spaced a max 12 in. along the top and bottom edges of the wall.

NATIONAL GYPSUM CO — Type FSW

4P. Gypsum Board* — As an alternate to Item 4. Nom 5/8 in. thick, 4 ft wide, Nom 5/8 in. thick gypsum panels with beveled, square or tapered edges, applied vertically or horizontally. Vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered or backed by steel framing. Panels attached to steel studs and runners with 1 in. long Type S steel screws spaced 12 in. OC when applied horizontally or vertically. When used in widths other than 48 in., gypsum panels to be installed horizontally.

CGC INC — Type ULIX

UNITED STATES GYPSUM CO — Types ULIX

4Q. Gypsum Board* — 3/4 in. thick, 4 ft wide, attached to steel studs and floor and ceiling track as described in Item 4 with screw length increased to min. 1- 1/8 in.

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type PG-13

4R. Gypsum Board* — As an alternate to Item 4D. For use with Item 3E, **Batts and Blankets*** — 5/8 in. thick, 4 ft wide, installed as described in Item 4. When studs (Item 2) spaced a max 16 in. OC, 5/8 in. thick gypsum panels applied vertically or horizontally, 1 in. long spaced 16 in. OC along vertical edges and in the field, and 16 in. OC along top and bottom of wall.

NATIONAL GYPSUM CO — Type FSLX.

4S. Gypsum Board* — As an alternate to Item 4. For use with Item 3E, **Batts and Blankets*** — 5/8 in. thick, 4 ft wide, installed as described in Item 4A.

CERTAINTED GYPSUM INC — Type CLLX.

4T. Wall and Partition Facings and Accessories* — (As an alternate to 5/8 in. thick board as outlined in Item 4) — Nominal 1-3/8 in. thick, 4 ft wide panels, applied vertically or horizontally. Fastened with #6 x 2 in. long drywall screws spaced 8 in. OC along the perimeter and 12 in. OC in the field.

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type QuietRock 545

4U. Gypsum Board* — (As an alternate to Item 4 when Foam Plastic insulation Items 3G or 3H is used) — Any 5/8 in. thick, 4 ft. wide, Gypsum Board listed in Item 4 above. Applied vertically with vertical joints centered over studs and staggered one stud cavity on opposite sides of studs. Gypsum panels secured to studs with 1-1/4 in. long Type S steel screws spaced 8 in. OC at perimeter and in the field. For 2 layer assemblies outer layer will be attached to studs over inner layer with the 1-7/8 in. long steel screws spaced 8 in. OC.

4V. Gypsum Board* — (As an alternate to Item 4, for 1 hr. rating) — Nom. 5/8 in. thick gypsum panels applied vertically or horizontally. Horizontal edge joints and horizontal butt joints on opposite sides of studs need not be staggered or backed by steel framing. Gypsum panels fastened to framing with 1 in. long Type S steel screws 12 in. OC along vertical edges and in the field. Screws spaced a max 12 in. along the top and bottom edges of the wall for both vertical and horizontal applications.

CERTAINTED GYPSUM INC — Type X-1, SilentFX, GlasRoc, Type C

5. Joint Tape and Compound — Vinyl, dry or premixed joint compound, applied in two coats to joints and screw heads; paper tape, 2 in. wide, embedded in first layer of compound over all joints. As an alternate, nominal 3/32 in. thick gypsum veneer plaster may be applied to the entire surface of Classified veneer baseboard. Joints reinforced. Paper tape and joint compound may be omitted when gypsum boards are supplied with square edges.

6. Resilient Channel — (Optional — Not Shown) — 25 MSG galv steel resilient channels spaced vertically max 24 in. OC, flange portion attached to each intersecting stud with 1/2 in. long type S-12 pan head steel screws. May not be used with Item 4F, 4J or 4L.

6A. Steel Framing Members* — (Optional, Not Shown, As an alternate to Item 6) — Furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. 2-9/16 in. or 2-23/32 in. wide by 7/8 in. deep, spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels are overlapped 6 in. and tied together with double strand of No. 18 SWG galv steel wire near each end of overlap. As an alternate, ends of adjoining channels may be overlapped 6 in. and secured together with two self-tapping No. 6 framing screws, min 7/16 in. long at the midpoint of the overlap, with one screw on each flange of the channel. Not for use with Items 4F, 4J, or 4L.

b. **Framing Members*** — Used to attach furring channels (Item a) to studs (Item 2). Clips spaced 48 in. OC., and secured to studs with 1-5/8 in. wafer or hex head Type S steel screw through the center grommet. Furring channels are friction fitted into clips. RSIC-1 clip for use with 2-9/16 in. wide furring channels. RSIC-1 (2.75) clip for use with 2-23/32 in. wide furring channels.

PAC INTERNATIONAL L L C — Types RSIC-1, RSIC-1 (2.75)

6B. Framing Members* — (Optional on one or both sides, Not Shown, As an alternate to Item 6) — Furring channel and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. 2-3/8 in. wide by 7/8 in. deep, spaced max. 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Gypsum board attached to furring channels as described in Item 4. Not for use with Items 4F, 4J, or 4L.

b. **Steel Framing Members*** — Used to attach furring channels (Item 6Ba) to studs (Item 2). Clips spaced max. 48 in. OC. GENIECLIPS secured to studs with No. 8 x 1-1/2 in. minimum self-drilling, S-12 steel screw through the center grommet. Furring channels are friction fitted into clips.

PLITEQ INC — Type Genie Clip

6C. Steel Framing Members* — (Optional, Not Shown, As an alternate to Item 6) — Furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire. Gypsum board attached to furring channels as described in Item 4. Not for use with Items 4F, 4J, or 4L.

b. **Steel Framing Members*** — Used to attach furring channels (Item 6Ca) to studs. Clips spaced 48 in. OC., and secured to studs with 2 in. coarse drywall screw with 1 in. diam washer through the center hole. Furring channels are friction fitted into clips.

STUDCO BUILDING SYSTEMS — RESILMOUNT Sound Isolation Clips - Type A237R

6D. Steel Framing Members* — (Optional, Not Shown As an alternate to Item 6) — Furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item 6Db. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire. Gypsum board attached to furring channels as described in Item 4. Not for use with Items 4F, 4J, or 4L.

b. **Steel Framing Members*** — Used to attach furring channels (Item 6Da) to studs. Clips spaced 48 in. OC, and secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center hole. Furring channels are friction fitted into clips.

REGUPOL AMERICA — Type SonusClip

6E. Steel Framing Members* — (Optional, Not Shown As an alternate to Item 6) — Resilient channels and Steel Framing Members as described below:

a. **Resilient Channels** — Formed of No. 25 MSG galv steel, spaced 24 in. OC, and perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and secured in place with two No. 8 15 x 1/2 in. Philips Modified Truss screws spaced 2-1/2 in. from the center of the overlap. Gypsum board attached to resilient channels as described in Item 4. Not for use with Items 4F, 4J, or 4L.

b. **Steel Framing Members*** — Used to attach resilient channels (Item 6Ea) to studs. Clips spaced 48 in. OC., and secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center hole. Resilient channels are secured to clips with one No. 10 x 1/2 in. pan-head self-drilling screw.

KEENE BUILDING PRODUCTS CO INC — Type RC+ Assurance Clip

6F. Steel Framing Members* — (Optional, Not Shown, As an alternate to Item 6) — Furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. 2-23/32 in. wide by 7/8 in. deep, spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels are overlapped 6 in. and tied together with double strand of No. 18 SWG galv steel wire near each end of overlap. As an alternate, ends of adjoining channels may be overlapped 6 in. and secured together with two self-tapping #6 framing screws, min. 7/16 in. long at the midpoint of the overlap, with one screw on each flange of the channel. Gypsum board attached to furring channels as described in Item 4.

b. **Steel Framing Members*** — Used to attach furring channels (Item 6Fa) to studs. Clips spaced maximum 48 in. OC. Clips secured to studs with No. 8 x 2-1/2 in. coarse drywall screw through the center grommet. Furring channels are friction fitted into clips.

CLARKDIETRICH BUILDING SYSTEMS — Type ClarkDietrich Sound Clip

6F. Steel Framing Members* — (Optional, Not Shown) — Furring channels and Steel Framing Members as described below:

a. **Furring Channels** — Formed of No. 25 MSG galv steel. Spaced 24 in. OC perpendicular to studs. Channels secured to studs as described in Item b. Ends of adjoining channels overlapped 6 in. and tied together with double strand of No. 18 AWG galvanized steel wire. Gypsum board attached to furring channels as described in Item 4. Not for use with Items 4F, 4J, or 4L.

b. **Steel Framing Members*** — Used to attach furring channels (Item 6Fa) to studs. Clips spaced 48 in. OC., and secured to studs with No. 10 x 2 in. screw through the center hole. Furring channels are friction fit into clips.

MASON INDUSTRIES INC — Type CWC-50

7. **Wall and Partition Facings and Accessories*** — (Optional, Not Shown) — Nominal 1/2 in. thick, 4 ft wide panels, for optional use as an additional layer on one or both sides of the assembly. Panels attached in accordance with manufacturer's recommendations. When the QR-500 or QR-510 panel is installed between the steel framing and the UL Classified gypsum board, the required UL Classified gypsum board layer(s) is/are to be installed as indicated as to fastener type and spacing, except that the required fastener length shall be increased by a minimum of 1/2 in. Not evaluated or intended as a substitute for the required layer(s) of UL Classified Gypsum Board.

PABCO BUILDING PRODUCTS L L C, DBA PABCO GYPSUM — Type QuietRock QR-500 and QR-510

8. **Mineral and Fiber Board*** — (Optional, Not Shown) — For optional use as an additional layer on one side of wall. Nom 1/2 in. thick, 4 ft wide with long dimension parallel and centered over studs. Attached to studs and floor and ceiling runners with 1-5/8 in. long Type S steel screws, spaced 12 in. OC and 24 in. OC along all intermediate framing. The required UL Classified gypsum board layer (Item 4M) is to be installed over the Mineral and Fiber Boards. Batts and Blankets, Item 3D, and Adhesive, Item 11, are required.

HOMASOTE CO — Homasote Type 440-32

8A. **Mineral and Fiber Board** — (Optional, Not Shown) — For optional use as an additional layer on one side of wall - Nom 1/2 in. thick, 4 ft wide, square edge fiber boards applied vertically to studs on one side of the wall in between the wood studs and the UL Classified Gypsum Board (Item 4). Fiber boards installed with 1-1/4 in. long, Type S steel screws spaced 12 in. OC max, with the last screws spaced 2 in. and 6 in. from edge of board. Gypsum board (Item 4) installed as indicated as to fastener type and spacing, except that the required fastener length shall be increased by a minimum of 1/2 in. Not evaluated or intended as a substitute for the required layer(s) of UL Classified Gypsum Board. Not evaluated for use with Item 4M.

BLUE RIDGE FIBERBOARD INC — SoundStop

8B. **Mineral and Fiber Board*** — (Optional, Not Shown) — For optional use as an additional layer on one side of wall. Nom 1/2 in. thick, 4 ft wide with long dimension parallel and centered over studs. Attached to studs and floor and ceiling runners with 1-5/8 in. long Type S steel screws, spaced 12 in. OC and 24 in. OC along all intermediate framing. The required UL Classified gypsum board layer is to be installed over the Mineral and Fiber Boards and secured to studs with length of fasteners increased by 1/2 in. over the length specified for installation of the gypsum boards. Batts and Blankets, Item 3, are optional unless otherwise required. Not for use with Items 4F, 4J, 4L, and 4M.

HOMASOTE CO — Homasote Type 440-32

9. **Lead Batten Strips** — (Not Shown, For Use With Item 4E) — Lead batten strips, min 1-1/2 in. wide, max 10 ft long with a max thickness of 0.125 in. Strips placed on the interior face of studs and attached from the exterior face of the stud with two 1 in. long Type S-12 pan head steel screws, one at the top of the strip and one at the bottom of the strip. Lead batten strips to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C". Lead batten strips required behind vertical joints of lead backed gypsum board (Item 4E) and optional at remaining stud locations. Required behind vertical joints.

9A. **Lead Batten Strips** — (Not Shown, for use with Item 4J) — Lead batten strips, 2 in. wide, max 10 ft long with a max thickness of 0.140 in. Strips placed on the face of studs and attached to the stud with two min. 1 in. long min. Type S-8 pan head steel screws, one at the top of the strip and one at the bottom of the strip or with one min. 1 in. long min. Type S-8 pan head steel screw at the top of

the strip. Lead batten strips to have a purity of 99.5% meeting the Federal specification QQ-L-201f, Grades "B, C or D". Lead batten strips required behind vertical joints of lead backed gypsum wallboard (Item 4J) and optional at remaining stud locations.

10. Lead Discs or Tabs — (Not Shown, For Use With Item 4E) — Used in lieu of or in addition to the lead batten strips (Item 8) or optional at other locations - Max 3/4 in. diam by max 0.125 in. thick lead discs compression fitted or adhered over steel screw heads or max 1/2 in. by 1-1/4 in. by max 0.125 in. thick lead tabs placed on gypsum boards (Item 4E) underneath screw locations prior to the installation of the screws. Lead discs or tabs to have a purity of 99.9% meeting the Federal specification QQ-L-201f, Grade "C".

10A. Lead Discs — (Not Shown, for use with Item 4J) — Max 5/16 in. diam by max 0.140 in. thick lead discs compression fitted or adhered over steel screw heads. Lead discs to have a purity of 99.5% meeting the Federal Specification QQ-L-201f, Grades "B, C or D".

11. Adhesive — Not Shown — (For use with Item 8) — Construction grade adhesive applied in vertical, serpentine, nominal 3/8 in. wide beads down the length of both vertical edges of Mineral and Fiber Board (Item 8).

12. Wall and Partition Facings and Accessories* — (CLBV) (Optional, Not Shown) — For use with Items 1 to 1I, Items 2 to 2J, Item 3, Items 4 to 4I, Item 5 and Item 6. For maximum fire rating of 1 hour. On one side of the wall, over the first layer of Gypsum Board (Item 4 to Item 4I), install RefleXor membrane with the gold side facing outwards. Membrane installed with T50 staples spaced 12 inches on center in both directions as per manufacturer's instructions, seams in membrane to be overlapped by 2 inches. When RefleXor membrane is used an additional layer of Gypsum Board that is identical to the one used in the first layer and as specified in Item 4 to Item 4I shall be installed over the membrane. The additional layer of Gypsum Board to be installed through the membrane to the stud as specified in Item 4 to Item 4I except the fastener length shall be increased by a minimum of 5/8 inch. Install Batts and Blankets in the stud cavity as per Item 3.

On the other side of the wall, prior to the installation of the Gypsum Board, install Resilient Channels as per Item 6. Over the Resilient Channels install 3/4 inch thick SONOpan panel secured to the Resilient Channels with min. 1-1/4 in. long drywall screws and washers spaced at 16 in. OC on the perimeter of the panel and 8 in. OC in the field of the panel. Over the SONOpan panel install the same Gypsum Board as specified in Item 4 to Item 4I with the fastener length increased by minimum 3/4 inch. Not evaluated or intended as a substitute for the required layer(s) of UL Classified Gypsum Board.

Alternately, on the other side of the wall prior to the installation of the Gypsum Board, install 3/4 in. thick SONOpan panels, secured to one side of studs either horizontally or vertically. Panels secured to each stud with min. 1-1/4 in. long drywall screws spaced 12 in. OC. Over the SONOpan, install 25 MSG galv steel, Resilient Channels, spaced vertically 24 in. OC. Resilient Channels fastened through panels to each stud with min. 2 in. long drywall screws or self-tapping screws. Over the Resilient Channels install Gypsum Board as specified in Item 4 to Item 4I with the specified drywall screws. Panels not evaluated or intended as a substitute for the required layer(s) of UL Classified Gypsum Board.

MSL — RefleXor membrane, SONOpan panel

13. Barrier Mesh — (Optional, Not Shown) - Attached to steel studs on one or both sides of the wall using Barrier Mesh Clips spaced at maximum 12 inches on center vertically, using a flat head type screw penetrating through the steel at least 3/8 of an inch. For Steel Studs less than 0.033 inches in thickness, use self-piercing screws. For Steel Studs equal to or greater than 0.033 inches in thickness, use steel drill screws (self-tapping). Gypsum Board (Item 4) to be installed directly over the Barrier Mesh using prescribed screw patterns with lengths increased by a minimum 1/8 in. Barrier Mesh may be installed with the long dimension of the diamond pattern positioned vertically or horizontally. Barrier Mesh joints may occur as butt joints at the framing members and secured using the Barrier Mesh Clips or occur in between framing members as overlapping joints secured using 18 SWG wire ties spaced a maximum 12 in. on center.

CLARKDIETRICH BUILDING SYSTEMS — Barrier Mesh, Barrier Mesh Clips

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Last Updated on 2024-06-14

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XHBN - Joint Systems

XHBN7 - Joint Systems Certified for Canada

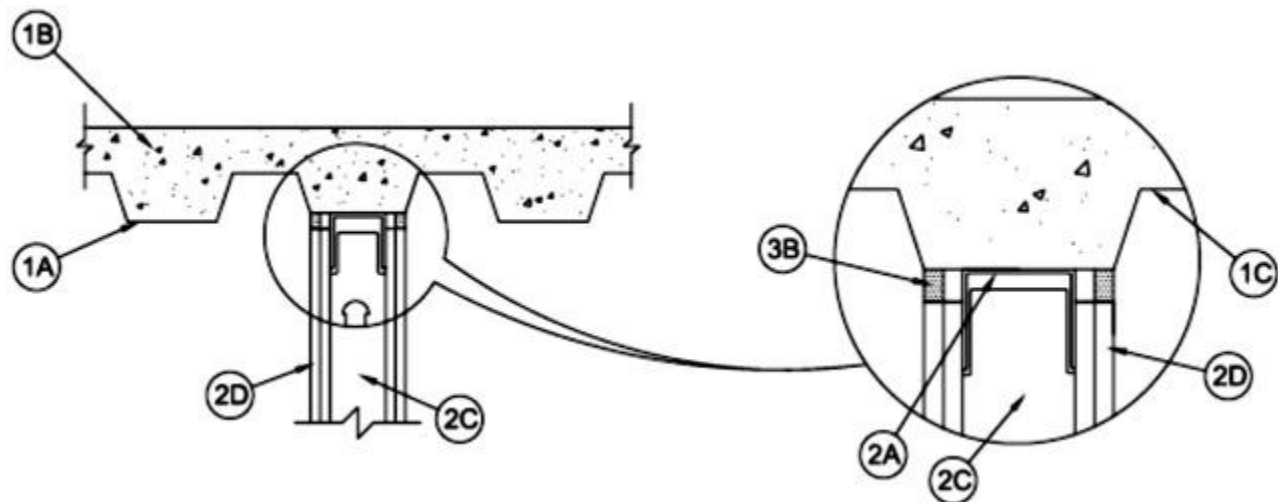
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System No. HW-D-0084

June 22, 2023

ANSI/UL2079	CAN/ULC S115
Assembly Rating — 1 and 2 Hr (See Items 2 & 3)	F Rating — 1 and 2 Hr (See Items 2 & 3)
Nominal Joint Width — 3/4 In.	FT Rating — 1 and 2 Hr (See Items 2 & 3)
Class II Movement Capabilities — 33% Compression or Extension	FH Rating — 1 and 2 Hr (See Items 2 & 3)
	FTH Rating — 1 and 2 Hr (See Items 2 & 3)
	Nominal Joint Width — 3/4 In.
	Class II Movement Capabilities — 33% Compression or Extension



1. **Floor Assembly** — The fire-rated fluted steel floor unit/concrete assembly floor assembly shall be constructed of the materials and in the manner described in the individual D700 or D900 Series Floor-Ceiling Design in the Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Form Units*** — Max 3 in. (76 mm) deep galv. steel fluted floor units.

B. **Concrete** — Min 2-1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

C. **Spray-Applied Fire Resistive Materials** — (Optional, Not Shown) — Prior to or after the installation of the ceiling runner and Fill, Void or Cavity Materials (Item 3), the steel floor units may be sprayed with a min 5/16 in. (8 mm) thickness to a max 11/16 in. (17 mm) thickness of fire resistive material.

GCP APPLIED TECHNOLOGIES INC — Type MK-6/HY

1A. **Roof Assembly** — (Not Shown) — As an alternate to the floor assembly, a fire rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction features:

A. **Steel Roof Deck** — Max 3 in. (76 mm) deep galv steel fluted roof deck.

B. **Roof Insulation** — Min 2-1/4 in. (57 mm) thick poured insulating concrete, as measured from the top plane of the floor units.

1B. **Roof Assembly** — As an alternate to Items 1 and 1A, a fire rated protected fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P700 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction features:

A. **Steel Roof Deck** — Max 3 in. (76 mm) deep galv steel fluted roof deck.

B. **Spray—Applied Fire Resistive Materials*** — (Not Shown)—Prior to or after the installation of the steel ceiling runners, Forming Material and Fill, Void or Cavity Material (Items 2A, 3A, 3B), the roof assembly shall be sprayed with the type and thickness of fire resistive material indicated in the individual P700 Series design.

2. **Wall Assembly** — The 1 or 2 h fire-rated gypsum board /steel stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Ceiling Runners** — Floor and ceiling runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to accommodate steel studs (Item 2C). Ceiling runner to be provided with min. 2 in. (51 mm) flanges. Ceiling runner installed parallel to direction of fluted steel deck, centered beneath valley, and secured with steel masonry anchors, steel fasteners or welds spaced 24 in. (610 mm) OC. before or after optional spray-applied fire resistive material is used. The use of welds to secure the ceiling runner may only be used prior to the installation of the optional spray-applied material.

A1. **Light Gauge Framing*-Slotted Ceiling Runner** — As an alternate to the ceiling runner in Item 2A, slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2C). Slotted ceiling runner installed parallel

to direction of fluted steel deck, centered beneath valley, secured with steel masonry anchors, steel fasteners or welds spaced 24 in. (610 mm) OC. before or after optional spray-applied fire resistive material is used. The use of welds to secure the ceiling runner may only be used prior to the installation of the optional spray-applied material.

CEMCO, LLC — CST

CLARKDIETRICH BUILDING SYSTEMS — Type SLT, SLT-H

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Type SLT

METAL-LITE INC — The System

RAM SALES L L C — RAM Slotted Track

SCAFCO STEEL STUD MANUFACTURING CO

TELLING INDUSTRIES L L C — True-Action Deflection Track

A2. Light Gauge Framing*-Vertical Deflection Ceiling Runner — As an alternate to the ceiling runners in Items 2A and 2A1, vertical deflection ceiling runner to consist of galv steel channel with slotted vertical deflection clips mechanically fastened within runner. Slotted clips, provided with step bushings, for permanent fastening of steel studs. Flanges sized to accommodate steel studs (Item 2C). Vertical deflection ceiling runner installed parallel to direction of fluted steel deck, centered beneath valley, and secured with steel masonry anchors, steel fasteners or welds spaced 24 in. (610 mm) OC. before or after optional spray-applied fire resistive material is used. The use of welds to secure the ceiling runner may only be used prior to the installation of the optional spray-applied material.

THE STEEL NETWORK INC — VertiTrack VTD250, VTD362, VTD400, VTD600 and VTD800

A3. Light Gauge Framing* - Notched Ceiling Runner — As an alternate to the ceiling runners in Items 2A through 2A3, notched ceiling runners to consist of C-shaped galv steel channel with notched return flanges sized to accommodate steel studs (Item 2C). Notched ceiling runner installed parallel to direction of fluted steel deck, centered beneath valley, and secured with steel masonry anchors, steel fasteners or welds spaced 24 in. (610 mm) OC. before or after optional spray-applied fire resistive material is used. The use of welds to secure the ceiling runner may only be used prior to the installation of the optional spray-applied material.

OLMAR SUPPLY INC — Type SCR

B. Steel Attachment Clips — (Optional - Not Shown) - When spray applied fireproofing is used ceiling runner may be secured to deck with Z-shaped clips formed from min. 1 in. (25 mm) long strips of min 20 ga galv steel. Length of clips should not exceed the width (thickness) of the wall. Clips to be sized to extend through the thickness of the spray-applied fire-resistive material on the bottom of the steel deck with 1-1/2 or 2 in. (38 or 51 mm) long upper and lower legs. Legs of clips fastened to valleys of steel deck (prior to application of spray-applied fire-resistive materials) and top of ceiling runner with masonry anchors, steel fasteners or welds. Clips spaced max 24 in. (610 mm) OC.

C. Studs — Steel studs to be min 2-1/2 in. (64 mm) wide. Studs cut 1/2 to 3/4 in. (13 to 19 mm) less in length than assembly height with bottom nesting in and resting on floor runner and with top nesting in ceiling runner without attachment. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. (13 mm) long wafer head steel screws at midheight of slot on each side of wall. Stud spacing not to exceed 24 in. (610 mm) OC. When vertical deflection ceiling runner (Item 2A2) is used, steel studs secured to slotted vertical deflection clips, through the bushings, with steel screws at midheight of each slot. Stud spacing not to exceed 24 in. (610 mm) OC.

D. Gypsum Board* — Gypsum board installed to a min total thickness 5/8 or 1-1/4 in. (16 or 32 mm) on each side of wall, for 1 or 2 hr fire resistance rated walls, respectively. Wall to be constructed as specified in the individual U400 or V400 Series Design in the UL Fire Resistance Directory, except that a max 3/4 in. (19 mm) gap shall be maintained between the top of gypsum board and bottom of steel deck. The screws attaching the gypsum board to the studs at the top of the first layer shall be located 4 in. (102 mm) from the steel deck valleys. The screws attaching the second layer to the steel studs shall be installed into the studs 3-1/2 in. (89 mm) below the valleys of the steel deck. **The hourly fire rating of the joint system is dependent on the hourly ratings of the walls.**

3. Fill, Void or Cavity Material* - Sealant — Max separation between the bottom of floor or roof and top of wall is 3/4 in. (19 mm). The joint system is designed to accommodate a max 33 percent compression or extension from its installed width. Fill material installed on each side of wall between the top of the gypsum board and the bottom of the steel deck. Min 5/8 in. (16 mm) thickness plus a 1/4 in. (6 mm) crown required for 1 hr fire rated system. Min 1-1/4 in. (32 mm) thickness installed flush with surface of wall required for 2 Hr fire rated system.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP601S Elastomeric Firestop Sealant or CFS-S SIL GG Sealant

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2023-06-22

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- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

XHBN - Joint Systems

XHBN7 - Joint Systems Certified for Canada

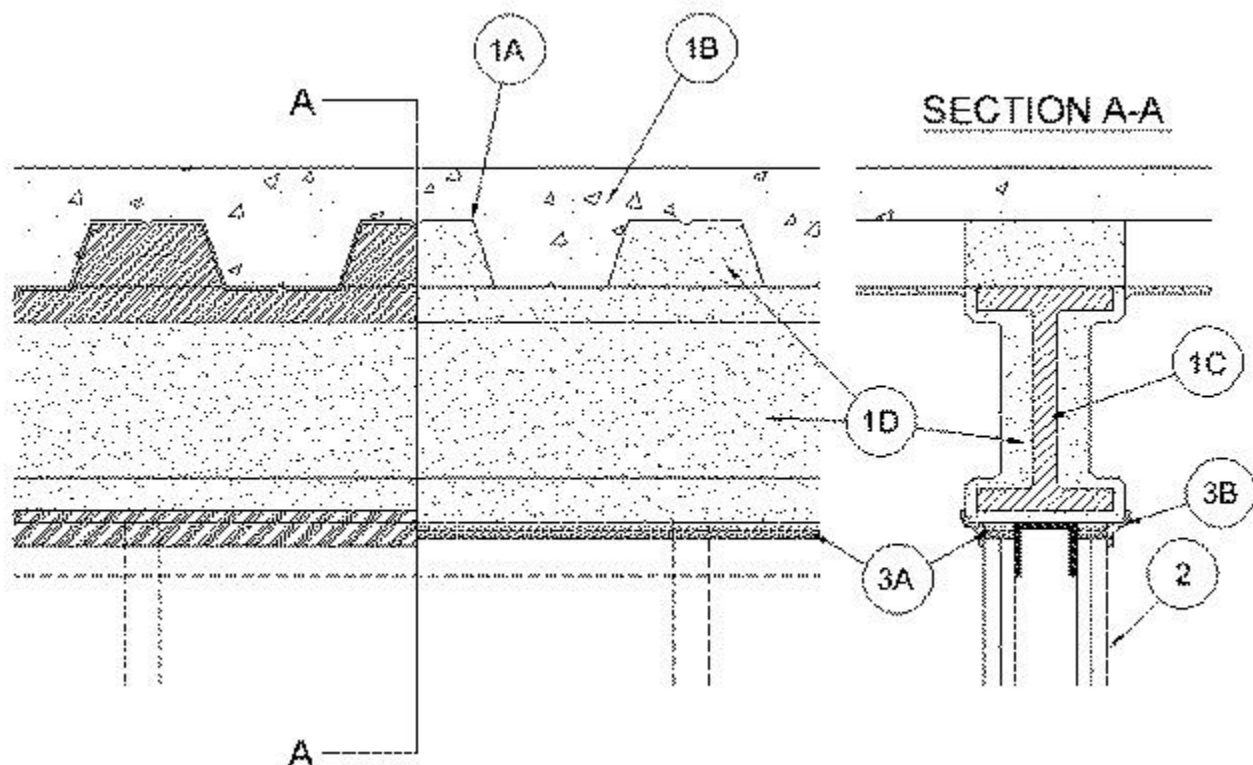
[See General Information for Joint Systems](#)

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System No. HW-D-0259

June 23, 2023

ANSI/UL2079	CAN/ULC S115
Assembly Ratings — 1 and 2 Hr (See Items 1 and 2)	F Ratings — 1 and 2 Hr (See Items 1 and 2)
Nominal Joint Width - 1-1/2 In.	FT Ratings — 1 and 2 Hr (See Items 1 and 2)
Class II Movement Capabilities — 50% Compression or Extension	FH Ratings — 1 and 2 Hr (See Items 1 and 2)
L Rating At Ambient — Less Than 1 CFM/lin ft	FTH Ratings — 1 and 2 Hr (See Items 1 and 2)
L Rating At 400 F — Less Than 1 CFM/lin ft	Nominal Joint Width - 1-1/2 In.
	Class II Movement Capabilities — 50% Compression or Extension
	L Rating At Ambient — Less Than 1 CFM/lin ft
	L Rating At 400 F — Less Than 1 CFM/lin ft



1. **Floor Assembly** — The fire-rated fluted steel floor unit/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Form Units*** — Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete** — Min 2-1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

C. **Structural Steel Support** — Steel beam, as specified in the individual D700 or D900 Series Floor-Ceiling Design, used to support steel floor units. Structural steel support centered over and parallel with wall assembly.

D. **Spray-Applied Fire Resistive Material*** — Steel floor units and structural steel beam to be sprayed with the thickness of material specified in the individual D700 Series Design or the structural steel supports to be sprayed in accordance with the specifications in the individual D900 Series Design. The flutes of the steel floor units are to be filled with material across the entire top flange of the steel beam. Additional material shall be applied to the web of the steel beam on each side of the wall. **For a 1 hr Assembly Rating, the total thickness of material applied to each side of the steel beam web shall be min 13/16 in. (21 mm). For a 2 hr Assembly Rating, the total thickness of material applied to each side of the steel beam web shall be min 1-3/8 in. (35 mm).**

GCP APPLIED TECHNOLOGIES INC — Types MK-6-HY or MK-10HB

D1. **Spray-Applied Fire Resistive Material*** — Steel floor units and structural steel support to be sprayed with the min thickness of material specified in the individual D700 or D900 Series Design. The flutes of the steel floor units are to be filled with material across the entire top flange of the steel beam. **Additional material shall be applied to the web of the steel beam on each side of the wall. For a 1 hr Assembly Rating, the total thickness of material applied to each side of the steel beam web shall be min 11/16 in. (18 mm). For a 2 hr Assembly Rating, the total thickness of material applied to each side of the steel beam web shall be min 1-1/2 in. (38 mm).**

ISOLATEK INTERNATIONAL — Type 300, Type 400

2. **Wall Assembly*** — The 1 or 2 h fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400, V400 or W400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Ceiling Runners** — Floor and ceiling runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to accommodate steel studs (Item 2B). Flange height of ceiling runner shall be min 1/4 in. (6 mm) greater than max extended joint width. Ceiling runner centered beneath and parallel with steel beam (Item 1C). Ceiling runner secured to steel beam through spray-applied fire resistive material with steel fasteners spaced max 24 in. (610 mm) OC.

A1. Light Gauge Framing* — Slotted Ceiling Runner As an alternate to the ceiling runner in Item 2A, slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner centered beneath and parallel with steel beam (Item 1C). Slotted ceiling runner secured to steel beam with steel fasteners, steel fasteners or welds spaced max 24 in. (610 mm) OC.

CEMCO, LLC — CST, CST325

CLARKDIETRICH BUILDING SYSTEMS — Type SLT, SLT-H

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Type SLT

RAM SALES L L C — RAM Slotted Track

SCAFCO STEEL STUD MANUFACTURING CO

TELLING INDUSTRIES L L C — True-Action Deflection Track

A2. Light Gauge Framing* — Vertical Deflection Ceiling Runner As an alternate to the ceiling runners in Item 2A and 2A1, vertical deflection ceiling runner to consist of galv steel channel with slotted vertical deflection clips mechanically fastened within runner. Slotted clips, provided with step bushings, for permanent fastening of steel studs. Flanges sized to accommodate steel studs (Item 2B). Vertical deflection ceiling runner centered beneath and parallel with steel beam (Item 1C). Vertical Deflection ceiling runner secured to steel beam with steel fasteners, steel fasteners or welds spaced max 24 in. (610 mm) OC.

A3. Light Gauge Framing*- Notched Ceiling Runner — As an alternate to the ceiling runners in Items 2A through 2A2, notched ceiling runners to consist of C-shaped galv steel channel with notched return flanges sized to accommodate steel studs (Item 2B). Notched ceiling runner installed perpendicular to direction of fluted steel deck and secured to valleys with steel masonry anchors, steel fasteners or welds spaced max 24 in. (610 mm) OC.

OLMAR SUPPLY INC — Type SCR

A4. Light Gauge Framing* — Slotted Ceiling Runner — As an alternate to the ceiling runner in Item 2A through 2A3, ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Flange height of slotted ceiling runner shall be 3-1/4 in. (83 mm) with 2 in. (51 mm) deep slots. Slotted ceiling runner centered beneath and parallel with steel beam (Item 1C). Slotted ceiling runner secured to steel beam with steel fasteners or welds spaced max 24 in. (610 mm) OC.

SCAFCO STEEL STUD MANUFACTURING CO — Slotted Track-Type SDLT

B. Studs — Steel studs to be min 3-1/2 in. (89 mm) wide. Studs cut 3/4 in. to 1-1/4 in. (19 to 32 mm) less in length than assembly height with bottom nesting in, resting on and fastened to the floor runner and with top nesting in ceiling runner without attachment. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. (13 mm) long wafer head steel screws at midheight of slot on each side of wall. When vertical deflection runner (Item 2A2) is used, studs secured to vertical clip through slip bushing, supplied, with No.8 by 1/2 in. (13 mm) steel screws at mid-height of slot of each slot. Stud spacing not to exceed 24 in. (610 mm) OC. When slotted ceiling runner (Item 2A4) is used, steel studs cut in lengths 3/4 to 1-3/4 in. (19 to 44 mm) less than floor to ceiling height and secured to slotted ceiling runner with No. 8 by 1/2 (13 mm) long wafer head steel screws at +/- 3/16 in. (5 mm) of the mid-height of slot on each side of wall.

C. Gypsum Board* — 5/8 in. (16 mm) thick, 4 ft (1.22 m) wide with square or tapered edges. The gypsum board type, number of layers an sheet orientation shall be as specified in the individual U400 or V400 Series Design in the Fire Resistance Directory, except that a max 1-1/2 in. (38 mm) gap shall be maintained between top edge of the gypsum board and the spray applied fire resistive material on the structural steel support. The top row of screws shall be installed into the studs 1-1/2 in. (38 mm) below the bottom of the ceiling runner.

D. Steel Attachment Clips — (Optional - Not Shown) - As an alternate to steel fasteners, ceiling runner secured to steel beam with Z-shaped clips formed from min 1 in. (25 mm) long strips of min 20 ga galv steel. Length of clips should not exceed the width (thickness) of the wall. Clips to be sized to extend through the thickness of the spray-applied fire-resistive material on the bottom flange of the steel beam with 1-1/2 or 2 in. (38 or 51 mm) long upper and lower legs. Legs of clips fastened to bottom of beam (prior to application of spray-applied fire-resistive materials) and top of ceiling runner with steel fasteners or welds. Clips spaced max 24in. (610 mm) OC.

The hourly ratings of the joint system are dependent on the hourly rating of the wall.

3. Joint System — Max separation between bottom of spray-applied fire resistive material on beam and top of gypsum board at time of installation is 1-1/2 in. (38 mm). The joint system is designed to accommodate a max 50 percent compression or extension from its installed width. The joint system consists of a forming material and a fill material between the top of the gypsum board and the bottom of the spray-applied fire resistive material on the beam, as follows:

A. Forming Material* — Nominal 4 pcf (64 kg/m³) mineral wool forming material cut into strips to fill the gap between top of the gypsum board and bottom of beam. Width of the strips shall be equal to the total thickness of the gypsum board. The strips of mineral wool shall be compressed 50 percent in thickness and firmly packed into the gap between the top of gypsum board and bottom of beam.

ROCK WOOL MANUFACTURING CO — Delta Board

ROCKWOOL — SAFE

THERMAFIBER/OWENS CORNING — Type SAF

A1. Forming Material* - Strips — (Optional) - Nom 5/8 in. (16 mm) and 1-1/4 in. (32 mm) wide by 2 in. (51 mm) high precut mineral wool strips for 1 and 2 hr rated assemblies respectively. The strips are compressed 50 percent and firmly packed, cut edge first, into the gap between the top of the gypsum board and bottom of the steel floor units on both sides of the wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP 767 Speed Strips

B. Fill, Void or Cavity Material* — Min 1/16 in. (1.6 mm) dry thickness (min 1/8 in. or 3.2 mm wet thickness) of fill material sprayed or troweled on each side of wall to completely cover mineral wool forming material and to overlap 1/2 in. (13 mm) onto gypsum board and 2 in. (51 mm) onto spray-applied fire resistive material on the structural steel support.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP672 Firestop Spray or CFS-SP WB Firestop Joint Spray

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2023-06-26

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XHBN - Joint Systems

See General Information for Joint Systems

System No. HW-D-0299

October 21, 2015

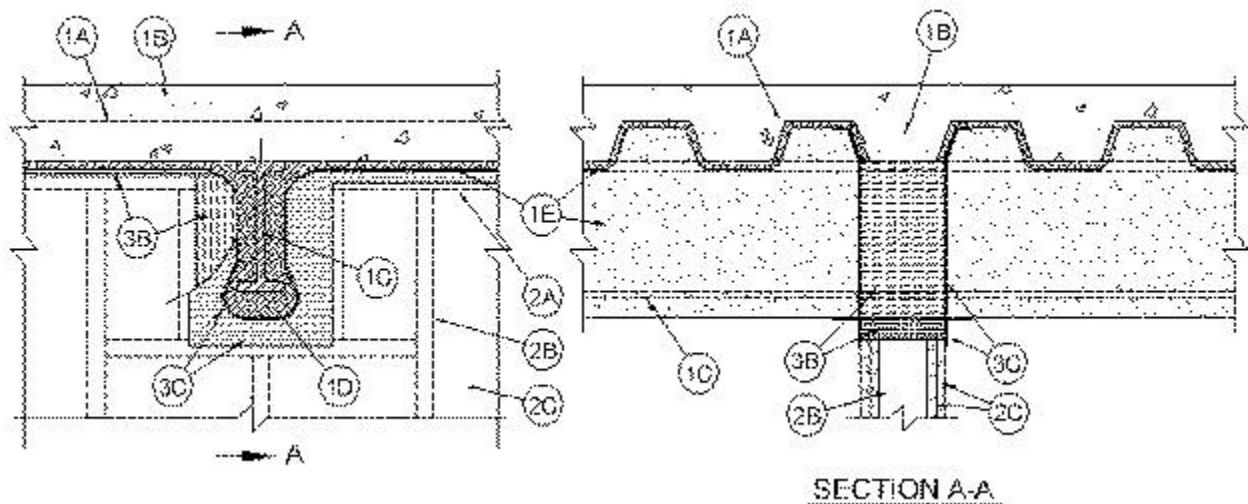
Assembly Ratings — 1 and 2 Hr (See Item 2)

Nominal Joint Width — 1 and 2 In. (See Item 3)

Class II Movement Capabilities — 25% Compression or Extension

L Rating At Ambient - Less Than 1 CFM/Lin Ft

L Rating At 400 F - Less Than 1 CFM/Lin Ft



1. Floor Assembly — The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D900 or D700 Series Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Floor Units*** — Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete** — Min 2-1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

C. **Structural Steel Support** — (Optional) - Steel beam or open-web steel joist, as specified in the individual D700 Series Floor-Ceiling Design, used to support steel floor units. Structural steel support oriented perpendicular to wall assembly. Where open-web steel joists pass through the fire rated wall, 3/8 in. (10 mm) diamond mesh expanded steel lath having a nom weight of 1.7 to 3.4 lb per sq yd (0.92-1.84 kg/m²) shall be secured to one side of each joist with steel tie wire and the lath shall be fully covered with spray-applied fire resistive material with no min thickness requirement.

D. **Spray-Applied Fire Resistive Material*** — After installation of the ceiling runner (Item 2A) or deflection channel (Item 3A, if used), steel floor units and structural steel supports to be sprayed in accordance with the specifications in the individual D700 Series Design. For D900 Series Designs structural steel supports only to be sprayed in accordance with the specifications in the individual D900 Series Design.

ISOLATEK INTERNATIONAL — Type 300

GCP APPLIED TECHNOLOGIES INC — Type MK-6/HY, MK-6/HY ES, MK-6S and RG

1A. Roof Assembly (Not Shown) — As an alternate to the floor assembly, a fire-rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P700 or P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly rating of the roof assembly shall be equal to or greater than the hourly rating of the wall assembly. The roof assembly shall include the following construction details:

A. **Steel Roof Deck** — Max 3 in. (76 mm) deep galv steel fluted roof deck.

B. **Roof Insulation** — For P900 Series Designs, min 2-1/4 in. (57 mm) thick poured insulating concrete, as measured from the top plane of the roof deck. For P700 Series Designs, as specified in the individual P700 Series Design.

C. **Spray - Applied Fire Resistive Materials*** — Prior to the installation of the Forming Material and Fill, Void or Cavity Material (Items 3B and 3C, respectively), the steel roof deck shall be sprayed with the thickness of material specified in the individual P700 Series Design. For P900 Series Designs structural steel supports only to be sprayed in accordance with the specifications in the individual P900 Series Design.

ISOLATEK INTERNATIONAL — Type 300

GCP APPLIED TECHNOLOGIES INC — Type MK-6/HY, MK-6/HY ES, MK-6S and RG

2. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Ceiling Runners** — Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). Ceiling runner to be provided with min 2 in. (51 mm) to max 3 in. (76 mm) flanges. When deflection channel (Item 3A) is used, the ceiling runner is to nest within the deflection channel with a 1/2 in. (13 mm) to 1 in. (25 mm) gap maintained between the top of the ceiling runner and the top of the deflection channel. When deflection channel is not used, ceiling runner to be provided with min 2 in. (51 mm) flanges and secured to steel floor units (Item 1A) with steel fasteners or welds spaced max 24 in. (610 mm) OC. Ceiling runner to be centered beneath and parallel with valley of steel floor unit or roof deck. A clearance of 1 in. (25 mm) shall be maintained between the end of the ceiling runner or deflection channel and the spray applied fire resistive material on the structural steel support members.

A1. Light Gauge Framing* - Slotted Ceiling Runner — As an alternate to the ceiling runner in Item 2A, slotted ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner installed parallel to direction of fluted steel floor units and secured to valleys with steel fasteners spaced max 24 in. (610 mm) OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Type SLT

A2. Light Gauge Framing* - Clipped Ceiling Runner — As an alternate to the ceiling runner in Items 2A and 2A1, clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-1/2 in. (64 mm). Clipped ceiling runner installed parallel to direction of fluted steel floor units and secured to valleys with steel fasteners spaced max 24 in. (610 mm) OC. When clipped ceiling runner is used, deflection channel (Item 3A) shall not be used.

TOTAL STEEL SOLUTIONS L L C — Snap Trak

A3. Light Gauge Framing* - Vertical Deflection Ceiling Runner — As an alternate to the ceiling runner in Items 2A, 2A1 or 2A2, vertical deflection ceiling runner to consist of galv steel channel with slotted vertical deflection clips mechanically fastened within runner. Slotted clips, provided with step bushings, for permanent fastening of steel studs. Vertical deflection ceiling runner installed parallel to direction of fluted steel floor or roof deck and secured to valleys with steel fasteners spaced max 24 in. (610 mm) OC. When slotted ceiling runner is used, deflection channel (Item 3A) shall not be used.

THE STEEL NETWORK INC — VertiTrack VTD250, VTD362, VTD400, VTD600 and VTD800

B. Studs — Steel studs to be min 3-1/2 in. (89 mm) wide. Studs cut 1/2 in. (13 mm) to 3/4 in. (19 mm) less in length than assembly height with bottom nesting in and secured to floor runner. When deflection channel (Item 3A) is used, steel studs attached to ceiling runner (Item 2A) with sheet metal screws located 1/2 in. (13 mm) below the bottom of the deflection channel. When deflection channel is not used, studs to nest in ceiling runner without attachment. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 in. (13 mm) long wafer head steel screws at midheight of slot on each side of wall. When vertical deflection ceiling runner (Item 2A3) is used, steel studs secured to slotted vertical deflection clips, through bushings, with steel screws at midheight of each slot. A framed opening shall be constructed around each structural steel support member. A min clearance of 1 in. (25 mm) to a max clearance of 3 in. (76 mm) shall be maintained between the framing and the spray applied fire resistive material on the two sides of the structural support member. The clearance between the framing and the spray applied fire resistive material on the bottom of the structural steel support member shall be max 1 in. (25 mm).

C. Gypsum Board* — Gypsum board sheets installed to a min total 5/8 in. (16 mm) or 1-1/4 in. (32 mm) thickness on each side of wall for 1 and 2 hr fire rated assemblies, respectively. Wall to be constructed as specified in the individual U400 Series Design in the UL Fire Resistance Directory, except that a max 1 in. (25 mm) gap shall be maintained between the top of the gypsum board and the spray applied fire resistive material on the steel floor units and between the top edge of the gypsum board and the spray applied fire resistive material on the structural steel support member. For D900 and P900 Series Designs, max separation between bottom of the steel floor units or roof deck and top of gypsum board (at time of installation of joint system) is 2 in. (51 mm). For D700 and P700 Series Designs, max separation between bottom of the spray applied fire resistive material on the steel floor units or roof deck and top of gypsum board (at time of installation of joint system) is 1 in. (25 mm). The screws attaching the gypsum board to studs at the top of the wall shall be located 1 in. (25 mm) below the bottom of the deflection channel, when deflection channel is used. When deflection channel is not used, the screws attaching the gypsum board to studs at the top of the wall shall be located 1 in. (25 mm) below the bottom of the ceiling runner.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. Joint System — Max separation between spray applied fire resistive material on bottom of structural support member and framed opening in top of wall is 1 in. (25 mm). For D700 and P700 series Designs, max separation between bottom of the spray applied fire resistive material on the steel floor units or roof deck and top of gypsum

board (at time of installation of joint system) is 1 in. (25 mm). For D900 and P900 Series Designs, max separation between bottom of steel floor units or roof deck and top of gypsum board (at time of installation of joint system) is 2 in. (51 mm). The joint system is designed to accommodate a max 25 percent compression or extension from it's installed width as measured between the spray applied fire resistive material on the steel floor units or roof deck and the top of the gypsum board. The joint system shall consist of forming and fill materials, with or without a deflection channel (Item 3A), as follows:

A. **Deflection Channel** — (Optional, Not Shown) - Min 24 gauge galv steel channel, 3 in. (76 mm) deep, sized to accommodate ceiling runner (Item 2A). Deflection channel to be centered beneath and parallel with valley of steel floor unit and secured to steel floor unit or roof deck with steel fasteners or welds spaced max 24 in. (610 mm) OC. The ceiling runner (Item 2A) is installed within the deflection channel to maintain a 1/2 in. (13 mm) to 1 in. (25 mm) gap between the top of the ceiling runner and the top of the deflection channel. A clearance of 1 in. (25 mm) shall be maintained between the end of the deflection channel and the spray applied fire resistive material on the structural steel support members. The ceiling runner nests inside the deflection channel without attachment.

B. **Forming Material*** — Nom 4 pcf (64 kg/m³) mineral wool batt insulation cut to a length approx the same as the overall thickness of wall and inserted cut edge first into the spaces between the spray-applied fire resistive material on the structural steel member and the framed notch at the top of the wall, flush with the gypsum board surface on both sides of the wall. The thickness of forming material shall be sufficient to attain a min compression of 33 percent between the sides of the framed notch and the protected structural steel member and a min compression of 50 percent between the bottom of the framed notch and the bottom of the protected structural steel member. Additional sections of mineral wool batt insulation are compressed 50 percent in thickness and are installed cut edge first to completely fill the gap above the top of the gypsum board, flush with both surfaces of wall.

INDUSTRIAL INSULATION GROUP L L C — MinWool-1200 Safing

JOHNS MANVILLE — Safing

ROCK WOOL MANUFACTURING CO — Delta Safing Board

ROCKWOOL MALAYSIA SDN BHD — SAFE

ROCKWOOL — SAFE

THERMAFIBER/OWENS CORNING — SAF

C. **Fill, Void or Cavity Material* - Sealant** — Min 1/8 in. (3.2 mm) wet thickness or 1/16 in. (1.6 mm) dry wet thickness of fill material sprayed or brushed over the forming material on each side of the wall. Fill material to overlap a min of 1 in. (25 mm) onto the gypsum board and a min 2 in. (51 mm) onto the spray applied material (Item 1D) on the steel floor unit or roof deck and on the structural steel support member on both sides of wall.

RECTORSEAL — FlameSafe FS3000, Metacaulk 1200, 1500 or Biostop 750, 800 Spray

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2015-10-21

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XHBN - Joint Systems

XHBN7 - Joint Systems Certified for Canada

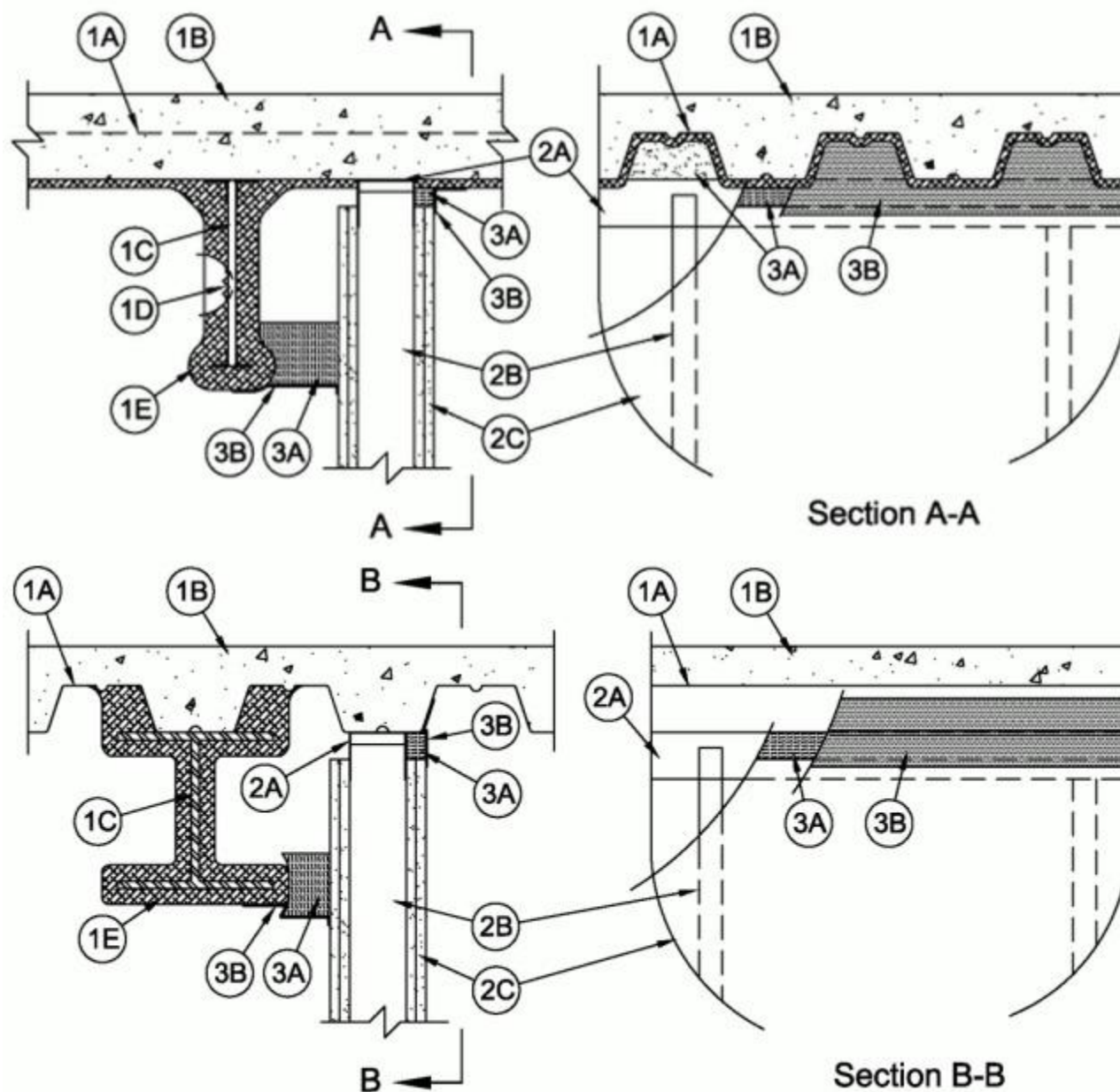
[See General Information for Joint Systems](#)

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System No. HW-D-0388

September, 05 2024

ANSI/UL2079	CAN/ULC S115
Assembly Ratings — 1 and 2 Hr (See Item 2)	F Ratings — 1 and 2 Hr (See Item 2)
Nominal Joint Width - 1-1/2 In.	FT Ratings — 1 and 2 Hr (See Item 2)
Class II Movement Capabilities — 50% Compression or Extension	FH Ratings — 1 and 2 Hr (See Item 2)
L Rating At Ambient — Less Than 1 CFM/lin ft	FTH Ratings — 1 and 2 Hr (See Item 2)
L Rating At 400 F — Less Than 1 CFM/lin ft	Nominal Joint Width - 1-1/2 In.
	Class II Movement Capabilities — 50% Compression or Extension
	L Rating At Ambient — Less Than 1 CFM/lin ft
	L Rating At 400 F — Less Than 1 CFM/lin ft



1. **Floor Assembly** — The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D700 or D900 Series Floor-Ceiling Design in the UL Fire Resistance Directory. The hourly fire rating of the floor assembly shall be equal to or greater than the hourly fire rating of the wall assembly. The floor assembly shall include the following construction features:

A. **Steel Floor and Floor Units*** — Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete** — Min 2-1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

C. **Structural Steel Support** — Steel beam or open-web steel joist, as specified in the individual D700 or D900 Series Floor-Ceiling Design, used to support steel floor units. Structural steel support oriented parallel to and 1 to 6 in. (25 to 152 mm) from wall assembly.

D. **Steel Lath** — When structural steel support (Item 1C) consists of open-web steel joists, 3/8 in. (10 mm) diamond mesh expanded steel lath having a nom weight of 1.7 to 3.4 lb per sq yd (0.9 to 1.8 kg/m²) shall be installed to completely cover one side of each joist which is located within 6 in. (152 mm) of wall assembly. The lath shall be secured with steel tie wire and shall be fully covered with spray applied fire resistive material.

E. **Spray-Applied Fire Resistive Material*** — After installation of the ceiling runner (Item 2A), steel floor units and structural steel supports to be sprayed with the thickness of material specified in the individual D700 Series Design or the structural steel supports to be sprayed in accordance with the specifications in the individual D900 Series Design. The flutes of the steel floor units above the structural steel supports and above the ceiling runner (Item 2A) shall be filled with spray-applied fire resistive material. As an alternate,

the spray-applied fire resistive material in the flutes above the ceiling runner may be applied to follow the contour of the steel floor units. Excess material shall be removed from the flanges of the ceiling runner beyond the required thickness of spray-applied fire resistive material on the steel floor units.

ISOLATEK INTERNATIONAL — Type 300, Type 400

GCP APPLIED TECHNOLOGIES INC — Type MK-6/HY, MK-6/HY ES, MK-6s, RG, MK-10HB

1A. Roof Assembly — (Not Shown) — As an alternate to the floor assembly (Item 1), a fire rated fluted steel deck roof assembly may be used. The roof assembly shall be constructed of the materials and in the manner described in the individual P700 or P900 Series Roof-Ceiling Design in the UL Fire Resistance Directory. The hourly fire rating of the roof assembly shall be equal to or greater than the hourly fire rating of the wall assembly. The roof assembly shall include the following construction features:

A. Steel Roof Deck — Max 3 in. (76 mm) deep galv steel fluted roof deck.

B. Roof Insulation — Mineral and Fiber Board* — Min 3/4 in. (19 mm) thick boards applied in one or more layers directly over steel roof deck or over gypsum board sheathing laid atop steel roof deck.

C. Roof Covering* — Hot-mopped or cold-application materials compatible with mineral and fiber board insulation.

D. Structural Steel Support — Steel beam or open-web steel joist, as specified in the individual P700 or P800 or P900 Series Roof-Ceiling Design, used to support steel deck. Structural steel support oriented parallel to and 1 in. to 6 in. (25 to 152 mm) from wall assembly.

E. Steel Lath — When structural steel support (Item 1D) consists of open-web steel joists, 3/8 in. (10 mm) diamond mesh expanded steel lath having a nom weight of 1.7 to 3.4 lb per sq yd (0.9 to 1.8 kg/m²) shall be installed to completely cover one side of each joist which is located within 6 in. (152 mm) of wall assembly. The lath shall be secured with steel tie wire and shall be fully covered with spray applied fire resistive material.

F. Spray-Applied Fire Resistive Material* — After installation of the ceiling runner (Item 2A), steel roof deck (P700 Series Roof-Ceiling design) and structural steel supports to be sprayed with a thickness of spray applied fire resistive material as specified in the individual Roof-Ceiling design. In addition, the flutes of the steel deck above the structural steel supports and above the ceiling runner (Item 2A) shall be filled with spray-applied fire resistive material. As an alternate, the spray-applied fire resistive material in the flutes above the ceiling runner may be applied to follow the contour of the steel roof deck. Excess material shall be removed from the flanges of the ceiling runner beyond the required thickness of spray-applied fire resistive material on the steel roof deck.

ISOLATEK INTERNATIONAL — Type 300, Type 400

GCP APPLIED TECHNOLOGIES INC — Type MK-6/HY, MK-6/HY ES, MK-6s, RG, MK-10HB

2. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400, V400 or W400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. Steel Floor and Ceiling Runners — Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). Flange height of ceiling runner to be 3/4 in. (19 mm) greater than max extended joint width. Ceiling runner is secured to steel floor units (Item 1A) with steel fasteners or welds spaced max 24 in. (610 mm) OC. Ceiling runner to be installed parallel with structural steel support and located such that a max clearance of 4 in. (102 mm) is present between the finished wall and the spray-applied fire resistive material at the lowest elevation of the structural steel support.

A1. Light Gauge Framing* — Slotted Ceiling Runner — As an alternate to the ceiling runner in Item 2A, ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Ceiling runner secured to valleys with steel fasteners spaced max 24 in. (610 mm) OC.

CEMCO, LLC — CST, CST325

MARINO/WARE, DIV OF WARE INDUSTRIES INC — Type SLT

A2. Light Gauge Framing* — Clipped Ceiling Runner — As an alternate to the ceiling runner in Items 2A and 2A1, clipped runner to consist of galv steel channel with clips preformed in track flanges which positively engage the inside flange of the steel studs (Item 2B). Track sized to accommodate steel studs (Item 2B). Track flanges to be min 2-1/2 in. (64 mm). Clipped ceiling runner secured with steel fasteners spaced max 24 in. (610 mm) OC.

TOTAL STEEL SOLUTIONS L L C — Snap Trak

A3. Light Gauge Framing*- Notched Ceiling Runner — As an alternate to the ceiling runners in Items 2A through 2A2, notched ceiling runners to consist of C-shaped galv steel channel with notched return flanges sized to accommodate steel studs (Item 2B). Notched ceiling runner secured to valleys with steel masonry anchors spaced max 24 in. (610 mm) OC.

OLMAR SUPPLY INC — Type SCR

A4. Light Gauge Framing* — Slotted Ceiling Runner — As an alternate to the ceiling runner in Item 2A, ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Flange height of slotted ceiling runner shall be 3-1/4 in. (83 mm) with 2 in. (51 mm) deep slots. Ceiling runner secured to valleys with steel fasteners or welds spaced max 24 in. (610 mm) OC.

SCAFCO STEEL STUD MANUFACTURING CO — Slotted Track-Type SDLT

B. Studs — Steel studs to be min 3-1/2 in. (89 mm) wide. Studs cut 3/4 in. to 1 in. (19 to 25 mm) less in length than assembly height with bottom nesting in and secured to floor runner. When slotted ceiling runner (Item 2A1) is used, steel studs secured to slotted ceiling runner with No. 8 by 1/2 (13 mm) long wafer head steel screws at mid-height of slot on each side of wall. When slotted ceiling runner (Item 2A4) is used, steel studs cut in lengths 3/4 to 1-3/4 in. (19 to 44 mm) less than floor to ceiling height and secured to slotted ceiling runner with No. 8 by 1/2 (13 mm) long wafer head steel screws at +/- 3/16 in. (5 mm) of the mid-height of slot on each side of wall.

C. Gypsum Board* — Gypsum board sheets installed to a min total 5/8 in. (16 mm) or 1-1/4 in. (32 mm) thickness on each side of wall for 1 and 2 hr fire rated assemblies, respectively. Wall to be constructed as specified in the individual U400, V400 or W400 Series Design in the UL Fire Resistance Directory except that a max 1-1/2 in. (38 mm) gap shall be maintained between the top of the gypsum board and the bottom plane of the spray applied fire resistive material on the steel deck when D700 series assembly is used or between the top of gypsum board and the steel floor units when D900 series assembly is used, on both sides of the wall assembly. The screws attaching the gypsum board to the studs along the top of the wall shall be located 1 to 1-1/2 in. (25 to 38 mm) below the bottom of the ceiling runner. No gypsum board attachment screws shall be driven into the ceiling runner. Where the top of the wall assembly is inaccessible above the lowest elevation of the structural steel support, the gypsum board attachment screws may be omitted.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. Joint System — Max separation between bottom of the spray applied fire resistive material on the steel floor units and top of gypsum board (at time of installation of joint system) is 1-1/2 in. (38 mm) when D700 series assembly is used. Max separation between bottom of the steel floor units and top of gypsum board (at time of installation of joint system) is 1-1/2 in. (38 mm) when D900 series assembly is used. Max separation between spray applied fire resistive material on structural support member and surface of wall is 4 in. (102 mm). The joint system is designed to accommodate a max 50 percent compression or extension from its installed width as measured between the bottom plane of the steel floor units or spray-applied fire resistive material on the steel floor units and the top of the gypsum board. The joint system shall consist of forming and fill materials, as follows:

A. Forming Material* — Nom 4 pcf (64 kg/m³) density mineral wool batt insulation. Sections of mineral wool batt cut to a width of 4 in. (102 mm) and stacked to attain a thickness which is 50 percent greater than the width of the linear gap between the spray applied fire resistive material on the structural steel member and the surface of the wall assembly. Stacked sections of mineral wool compressed 33 percent in thickness and installed cut edge first into linear gap until the bottom edge is flush with or extend max 1-1/2 in. (38 mm) below the bottom surface of the spray applied fire resistive material on the structural steel member. When the spray-applied fire resistive material in the flutes above the wall follows the contour of the steel deck, sections of mineral wool batt cut to the shape of the fluted deck and installed in the flutes of the steel floor or roof deck between the top of the ceiling runner and the spray-applied fire resistive material. The mineral wool batt insulation is to be installed flush with the gypsum board surface on the side of the wall opposite the structural steel support. Additional sections of mineral wool batt insulation are compressed 50 percent in thickness and are installed cut edge first to completely fill the gap above the top of the gypsum board.

INDUSTRIAL INSULATION GROUP L L C — MinWool-1200 Safing

JOHNS MANVILLE — Safing

ROCK WOOL MANUFACTURING CO — Delta Board

ROCKWOOL MALAYSIA SDN BHD — SAFE

ROCKWOOL — SAFE

THERMAFIBER/OWENS CORNING — Type SAF

A1. Forming Material* — Plugs — (Optional, Not Shown) - Preformed mineral wool plugs, formed to the shape of the fluted deck, friction fit to completely fill the flutes. The plugs shall be flush with both wall surfaces. Additional forming material, described in Item 3A, to be used in conjunction with the plugs to fill the gap between the top of the wall and bottom of steel deck.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP777 Speed Plugs

B. Fill, Void or Cavity Material* — Sealant — Min 1/8 in. (3.2 mm) wet thickness or 1/16 in. (1.6 mm) dry thickness of fill material spray or brush applied over the forming material on each side of the wall. Fill material to overlap a min of 1/2 in. (13 mm) onto the gypsum board and a min 2 in. (51 mm) onto the steel floor units or spray-applied fire resistive material on the steel floor units and on the structural steel support member.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-SP WB Firestop Joint Spray

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2024-09-05

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XHBN - Joint Systems

XHBN7 - Joint Systems Certified for Canada

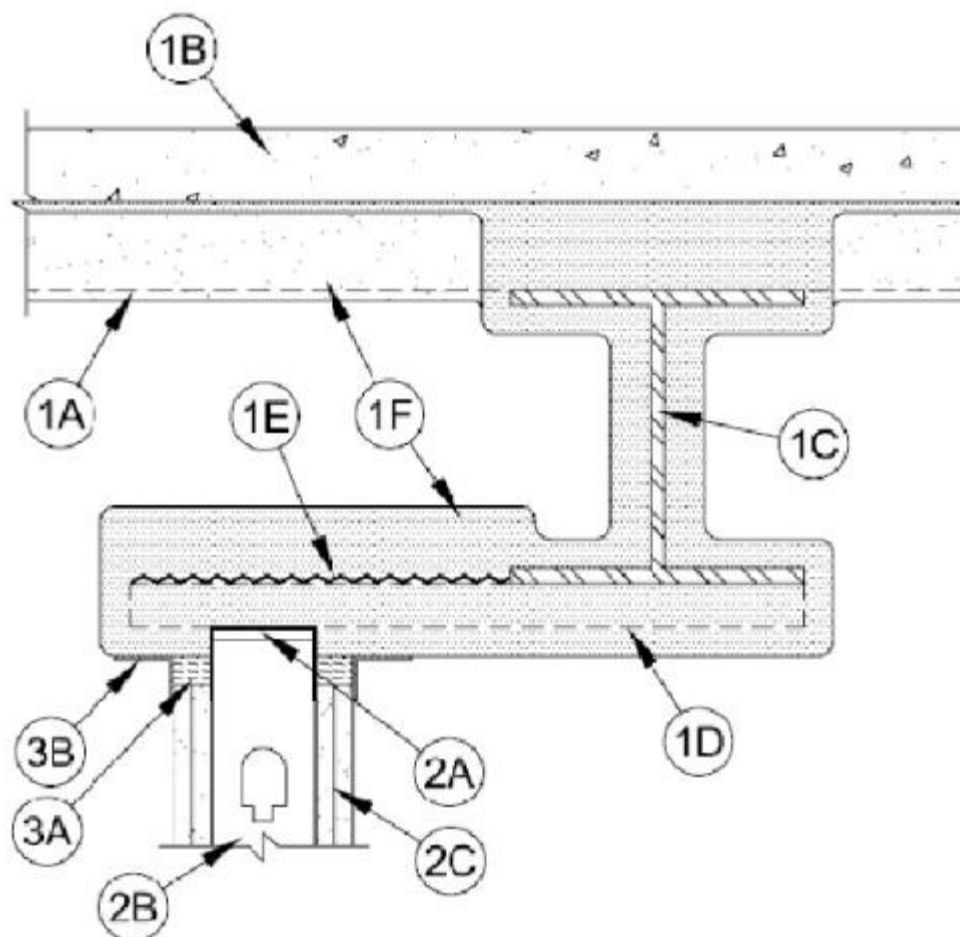
[See General Information for Joint Systems](#)

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System No. HW-D-0634

June 22, 2023

ANSI/UL2079	CAN/ULC S115
Assembly Rating — 1 and 2 Hr (See Items 1 and 2)	F Rating — 1 and 2 Hr (See Items 1 and 2)
Nominal Joint Width — 1-1/2 In.	FT Rating — 1 and 2 Hr (See Items 1 and 2)
Class II or III Movement Capabilities — 50% Compression or Extension	FH Rating — 1 and 2 Hr (See Items 1 and 2)
L Rating At Ambient — Less Than 1 CFM/sq ft	FTH Rating — 1 and 2 Hr (See Items 1 and 2)
L Rating At 400 F — Less Than 1 CFM/sq ft	Nominal Joint Width — 1-1/2 In.
	Class II or III Movement Capabilities — 50% Compression or Extension
	L Rating At Ambient — Less Than 1 CFM/sq ft
	L Rating At 400 F — Less Than 1 CFM/sq ft



1. **Floor Assembly** — The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D700 or D900 Series Floor-Ceiling Design in the UL Fire Resistance Directory and as noted below. The hourly fire rating of the floor assembly shall be equal to or greater than the hourly fire rating of the wall assembly. The floor assembly shall include the following construction features:

A. **Steel Floor and Floor Units*** — Max 3 in. (76 mm) deep galv steel fluted floor units.

B. **Concrete** — Min 2-1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

C. **Structural Steel Support** — Steel beam, as specified in the individual D700 or D900 Series Floor-Ceiling Design, used to support steel floor units. Structural steel support oriented parallel to and max 12 in. (305 mm) from wall assembly.

D. **Steel Furring** — Z-shaped bars or channels, located to span from steel beam to min 1 in. (25 mm) beyond face of wall and spaced max 24 in. (610 mm) on center. Z-shaped bars are nom 1-1/2 to 2 in. (38 to 51 mm) deep and formed from min 16 gauge painted or galvanized steel. Channels are nom 1-1/2 in. (38 mm) or 2 in. (51 mm) deep and formed from min 16 gauge painted or galvanized steel. Each bar or channel welded or fastened with steel fasteners to steel beam and welded, bolted or screwed to ceiling runner of wall. Each bar or channel shall be fully covered with spray applied fire resistive material to the minimum thickness of material required on the flanges of the steel beam.

E. **Steel Lath** — Nom 3/8 in. (10 mm) diamond mesh expanded steel rib lath having a nom weight of 3.4 lb/yd² (1.8 kg/m²) shall be installed over and attached to the steel furring bars or channels (Item 1D) to completely cover the exposed area from the flange tip of the steel beam to the end of the bar/channel framing extending beyond the wall surface. The lath shall be secured with steel fasteners or tie wire and shall be fully covered with spray applied fire resistive material (see Item 1F).

F. **Spray-Applied Fire Resistive Material*** — After installation of ceiling runner, steel floor units (as applicable) and structural steel beam to be sprayed with the thickness of material specified in the individual D700 or D900 Series Design. The flutes of the steel floor units above the structural steel beam shall be filled with spray-applied fire resistive material across the entire top flange of the steel beam. Each bar or channel furring member (Item 1D) shall be fully covered with spray applied fire resistive material to the minimum thickness of material required on the flanges of the steel beam. The thickness of material applied to the expanded steel lath shall be

sufficient to completely fill the spaces between the bar/channel furring above the wall. Additional spray-applied fire resistive material shall be applied to the web of the steel beam on each side of the wall. **For a 1 hr Assembly Rating, the thickness of material applied to each side of the steel beam web shall be 13/16 in. (21 mm). For a 2 hr Assembly Rating, the thickness of material applied to each side of the steel beam web shall be 1-3/8 in. (35 mm). In addition, the thickness of material applied to the expanded steel lath shall cover the top surface of the lath with a minimum 1-5/8 in. (41 mm) of material for the 1 hr Assembly Rating and 2-5/8 in. (67 mm) of material for the 2 hr Assembly Rating.** For D700 floors, the remainder of the steel floor units shall be sprayed as specified in the individual D700 design.

GCP APPLIED TECHNOLOGIES INC — Type MK-6/HY, MK-6/HY ES, MK-6s, RG, MK-10HB

F1. Spray-Applied Fire Resistive Material* — After installation of ceiling runner, steel floor units (as applicable) and structural steel support to be sprayed with the min thickness of material specified in the individual D700 or D900 Series Design. The flutes of the steel floor units above the structural steel beam shall be filled with spray-applied fire resistive material across the entire top flange of the steel beam. Each bar or channel furring member (Item 1D) shall be fully covered with spray applied fire resistive material to the minimum thickness of material required on the flanges of the steel beam. The thickness of material applied to the expanded steel lath shall be sufficient to completely fill the spaces between the bar/channel furring above the wall. **Additional material shall be applied to the web of the steel beam on each side of the wall. For a 1 hr Assembly Rating, the thickness of material applied to each side of the steel beam web shall be 11/16 in. (18 mm). For a 2 hr Assembly Rating, the thickness of material applied to each side of the steel beam web shall be 1-1/2 in. (38 mm). In addition, the thickness of material applied to the expanded steel lath shall cover the top surface of the lath with a minimum 1-5/8 in. (41 mm) of material for the 1 hr Assembly Rating and 2-5/8 in. (67 mm) of material for the 2 hr Assembly Rating.** For D700 floors, the remainder of the steel floor units shall be sprayed as specified in the individual D700 design.

ISOLATEK INTERNATIONAL — Type 300, Type 400

2. Wall Assembly — The 1 or 2 hr fire rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner described in the individual U400, V400 or W400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. Steel Floor and Ceiling Runners — Floor and ceiling runners of wall assembly shall consist of galv steel channels sized to accommodate steel studs (Item 2B). Flange height of ceiling runner shall be min 1/4 in. greater than max extended joint width. Ceiling runner is secured to steel furring (Item 1D) with steel fasteners or welds spaced max 24 in. (610 mm) OC. Ceiling runner to be installed parallel with structural steel support and located such that a max clearance of 12 in. (305 mm) is present between the finished wall and the flange of the steel beam (Item 1C).

A1. Light Gauge Framing* — Slotted Ceiling Runner — As an alternate to the ceiling runner in Item 2A, ceiling runner to consist of galv steel channel with slotted flanges sized to accommodate steel studs (Item 2B). Flange height of slotted ceiling runner shall be 3-1/4 in. (83 mm) with 2 in. (51 mm) deep slots. Slotted ceiling runner is secured to steel furring (Item 1D) with steel fasteners or welds spaced max 24 in. (610 mm) OC. Slotted ceiling runner to be installed parallel with structural steel support and located such that a max clearance of 12 in. (305 mm) is present between the finished wall and the flange of the steel beam (Item 1C).

SCAFCO STEEL STUD MANUFACTURING CO — Slotted Track-Type SDLT

A2. Light Gauge Framing* — Slotted Ceiling Runner — As an alternate to the ceiling runner in Item 2A, slotted ceiling runner to consist of galv steel channel with 3-1/4 in. (83 mm) high slotted flanges sized to accommodate steel studs (Item 2B). Slotted ceiling runner is secured to steel furring (Item 1D) with steel fasteners or welds spaced max 24 in. (610 mm) OC. Slotted ceiling runner to be installed parallel with structural steel support and located such that a max clearance of 12 in. (305 mm) is present between the finished wall and the flange of the steel beam (Item 1C).

CEMCO, LLC — CST 325

B. Studs — Steel studs to be min 3-1/2 in. (89 mm) wide. Studs cut 1/2 in. to 3/4 in. (13 to 19 mm) less in length than assembly height with bottom nesting in and secured to floor runner. Studs to nest in ceiling runner without attachment. When slotted ceiling runner (Item 2A1) is used, steel studs cut in lengths 3/4 to 1-3/4 in. (19 to 44 mm) less than floor to ceiling height and secured to slotted ceiling runner with No. 8 by 1/2 (13 mm) long wafer head steel screws at +/- 3/16 in. (5 mm) of the mid-height of slot on each side of wall

C. Gypsum Board* — Gypsum board sheets installed to a min total 5/8 in. (16 mm) or 1-1/4 in. (32 mm) thickness on each side of wall for 1 and 2 hr fire rated assemblies, respectively. Wall to be constructed as specified in the individual U400 or V400 Series Design in the UL Fire Resistance Directory except that a max 1-1/2 in. (38 mm) gap shall be maintained between the top of the gypsum board and the bottom plane of the spray applied fire resistive material on the steel furring (Item 1D) on both sides of the wall assembly.

The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.

3. **Joint System** — Max separation between bottom plane of spray-applied fire resistive material on the steel attachment clip (Item 1D) and the top of the gypsum board is 1-1/2 in. (38 mm). The joint system is designed to accommodate a max 50 percent compression or extension from its installed width. The joint system shall consist of forming and fill materials, as follows:

A. **Forming Material*** — Nom 4 pcf (64 kg/m³) density mineral wool batt insulation. Sections of mineral wool batt cut to a thickness equal to the overall thickness of gypsum board and compressed a min of 50 percent into the gap between the top of the gypsum board and the bottom plane of the spray applied fire resistive material on the steel furring (Item 1D) on both sides of the wall assembly.

ROCK WOOL MANUFACTURING CO — Delta Board

ROCKWOOL — SAF Mineral Wool

THERMAFIBER/OWENS CORNING — Type SAF

A1. **Forming Material* — Strips** — As an alternate to Item 3A, the strips are stacked to a height twice larger than the distance between the top of the gypsum board and the bottom of the steel floor unit. Strips compressed 50 percent and installed within ceiling runner above top of liner panel flush with the inside surface of the panel. Strips compressed and installed on finished side of the wall between the top of the gypsum board and the bottom of the steel floor units, flush with the surface of the wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP 767 Speed Strips

B. **Fill, Void or Cavity Material* — Sealant** — Min 1/16 in. (1.6 mm) dry thickness (1/8 in. or 3.2 mm wet thickness) fill material sprayed or troweled on each side of wall to completely cover mineral wool forming material and to overlap min 1/2 in. (13 mm) onto wall and min 2 in. (51 mm) onto spray-applied fire resistive material.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP672 Firestop Spray or CFS-SP WB Firestop Joint Spray

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2023-06-22

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- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

XHBN - Joint Systems
XHBN7 - Joint Systems Certified for Canada

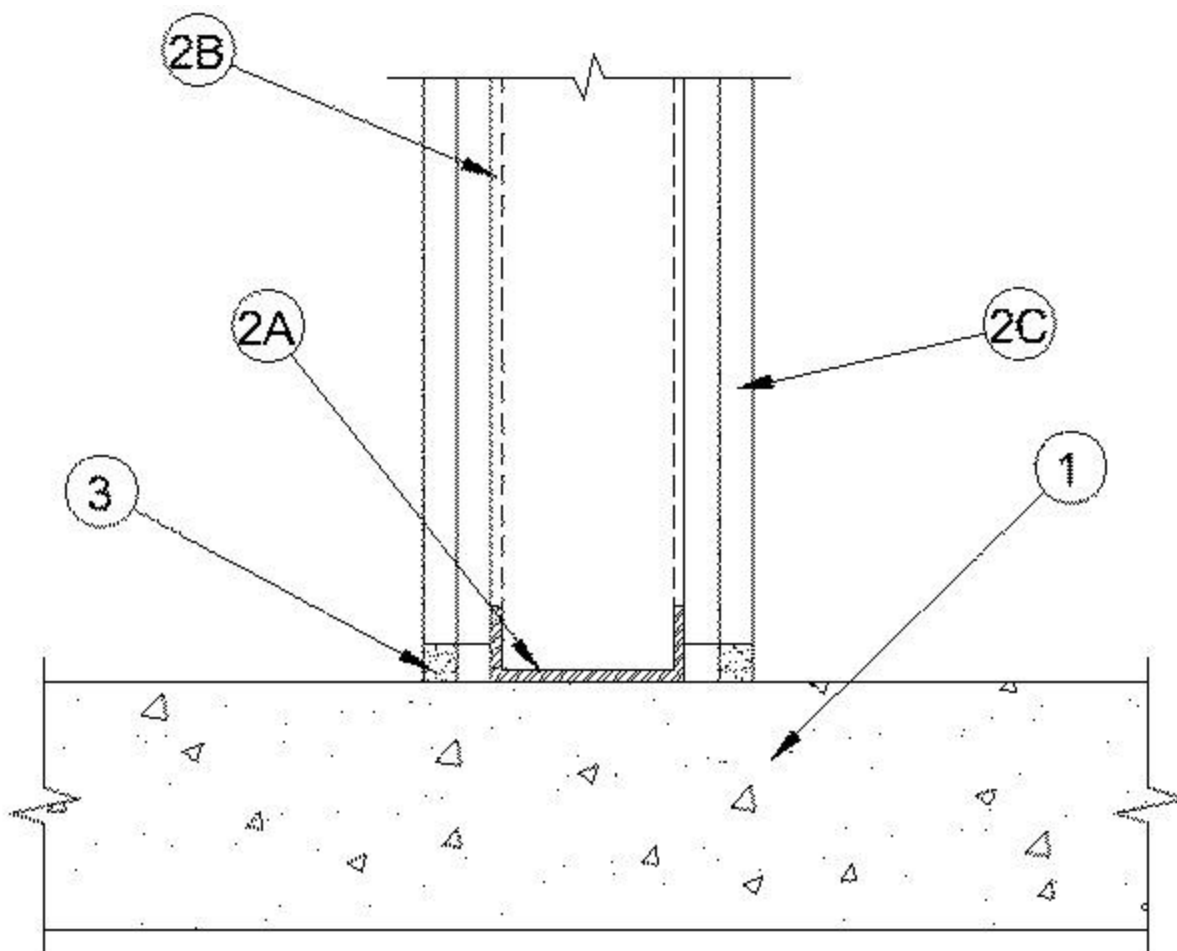
[See General Information for Joint Systems](#)

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System No. BW-S-0002

October 7, 2022

ANSI/UL2079	CAN/ULC S115
Assembly Ratings — 1, 2, 3 and 4 Hr (See Item 2)	F Ratings — 1, 2, 3 and 4 Hr (See Item 2)
Nominal Joint Width - 7/8 or 1 In. (See Item 3)	FT Ratings — 1, 2, 3 and 4 Hr (See Item 2)
L Rating at Ambient — Less than 1 CFM/Lin Ft	FH Ratings — 1, 2, 3 and 4 Hr (See Item 2)
L Rating at 400°F — Less than 1 CFM/Lin Ft	FTH Ratings — 1, 2, 3 and 4 Hr (See Item 2)
	Nominal Joint Width - 7/8 and 1 In. (See Item 3)
	L Rating at Ambient — Less than 1.55 L/s/m
	L Rating at 204°C — Less than 1.55 L/s/m



1. **Floor Assembly** — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) structural concrete. Floor may also be constructed of any 6 in. (152 mm) thick UL Classified hollow-core **Precast Concrete Units***. See **Precast Concrete Units** category in the Fire Resistance Directory for names of manufactures.

1A — (Not Shown, Alternate) For 1-hr and 2-hr fire ratings only, The fire-rated fluted steel floor unit/concrete floor assembly shall be constructed of the materials and in the manner described in the individual D700 or D900 Series Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Floor and Form Units*** —Max 3 in. (76 mm) deep galv steel fluted units.

B. **Concrete** —Min 2-1/2 in. (64 mm) thick reinforced concrete, as measured from the top plane of the floor units.

2. **Wall Assembly** — The 1, 2, 3 or 4 hr fire-rated gypsum board/steel stud wall assembly shall be constructed of the materials and in the manner specified in the individual U400, V400 or W400 Series Wall or Partition Design in the UL Fire Resistance Directory. In addition, the wall may incorporate a head-of-wall joint system as specified in the HW Series Joint Systems in the UL Fire Resistance Directory. The wall shall include the following construction features:

A. **Steel Floor Runners** — Floor runners of wall assembly shall consist of min No. 25 gauge galv steel channels sized to accommodate steel studs (Item 2B). Floor runners to be provided with 1-1/4 in. (32 mm) flanges. Runners secured with steel fasteners spaced 12 in. (305 mm) OC.

B. **Studs** — Steel studs to be min 3-1/2 in. (89 mm) wide. Studs cut 1/2 to 3/4 in. (13 to 19 mm) less in length than assembly height with bottom nesting in, resting on and fastened to floor runner with sheet metal screws. Stud spacing not to exceed 24 in. (610 mm) OC.

C. **Gypsum Board*** — One, two, three or four layers of 5/8 in. (16 mm) thick gypsum board for 1, 2, 3 and 4 hr rated assemblies, respectively, Wall to be constructed as specified in the individual U400, V400 or W400 Series Design in the UL Fire Resistance Directory, except that a max 1 in. (25 mm) gap for 1 and 2 hr rated assemblies or a max 7/8 in. gap for 3 and 4 hr rated assemblies shall be maintained between the bottom of gypsum board and top of concrete floor. **The hourly fire rating of the joint system is equal to the hourly fire rating of the wall.**

3. Fill, Void or Cavity Material* Sealant — Max separation between top of floor and bottom of gypsum board wall sheathing is 1 in. (25 mm) for 1 and 2 hr rated assemblies or 7/8 in. (22 mm) for 3 and 4 hr rated assemblies. Min 5/8 in. (16 mm) thickness of fill material for 1 and 2 hr rated assemblies, min. 1 in. (25 mm) thickness of fill material for 3 and 4 hr rated assemblies, installed on each side of the wall between the bottom of the gypsum board and the top of the concrete floor, flush with each surface of the wall. For 1 and 2 hr rated assemblies only, and when forming material, (Item 4) is used, the fill material thickness may be reduced to a min. 1/4 in. (6.4 mm).

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP 605 Bottom of Wall Firestop Sealant, CP601S Elastomeric Firestop Sealant, CP606 Flexible Firestop Sealant, CFS-S SIL GG or FS-ONE MAX Intumescent Sealant.

4. Forming Material — (Optional, Not Shown) - Mineral wool insulation, fiberglass batt insulation or polyurethane/polyethylene foam backer rod. Forming material to be recessed from both surfaces of the 2, 3 and 4 hr fire rated wall to accommodate the required thickness of fill material.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2022-10-07

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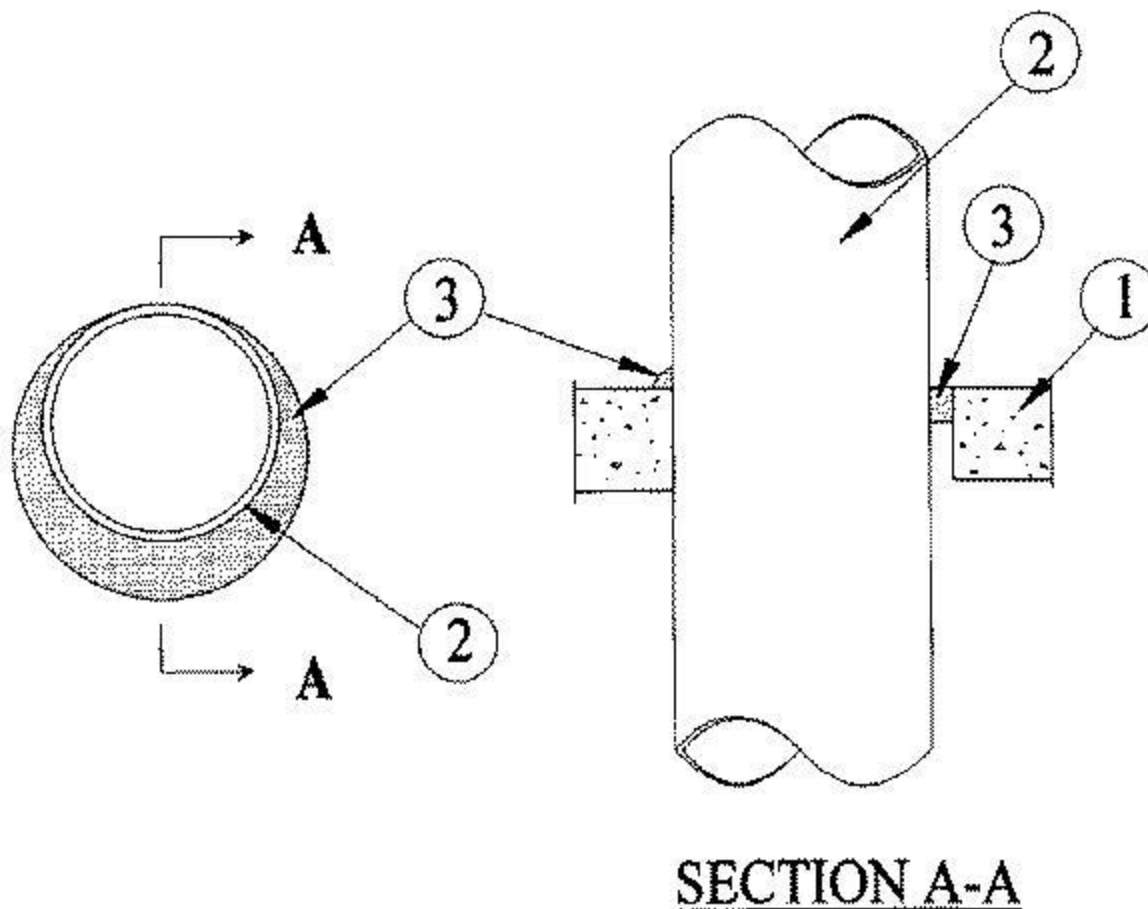
XHEZ - Through-penetration Firestop Systems
XHEZ7 - Through-penetration Firestop Systems Certified for Canada

[See General Information for Through-penetration Firestop Systems](#)
[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. C-AJ-1291

January 07, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Rating — 2 Hr	F Rating — 2 Hr
T Rating — 0 Hr	FT Rating — 0 Hr
	FH Rating — 2 Hr
	FTH Rating — 0 Hr



1. **Floor or Wall Assembly** — Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 30-7/8 in. (784 mm).

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

2. **Through-Penetrant** — One metallic pipe or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe or conduit and periphery of opening shall be min 0 in. to max 7/8 in. (22 mm). Pipe or conduit to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes or conduits may be used:

A. **Steel Pipe** — Nom 30 in. (762 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe** — Nom 30 in. (762 mm) diam (or smaller) cast or ductile iron pipe.

C. **Copper Pipe** — Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

D. **Copper Tubing** — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

E. **Conduit** — Nom 6 in. (152 mm) diam (or smaller) steel conduit.

F. **Conduit** — Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing (EMT).

3. **Fill, Void or Cavity Material* — Sealant** — Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall. At the point contact location between pipe and concrete, a min 1/4 in. (6 mm) diam bead of fill material shall be applied at the concrete/pipe interface on the top surface of floor and on both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant or FS-ONE MAX Intumescent Sealant

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2015-01-07

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- Only products which bear UL's Mark are considered Certified.

XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

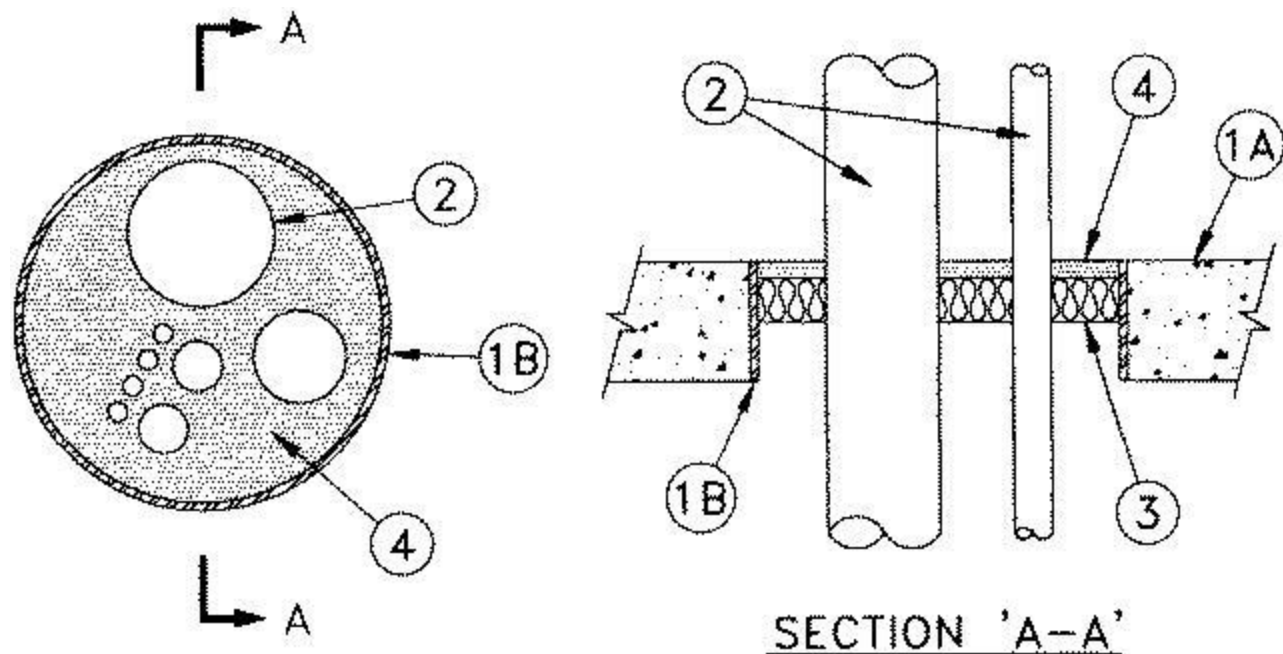
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. C-AJ-1406

July 03, 2024

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Rating — 2 Hr	F Rating — 2 Hr
T Rating — 0 Hr	FT Rating — 0 Hr
	FH Rating — 2 Hr
	FTH Rating — 0 Hr
L Rating at Ambient - Less than 1 CFM/sq ft	L Rating At Ambient — Less Than 5.1 L/s/m ²
L Rating at 400° F - Less than 1 CFM/sq ft	L Rating At 204° C — Less Than 5.1 L/s/m ²



1A. Floor or Wall Assembly — Min 2-1/2 in. (64 mm) thick floor or 3 in. (76 mm) thick wall of reinforced light weight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max diam of opening is 15-1/4 in. (387 mm).

See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

1B. Metallic Sleeve (Optional) — Nom 15-1/4 in. (387 mm) diam (or smaller), Schedule 30 (or heavier) steel pipe sleeve, cast or grouted into floor or wall assembly, flush with floor or wall surfaces.

2. Through Penetrants - — A max of eight pipes, conduits or tubing to be installed within the opening. The space between pipes, conduits or tubing shall be min 1/2 in. (13 mm) to max 3 in. (76 mm). The space between pipes, conduits or tubing and periphery of opening shall be min 1/2 in. (13 mm) to max 5 in. (127 mm). Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:

A. **Steel Pipe** — Nom 6 in. (152 mm) diam (or smaller) Schedule 40 (or heavier) steel pipe.

B. **Conduit** — Nom 2 in. (51 mm) diam (or smaller) electrical metallic tubing.

C. **Copper Tubing** — Nom 3/4 in. (19 mm) diam (or smaller) Type L (or heavier) copper tubing.

D. **Copper Pipe** — Nom 4 in. (102 mm) diam (or smaller) Regular (or heavier) copper pipe.

3. Packing Material — Min 2 in. (51 mm) thick mineral wool insulation of min 4 pcf (64 kg/m³) firmly pressed into opening as a permanent form. Insulation material to be recessed by min depth of 1/2 in. (13 mm) from top surface of floor or both surfaces of wall.

4. Fill, Void, or Cavity Materials* - Caulk — Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with top surface of floor or both surfaces of wall.

RECTORSEAL — Metacaulk MC 150+

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2024-07-03

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- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

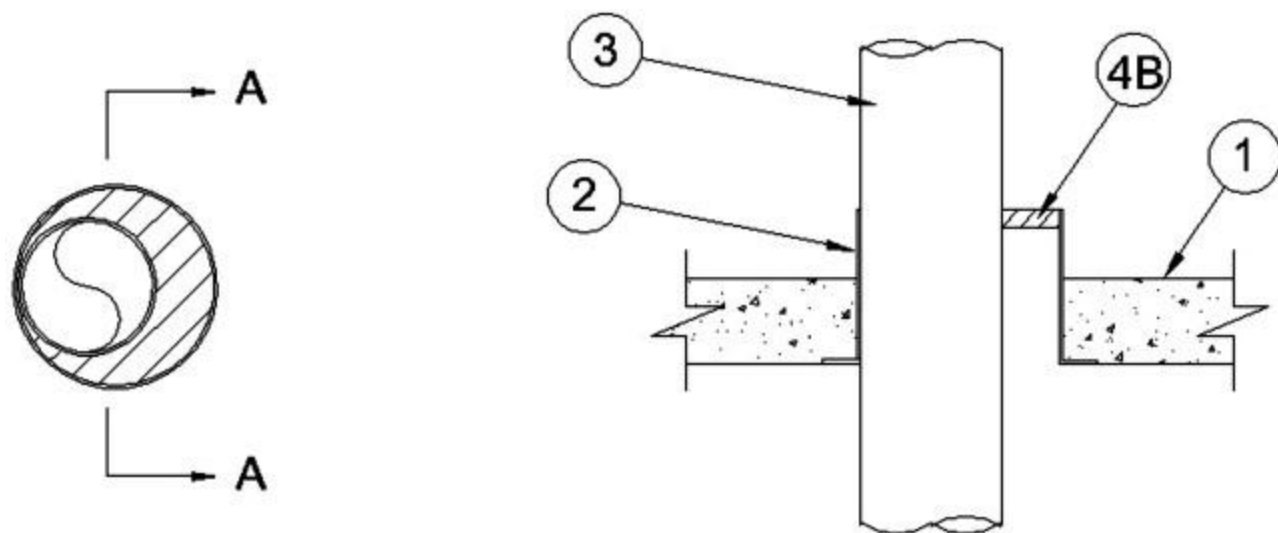
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. C-AJ-1575

February 20, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 2 and 3 Hr (See Item 4B)	F Ratings — 2 and 3 Hr (See Item 4B)
T Rating — 0 Hr	FT Rating — 0 Hr
W Rating — Class 1 (See Item 4)	FH Ratings — 2 and 3 Hr (See Item 4B)
	FTH Rating — 0 Hr



SECTION A-A

1. Floor or Wall Assembly — Min 2-1/2 in. (64 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow core **Precast Concrete Units***. Max diam of opening is 30-7/8 in. (784 mm) when concrete floor or wall is used and max 7 in. (178 mm) when precast concrete units are used.

See **Concrete Blocks** (CAZT) and **Precast Concrete Units** (CFTV) categories in the Fire Resistance Directory for names of manufacturers.

1A. Floor Assembly - (Optional - Not Shown) — The fire rated unprotected concrete and steel floor assembly shall be constructed of the materials and in the manner specified in the individual D900 Series designs in the UL Fire Resistance Directory and as summarized below:

A. **Concrete** — Min 2-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete.

B. **Steel Floor and Form Units*** — Composite or non-composite max 3 in. (76 mm) deep galv steel fluted units as specified in the individual Floor-Ceiling Design.

2. Steel Sleeve — See Table in Item 4B for when sleeve is required. Also not required for hollow core precast concrete floors. Schedule 10 (or heavier) steel sleeve cast or grouted into floor or wall assembly. Sleeve may extend a max of 8 in. (203 mm) above top of floor or beyond either surface of wall. As an alternate, in floors only, min 26 gauge galvanized sheet steel sleeve provided with a min. 26 gauge galvanized steel square flange spot welded to the bottom of the sleeve and sized to be a min of 2 in. (51 mm) larger than the sleeve diam. The sheet metal sleeve is to be cast in place and may extend a max of 2 in. (51 mm) above the top surface of the concrete floor, except that when sleeve is greater than nom 13 in. (330 mm) diam, sleeve shall be installed flush with both surfaces of floor.

3. Through-Penetrants — One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening or sleeve shall be min 0 in. (point contact). See Table in Item 4B for max annular space. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:

A. **Steel Pipe** — Nom 30 in. (762 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe** — Nom 30 in. (762 mm) diam (or smaller) cast or ductile iron pipe.

C. **Conduit** — Nom 6 in. (152 mm) diam (or smaller) rigid steel conduit.

D. **Conduit** — Nom 4 in. (102 mm) diam (or smaller) electrical metallic tubing (EMT).

E. **Copper Tubing** — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

F. **Copper Pipe** — Nom 6 in. (152 mm) diam (or smaller) regular (or heavier) copper pipe.

4. **Firestop System** — The firestop system shall consist of the following:

A. **Packing Material** — (Not Shown.) - Min 1 in. (25 mm) thickness of polyethylene backer rod, mineral wool batt or glass fiber insulation firmly packed into opening as a permanent form. Packing material to be recessed from top or bottom surface of floor/sleeve or from both surfaces of wall/sleeve to accommodate the required thickness of fill material (Item 4B). Packing material is required as specified in Table below.

A1. **Forming Materials*** — (Optional, Not Shown) As an alternate to Item 4A, min 1 in. (25 mm) thickness of forming material to be foamed into the opening as a permanent form. Forming material to be recessed from top or bottom surface of floor/sleeve or from both surfaces of wall/sleeve to accommodate the required thickness of fill material (Item 4B).

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CF812 or CF-AS CJP Foam Sealant

A2. **Packing Material** — (Not Shown.) - For W Rating, floors only, min 4 in. thick, min 4 pcf (64 kg/m³) mineral batt insulation tightly packed into sleeve and recessed from top of sleeve to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Materials* — Sealant** — Applied to fill the annular space flush with top or bottom surface of floor/sleeve. In hollow core precast concrete floors, fill material to be installed flush with the bottom of the floor. Fill material may optionally be installed flush with the top of the assembly. In wall assemblies, fill material to be installed symmetrically on both sides of wall or floor, flush with wall/sleeve or floor surface. In wall assemblies, an additional bead of fill material shall be applied at the point contact location between penetrant and sleeve or between penetrant and concrete, at top surface of floor/sleeve and at both surfaces of wall/sleeve. The bead shall be min 1/2 in. (13 mm) diam and shall extend over the point contact location to the 1/4 in. (6 mm) annular space. **For W Rating, fill material to be installed flush with top of sleeve only and an additional min 1/2in. (13 mm) bead of sealant shall be applied at the sleeve/concrete interface on the top surface of the floor.** The min required fill material thickness and the location of the sealant at top or bottom of floor opening are dependent upon a number of parameters, as shown in the table below.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant or FS-ONE MAX Intumescent Sealant

Note: W Rating applies only when FS-ONE MAX Intumescent Sealant is used.

Min Floor or Wall Thick, In. (mm)	Nom Diam of Copper Pipe or Tube In. (mm)	Nom Diam of Steel/Iron Pipe or Conduit In. (mm)	Max Annular Space In. (mm)	Min Sealant Thick. In. (mm)	Sealant Flush with Top or Bottom	Sleeve	Packing Matl	F Rating Hr
2- 1/2 (64)	1/2-4 (13- 102)	1/2-30 (13-762)	7/8 (22)	1/2(13)	Top	No	No	2
2- 1/2 (64)	1/2-4 (13- 102)	1/2-8 (13-203)	2-7/8 (73)	1 (25)	Top	Yes	No	2
2- 1/2 (64)	1/2-4 (13- 102)	1/2-8 (13-203)	1-7/8 (48)	1/2(13)	Top	Yes	No	2

2- 1/2 (64)	1/2-4 (13- 102)	1/2-12 (13-305)	7/8 (22)	1 (25)	Bottom	Yes	No	2
2- 1/2 (64)	1/2-4 (13- 102)	1/2-8 (13-203)	2-7/8 (73)	1 (25)	Top	Optional	Yes	2
2- 1/2 (64)	1/2-6 (13- 152)	1/2-30 (13-762)	2-7/8 (73)	1 (25)	Top	Yes	Yes	2
4- 1/2 (114)	1/2-4 (13- 102)	1/2-10 (13-254)	3-1/4 (83)	1 (25)	Top or Bottom	No	No	3
4- 1/2 (114)	1/2-4 (13- 102)	1/2-30 (13-762)	7/8 (22)	1/2(13)	Top	No	No	3
4- 1/2 (114)	1/2-4 (13- 102)	1/2-8 (13-203)	1-7/8 (48)	1/2(13)	Bottom	No	No	2

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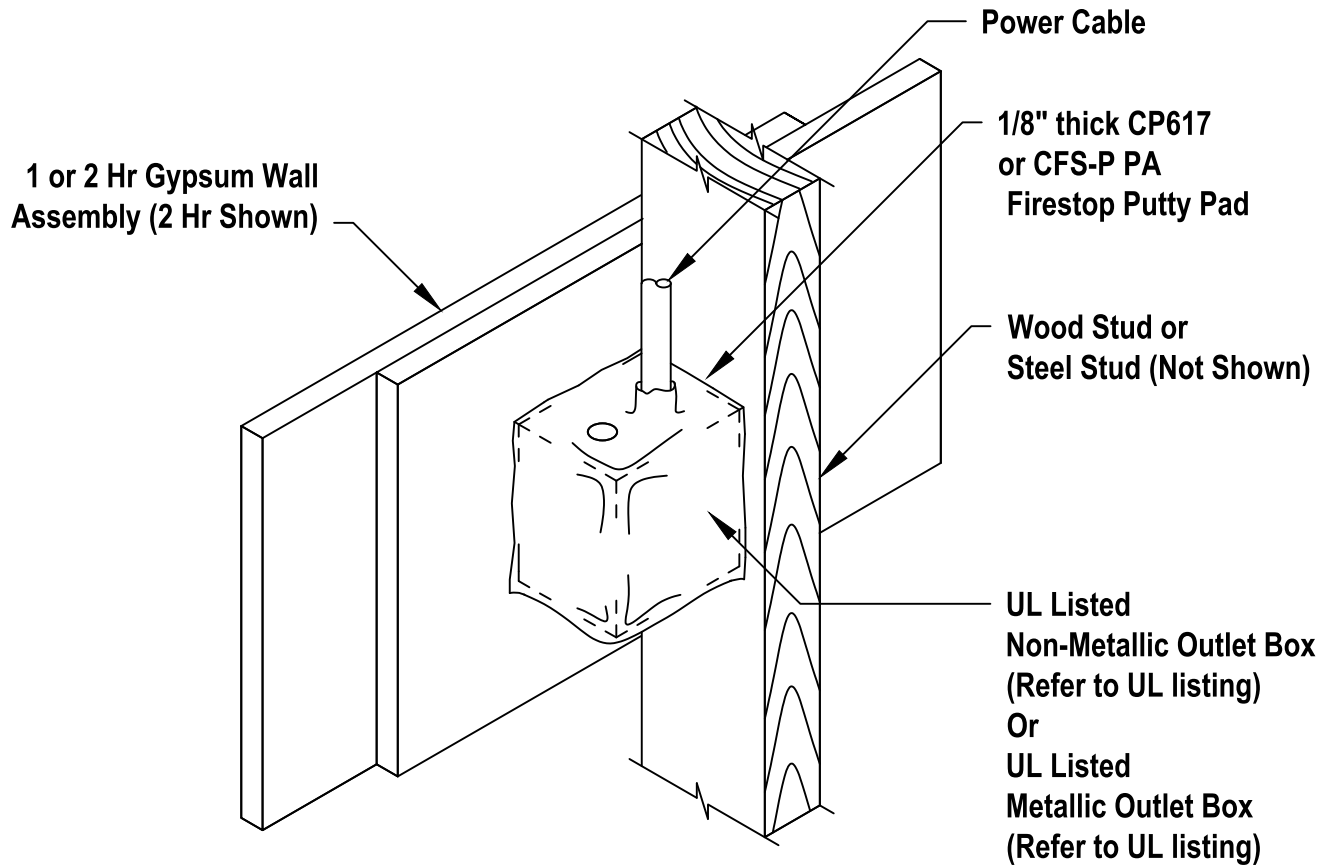
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Classified by
Underwriters Laboratories, Inc.
to UL 263 and CAN/ULC-S115

Wall Opening Protective Materials (CLIV, CLIV7)

CP617 / CFS-P PA / FIRESTOP BOX INSERT



Wall Opening Protective Materials (CLIV, CLIV7)

CP617 / CFS-P PA / FIRESTOP BOX INSERT

1 or 2-Hr. Gypsum
Wall Assembly
(2-Hr. Shown)

Steel Stud or
Wood Stud (Not Shown)

Power Cable

Firestop Box Insert

UL Listed Metallic Outlet Box
(Refer to UL Listing)

HILTI

FIRESTOP BOX INSERT

4" x 4"

Switch and Outlet Boxes



APPLICATION

Hilti Firestop Box Insert is used to maintain fire resistance rating of gypsum wall assemblies when the horizontal distance between electrical boxes on opposite sides of the walls is less than 24" provided that the boxes are not installed back to back. (Refer to UL Fire Resistance Directory)



Refer to NEC 314.16 or other applicable codes.



Hilti Firestop Systems

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October 28, 2019

Wall Opening Protective Materials (CLIV, CLIV7)

CP 617(-L, -XL) or CFS-P PA Firestop Putty Pads, for use with flush device UL Listed Metallic Outlet Boxes installed with steel mud rings or UL Listed Nonmetallic Outlet Boxes in framed wall assemblies as specified below. When protective material is used on outlet boxes on both sides of the wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back (unless otherwise indicated). Installation shall comply with the National Electrical Code (NFPA 70). Min 1/8 in. thick (CP 617) or min 0.2 in. (CFS-P PA) thick moldable putty pads are to be installed to completely cover the exterior surfaces of the outlet box (except for the side of the outlet box against the stud) and conduit fittings/connectors and to completely seal against the stud and gypsum board in the wall cavity unless otherwise noted below. When CFS-P PA is used, the putty pads may be installed with the release liner intact on the outside of the pad with the exception of any overlaps, in which case the liner is to be removed from the bottom layer at the overlap location. The box composition, max device dimensions, hourly rating, type of stud and type of faceplate are specified below.

CP 617(-L, -XL) or CFS-P PA Firestop Putty Pads, for use with max 4 by 4 by max 2-1/8 in. flush device UL Listed Metallic Outlet Boxes installed with steel cover plates in 1 and 2 hr. fire rated gypsum wallboard wall assemblies framed with min 3-1/2 in. deep wood or steel studs and constructed as specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the Fire Resistance Directory.

CP 617(-L, -XL) or CFS-P PA Firestop Putty Pads, for use with max 4-11/16 by 4-11/16 by max 2-1/8 in., or max 4-3/8 by 4-7/8 by max 2-1/8 in., flush device UL Listed Metallic Outlet Boxes installed with steel cover plates for use in 1 hr fire rated V446 gypsum board/steel stud or U341 gypsum board/wood stud Wall and Partition Design No. in the Fire Resistance Directory. When U341 wall design is used, wall shall be sheathed with 5/8 in. gypsum board, and glass or mineral fiber batt insulation shall be installed in stud cavities in accordance with U341 design. Boxes may be installed back-to-back.

CP 617(-L, -XL) or CFS-P PA Firestop Putty Pads, for use with max 4-11/16 by 4-11/16 by max 2-1/8 in. flush device UL Listed Metallic Outlet Boxes installed with steel cover plates for use in 1 and 2 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep wood or steel studs and constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the Fire Resistance Directory. Min 0.8 pcf density fiberglass batt insulation is to be installed within the wall cavity required for 1 hr fire rated gypsum board wall assemblies and optional in 2 hr fire rated gypsum wallboard assemblies.

CP 617(-L, -XL) or CFS-P PA Firestop Putty Pads, for use with max 4 by 3-3/4 by 3 in. deep UL Listed Nonmetallic Outlet Boxes manufactured by Carlon Electrical Products, made from polyvinyl chloride, and bearing a 2 hr rating under the "Outlet Boxes and Fittings Classification for Fire Resistance" category in the Fire Resistance Directory. Putty pads and boxes for use in 1 and 2 hr fire rated gypsum wallboard assemblies, framed with min 3-1/2 in. deep wood studs and constructed as specified in the individual U300 Series Wall and Partition Designs in the Fire Resistance Directory. Outlet box secured to wood stud by means of two nailing tabs supplied with the outlet box. Putty pads shall lap min 1/2 in. onto the stud and gypsum board within the stud cavity. Outlet boxes installed with steel or plastic cover plates.

CP 617(-L, -XL) or CFS-P PA Firestop Putty Pads, for use with max 4 by 4 by 2-7/8 in. deep UL Listed Nonmetallic Outlet Boxes manufactured by Carlon Electrical Products, made from polyvinyl chloride, and bearing a 2 hr rating under the "Outlet Boxes and Fittings Classification for Fire Resistance" category in the Fire Resistance Directory. Putty pads and boxes for use in the 1 hr fire rated V446 gypsum board/steel stud or U341 gypsum board/wood stud Wall and Partition Design in the Fire Resistance Directory. When U341 wall design is used, wall shall be sheathed with 5/8 in. gypsum board, and glass or mineral fiber batt insulation shall be installed in stud cavities in accordance with U341 design. Outlet box secured to steel stud by means of fastening tab supplied with the outlet box. Putty pads shall lap min 1/2 in. onto the stud and gypsum board within the stud cavity. Outlet boxes installed with steel or plastic cover plates. Boxes may be installed back to back.

CP 617(-L, -XL) Firestop Putty Pads, for use with max 2-1/4 by 3-3/4 by 2-3/4 in. deep UL Listed Nonmetallic Outlet Boxes manufactured by Pass and Seymore, Inc., and bearing a 2 hr rating under the "Outlet Boxes and Fittings Classification for Fire Resistance" category in the Fire Resistance Directory. Putty pads and boxes for use in 1 and 2 hr fire rated gypsum wallboard assemblies, framed with min 3-1/2 in. deep wood studs and constructed as specified in the individual U300 Series Wall and Partition Designs in the Fire Resistance Directory. Outlet box secured to wood stud by means of two nailing tabs supplied with the outlet box. Putty pads shall lap min 1/2 in. onto the stud and gypsum board within the stud cavity. Outlet boxes installed with steel or plastic cover plates.

CP 617(-L, -XL) or CFS-P PA Firestop Putty Pads, for use with max 4 by 3-3/4 by 3 in. deep UL Listed Nonmetallic Outlet Boxes manufactured by Allied Molded Products, Inc., made from fiber reinforced thermoplastic and bearing a 2 hr rating under the "Outlet Boxes and Fittings Classification for Fire Resistance" category in the Fire Resistance Directory. Putty pads and boxes for use in 1 hr fire rated gypsum wallboard assemblies, framed with min 3-1/2 in. deep wood studs and constructed as specified in the individual U300 Series Wall and Partition Designs in the Fire Resistance Directory. Outlet box secured to wood stud by means of two nailing tabs supplied with the outlet box. Outlet boxes installed with plastic cover plates. Putty pads shall lap min 1/2 in. onto the stud and gypsum board within the stud cavity.



Hilti Firestop Systems

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Wall Opening Protective Materials (CLIV, CLIV7)

CP 617(-L, -XL) or CFS-P PA Firestop Putty Pads, for use with max 4 by 4 in. by 1-1/2 in. deep flush device UL Listed Metallic Outlet Boxes installed with steel cover plates in 1 hr. fire rated gypsum wallboard wall assemblies framed with min 3-1/2 in. deep wood or steel studs and constructed as specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the Fire Resistance Directory. The boxes are installed back to back with 5 in. by 4 in. UL Classified fire block, CP 657 or CFS-BL Firestop Block installed in the cavity between the two boxes.

CP 617(-L, -XL) or CFS-P PA Firestop Putty Pads, for use with max 14 by 4 by max 2-1/2 in. flush device UL Listed Metallic Outlet Boxes installed with steel cover plates in 1 and 2 hr. fire rated gypsum board wall assemblies framed with min 5-1/2 in. deep wood or steel studs for 2 hr fire rated walls and min 3-1/2 in. deep wood or steel studs for 1 hr fire rated walls. Walls constructed as specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the Fire Resistance Directory. Stud cavity insulation is required and shall consist of min 5-1/2 in. (2 hr rated walls) or min 3-1/2 in. (1 hr rated walls) thick fiberglass (min 0.8 pcf) or mineral fiber (min 4 pcf). Putty pads shall lap min 1/2 in. onto the stud and gypsum board within the stud cavity. When boxes are interconnected by means of electrical metallic tube (EMT) or conduit, a ball of putty pad material shall be used to completely plug the open end of each EMT or conduit within the box.

CP 617(-L, -XL) or CFS-P PA Firestop Putty Pads, for use with max 4-11/16 by 4-11/16 by max 2-1/8 in. flush device UL Listed Metallic Outlet Boxes installed with steel or plastic cover plates for use in 1 and 2 hr fire rated gypsum board wall assemblies framed with min 5-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 or V400 Series Wall and Partition Designs in the Fire Resistance Directory. Putty pads shall lap min 1/2 in. onto the stud and gypsum board within the stud cavity. When boxes are interconnected by means of electrical metallic tube (EMT) or conduit, a ball of putty pad material shall be used to completely plug the open end of each EMT or conduit within the outlet boxes. Metallic outlet boxes may be provided with steel attachment brackets which offset box min 1/4 in. from stud. When steel attachment brackets are used, putty pad to be affixed to the back and all four sides of the box.

CP 617(-L, -XL) or CFS-P PA Moldable Putty Pads, for use with max 4-11/16 by 4-11/16 in. by max 2-1/8 in. flush device UL Listed Metallic Outlet Boxes installed with steel cover plates in 2 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 and V400 Series Wall and Partition Designs in the Fire Resistance Directory. An additional 3/4 in. ball of putty pad material shall be used to plug the end of each electrical metallic tube or conduit at its connection to the box.

CP 617(-L, -XL) or CFS-P PA Moldable Putty Pads, for use with max 4 by 4 by 2-1/8 in. flush device UL Listed Metallic Outlet Boxes installed with steel or plastic cover plates in 2 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 and V400 Series Wall and Partition Designs in the Fire Resistance Directory. An additional 3/4 in. ball of putty pad material shall be used to plug the end of each electrical metallic tube or conduit at its connection to the box.

CP 617(-L, -XL) or CFS-P PA Moldable Putty Pads, for use with max 14-1/4 by 4-1/2 by 2-1/2 in. flush device UL Listed Metallic Outlet Boxes installed with steel cover plates in 2 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 and V400 Series Wall and Partition Designs in the Fire Resistance Directory. An additional 3/4 in. ball of putty pad material shall be used to plug the end of each electrical metallic tube or conduit at its connection to the box.

HILTI Firestop Box Insert, for use with flush device UL Listed Metallic Outlet Boxes installed with steel mud rings or UL Listed Nonmetallic Outlet Boxes in framed wall assemblies as specified below. When protective material is used on outlet boxes on both sides of the wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back (unless otherwise indicated). Installation shall comply with the National Electrical Code (NFPA 70). The box composition, max device dimensions, hourly rating, type of stud and type of faceplate are specified below.

HILTI Firestop Box Insert, for use with max 4-11/16 by 4-11/16 by 2-1/8 in. deep UL Listed Metallic Outlet Boxes without internal clamps in 1 or 2 hr fire rated gypsum wallboard wall assemblies framed with min 3-1/2 in. deep wood or steel studs and constructed of materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the Fire Resistance Directory. Outlet boxes in 1 hr fire rated walls may be installed with plastic or steel cover plates. Outlet boxes in 2 hr fire rated walls shall be installed with steel cover plates. One 4-3/8 by 4-3/8 in. insert adhered to the interior back wall of the outlet box in accordance with the instructions supplied with the product. Smaller sized inserts may be cut and combined to achieve the 4-3/8 x 4-3/8 in coverage.



Hilti Firestop Systems

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October 28, 2019

Wall Opening Protective Materials (CLIV, CLIV7)

HILTI Firestop Box Insert, for use with max 4 by 4 by 1-1/2 in. deep and 2-1/8 in. deep UL Listed Metallic Outlet Boxes without internal clamps in 1 or 2 hr fire rated gypsum wallboard wall assemblies framed with min 3 1/2 in. deep steel or wood studs and constructed of materials and in the manner specified in the individual U400, V400 or U300 Series Wall and Partition Designs in the Fire Resistance Directory, as summarized in the Table below. One 3-11/16 by 3-3/4 in. insert adhered to the interior back wall of the outlet box in accordance with the instructions supplied with the product. Smaller sized inserts may be cut and combined to achieve the 3-11/16 x 3-3/4 in coverage.

Box Size	Type of Box and Cover Plate	Hourly Rating	Wall Type
4 x 4 x 2-1/8 in deep	Metallic w/ steel cover plates	2-hour	U300, U400 or V400 - wood or steel studs
4 x 4 x 2-1/8 in deep	Metallic w/ plastic cover plates	1-hour	U300, U400 or V400 - wood or steel studs
4 x 4 x 1-1/2 in deep	Metallic w/ plastic cover plates	1-hour	U300 - wood studs

HILTI Firestop Box Insert, for use with max 2-1/8 x 4 x 2-1/8 in. deep UL Listed Metallic Outlet Boxes without internal clamps in 2 hr fire rated gypsum wallboard wall assemblies framed with min 3-1/2 in. deep wood or steel studs and constructed of materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the Fire Resistance Directory. Outlet boxes may be installed with steel cover plates. One 1-7/8 x 2-13/16 insert adhered to the interior back wall of the outlet box in accordance with the instructions supplied with the product.

HILTI Firestop Box Insert, for use with max 4-1/2 x 8-1/2 in. by 1-5/8 in. deep or max 3-3/4 x 5-1/2 in. by 2-1/2 in. deep UL Listed Metallic Outlet Boxes without internal clamps in 1 hr or 2 hr fire rated gypsum wallboard wall assemblies framed with min 3 1/2 in. deep steel or wood studs and constructed of materials and in the manner specified in the individual U400, V400 or U300 Series Wall and Partition Designs in the Fire Resistance Directory, as summarized in the Table below. Outlet boxes installed with steel cover plates. Box inserts evenly spaced and adhered to the interior back wall of the outlet box in accordance with the instructions supplied with the product.

Box Size	Inserts Used	Fire Rating	Wall Type
4-1/2 x 8-1/2 x 1-5/8 in deep	Two 3-11/16 x 3-3/4 in. inserts **	2 hour	U300, U400 or V400 - wood or steel studs
3-3/4 x 5-1/2 x 2-1/2 in deep	One 3-11/16 x 3-3/4 in. insert and one 1-7/8 x 2-13/16 in. insert	1 hour	U300, U400, or V400 - wood or steel studs

** - Min 3/4 in. deep plaster rings installed over outlet box. After installation of gypsum board, nom 1/4 in. thickness of Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant, bearing the UL Classification Marking for Fill, Void or Cavity Materials, applied between the base layer of wallboard and the plaster ring.

HILTI Firestop Box Insert, for use with 4-3/8 by 4-7/8 by 2-1/4 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 1 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep wood or steel studs and constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the Fire Resistance Directory. One 4-3/8 in. wide by 4-3/8 in. high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Smaller sized inserts may be cut and combined to achieve the 4-3/8 in. by 4-3/8 in. coverage and adhered to the interior back wall of the outlet box. Outlet boxes installed with plastic or steel cover plates.

HILTI Firestop Box Insert, for use with 4-3/8 by 4-7/8 by 2-1/4 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 2 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep wood or steel studs and constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the Fire Resistance Directory. One 4-3/8 in. wide by 4-3/8 in. high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Smaller sized inserts may be cut and combined to achieve the 4-3/8 in. by 4-3/8 in. coverage and adhered to the interior back wall of the outlet box. Outlet boxes installed with steel cover plates.



Hilti Firestop Systems

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Wall Opening Protective Materials (CLIV, CLIV7)

CP 617(-L, -XL) or CFS-P PA Firestop Putty Pads and HILTI Firestop Box Inserts, for use with maximum 4 by 4 by 1-1/2 in. (102 by 102 by 38 mm) deep flush device UL Listed Metallic Outlet Boxes installed with steel mud rings and with steel or plastic faceplates in 1 or 2 hr fire rated gypsum board wall assemblies constructed with min 3-1/2 in. (89 mm) wide wood or steel studs. When both protective materials are used with outlet boxes on both sides of the wall as directed, the boxes may be installed back-to-back provided that the backs of the boxes are minimum 1/2 in. (13 mm) apart and provided that the boxes are not interconnected. Adjoining pieces of moldable putty pads to be overlapped approx 1/2 in. (13 mm) at the seam. An insert pad shall be installed to completely cover the back inside surface of each outlet box.

Firestop Box Inserts, for use with max 2-1/8 by 4 by 2-1/8 in. deep. flush device UL Listed Metallic Outlet Boxes without internal clamps in 2 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 47 mm wide by 71 mm high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Installation to comply with the National Electrical code, (NFPA 70). Outlet boxes installed with steel cover plates. A max 3/8 in. diam opening at one edge may be provided to permit access to the electrical box ground screw. When protective material is used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

Firestop Box Inserts, for use with max 4 by 4 by 2-1/8 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 2 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 94 mm wide by 95 mm high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Installation to comply with the National Electrical Code, (NFPA 70). Outlet boxes installed with steel cover plates. A max 3/8 in. diam opening at one edge may be provided to permit access to the electrical box ground screw. When protective material is used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

Firestop Box Inserts, for use with max 4 by 4 by 1-1/2 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 1 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep wood studs and with max 4 by 4 by 2-1/8 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 1 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 94 mm wide by 95 mm high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Installation to comply with the National Electrical Code, (NFPA 70). Outlet boxes installed with plastic cover plates. A max 3/8 in. diam opening at one edge may be provided to permit access to the electrical box ground screw. When protective material is used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

Firestop Box Inserts, for use with 4-11/16 by 4-11/16 by 2-1/8 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 1 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 111 mm wide by 111 mm high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Smaller sized inserts may be cut and combined to achieve the 111 mm by 111 mm coverage and adhered to the interior back wall of the outlet box. Installation to comply with the National Electrical Code, (NFPA 70). Outlet boxes installed with plastic or steel cover plates. A max 3/8 in. diam opening at one edge may be provided to permit access to the electrical box ground screw. When protective material is used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

Wall Opening Protective Materials (CLIV, CLIV7)

Firestop Box Inserts, for use with 4-11/16 by 4-11/16 by 2-1/8 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 2 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 111 mm wide by 111 mm high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Smaller sized inserts may be cut and combined to achieve the 111 mm by 111 mm coverage and adhered to the interior back wall of the outlet box. A max 3/8 in. diam opening at one edge may be provided to permit access to the electrical box ground screw. Installation to comply with the National Electrical Code, (NFPA 70). Outlet boxes installed with steel cover plates. When protective material is used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

Firestop Box Inserts, for use with max 3-3/4 by 5-1/2 by 2-1/2 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 1 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel or wood studs and constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 94 mm wide by 95 mm high and one 47 mm wide by 71 mm high inserts adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Installation to comply with the National Electrical Code, (NFPA 70). Outlet boxes installed with steel cover plates. A max 3/8 in. diam opening at one edge may be provided to permit access to the electrical box ground screw. When protective material is used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

Firestop Box Inserts, for use with 4-3/8 by 4-7/8 by 2-1/4 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 1 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 111 mm wide by 111 mm high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Smaller sized inserts may be cut and combined to achieve the 111 mm by 111 mm coverage and adhered to the interior back wall of the outlet box. Installation to comply with the National Electrical Code, (NFPA 70). Outlet boxes installed with plastic or steel cover plates. A max 3/8 in. diam opening at one edge may be provided to permit access to the electrical box ground screw. When protective material is used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

Firestop Box Inserts, for use with 4-3/8 by 4-7/8 by 2-1/4 in. deep flush device UL Listed Metallic Outlet Boxes without internal clamps in 2 hr fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep steel studs and constructed of the materials and in the manner specified in the individual U400 Series Wall and Partition Designs in the Fire Resistance Directory. One 111 mm wide by 111 mm high insert adhered to the interior back wall of the outlet box in accordance with the installation instructions supplied with the product. Smaller sized inserts may be cut and combined to achieve the 111 mm by 111 mm coverage and adhered to the interior back wall of the outlet box. Installation to comply with the National Electrical Code, (NFPA 70). Outlet boxes installed with steel cover plates. A max 3/8 in. diam opening at one edge may be provided to permit access to the electrical box ground screw. When protective material is used within outlet boxes on both sides of wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

Firestop Box Inserts, for use with max 4-11/16 by 4-11/16 by 2-1/8 in. flush device UL Listed Metallic Outlet Boxes installed with steel mud rings and plastic or steel cover plates in 1 h or 2 h fire rated gypsum board wall assemblies framed with min 3-1/2 in. deep wood or steel studs and constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the Fire Resistance Directory. Min 3-1/2 in. thick fiberglass (min 0.5 pcf) or mineral wool (min 4.0 pcf) batt insulation is to be installed within the wall cavity. One 4-3/8 by 4-3/8 in. insert adhered to the interior back wall of the outlet box in accordance with the instructions supplied with the product. Installation to comply with the National Electrical Code (NFPA 70). A max 3/8 in. diam opening at one edge may be provided to permit access to the electrical box ground screw. When protective material is used within outlet boxes on both sides of the wall as directed, the horizontal separation between outlet boxes on opposite sides of the wall may be less than 24 in. provided that the boxes are not installed back-to-back.

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- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

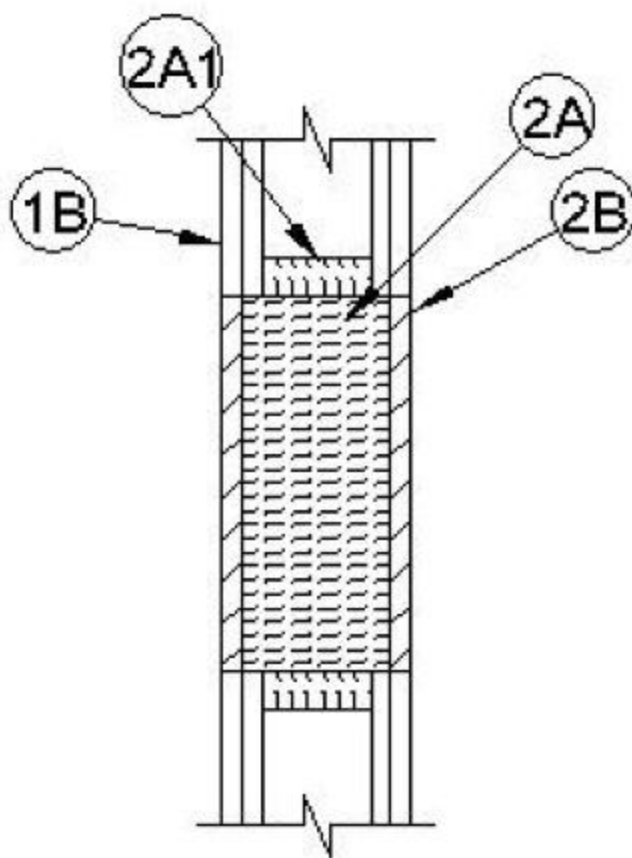
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-0030

January 23, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Rating — 1 and 2 Hr (See Item 1)	F Rating — 1 and 2 Hr (See Item 1)
T Rating — 1 and 2 Hr (See Item 1)	FT Rating — 1 and 2 Hr (See Item 1)
	FH Rating — 1 and 2 Hr (See Item 1)
	FTH Rating — 1 and 2 Hr (See Item 1)



1. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or channel shaped steel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced max 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — 5/8 in. (16 mm) thick with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300, U400 or V400 Wall and Partition Design. If the system is installed in a wood stud/gypsum board assembly, the max area of square, rectangular, or circular opening is 210 sq in. (1355 cm²). with max dimension of 14-1/2 in. (368 mm). If the system is installed in a steel stud/gypsum board assembly, max area of square, rectangular, or circular opening is 240 sq in. (1548 cm²) with max dimension of 20 in. (508 mm) wide.

The hourly F, FH and T, FT and FTH Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. Firestop System — The firestop system shall consist of the following:

A. **Packing Material** — In 2 hr fire rated wall assemblies, min 4-3/4 in. (121 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form. In 1 hr fire rated wall assemblies, min 3-1/2 in. (89 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material recessed from both surfaces of the wall to accommodate the required thickness of fill material.

A1. **Packing Material** — Min 1-1/4 in. (32 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed as a backer around the perimeter of opening as a permanent form.

B. **Fill, Void or Cavity Material* — Sealant** — Min 5/8 in. (16 mm) thickness of fill material applied within opening, flush with both surfaces of wall.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

+ Bearing the UL Listing Mark

Bearing the UL Recognized Component Mark

Last Updated on 2015-01-23

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- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

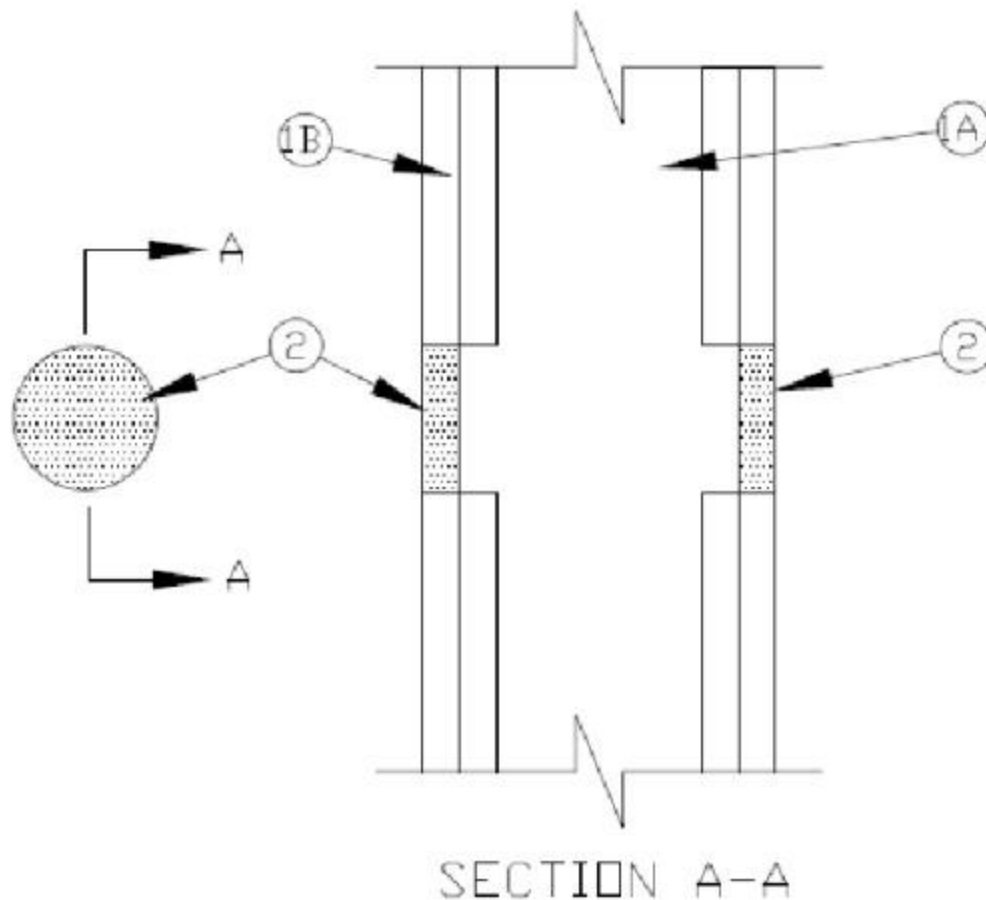
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System No. W-L-0040

July 31, 2024

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings - 1 and 2 Hr (See Item 1)	F Ratings - 1 and 2 Hr (See Item 1)
T Ratings - 0 and 1-3/4 Hr (See Item 1)	FT Ratings - 0 and 1-3/4 Hr (See Item 1)
	FH Ratings - 1 and 2 Hr (See Item 1)
	FTH Ratings - 0 and 1-3/4 Hr (See Item 1)



1. **Wall Assembly** — The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — Thickness, type, number of layers and orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening is 2-1/2 in. (64 mm) or a max area of 4 sq. in. (25.8 cm²) with a max dimension of 2 in. (51 mm).

The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed. The hourly T, FT and FTH Ratings of the firestop system are 0 and 1-3/4 hr for 1 and 2 hr rated assemblies, respectively.

2. **Fill, Void or Cavity Material* — Sealant** — Min 5/8 in. (16 mm) thickness of sealant applied within annulus, flush with both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant or FS-ONE MAX Intumescent Sealant

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2024-07-31

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

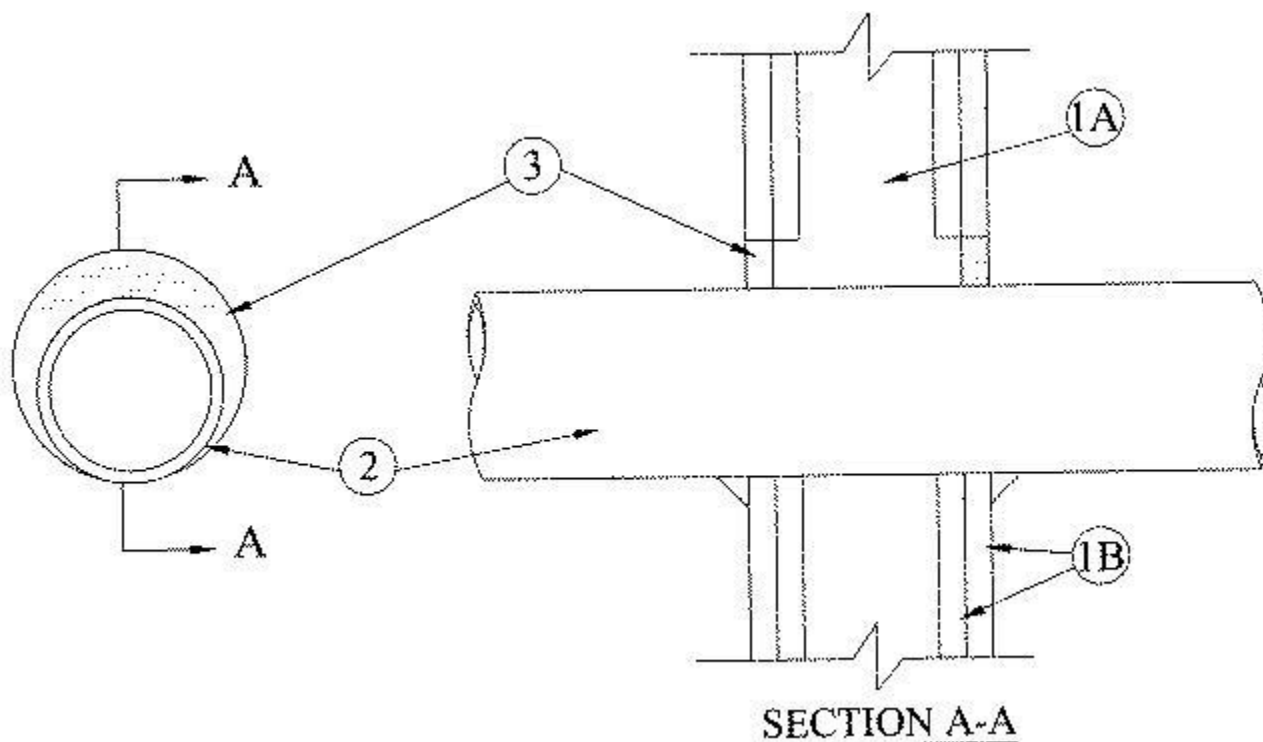
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-1054

January 21, 2020

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Items 1 and 3)	F Ratings — 1 and 2 Hr (See Items 1 and 3)
T Rating — 0 Hr	FT Rating — 0 Hr
L Rating (Without Movement) at Ambient — Less Than 1 CFM/sq ft	FH Ratings — 1 and 2 Hr (See Items 1 and 3)
L Rating (Without Movement) at 400°F — Less Than 1 CFM/sq ft	FTH Rating — 0 Hr
M Rating (Movement) — See Table 1	FTH Rating — 0 Hr
	L Rating at Ambient — Less Than 5.1 L/s/m ²
	L Rating at 204°C — Less Than 5.1 L/s/m ²



1. **Wall Assembly** — The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC. For M Rating, steel studs to be min 3-5/8 in. (92 mm) wide. When steel studs are used and the diam of opening exceeds the width of stud cavity, the opening shall be framed on all sides using lengths of steel stud installed between the vertical studs and screw-attached to the steel studs at each end. The framed opening in the wall shall be 4 to 6 in. (102 to 152 mm) wider and 4 to 6 in. (102 to 152 mm) higher than the diam of the penetrating item such that, when the penetrating item is installed in the opening, a 2 to 3 in. (51 to 76 mm) clearance is present between the penetrating item and the framing on all four sides.

B. **Gypsum Board*** — 5/8 in. (16 mm) thick, 4 ft (122 cm) wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 32-1/4 in. (819 mm) for steel stud walls. Max diam of opening is 14-1/2 in. (368 mm) for wood stud walls.

The F and FH Ratings of the firestop system are equal to the fire rating of the wall assembly. The M Rating is applicable only to 1 hr rated walls.

2. **Through-Penetrants** — One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space shall be min 0 in. to max 2-1/4 in. (57 mm). Pipe may be installed with continuous point contact. Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:

- A. **Steel Pipe** — Nom 30 in. (762 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
- B. **Iron Pipe** — Nom 30 in. (762 mm) diam (or smaller) cast or ductile iron pipe.
- C. **Conduit** — Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing or 6 in. (152 mm) . diam steel conduit.
- D. **Copper Tubing** — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.
- E. **Copper Pipe** — Nom 6 in. (152 mm) diam (or smaller) regular (or heavier) copper pipe.

3. **Fill, Void or Cavity Material* — Sealant** — Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point or continuous contact locations between pipe and wall, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the pipe wall interface on both surfaces of wall.
HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE MAX Intumescent Sealant

The M Rating for the firestop system is dependent on the variables as noted in the Table 1 below.

Table 1

Movement Direction	Penetrant Item	Nominal Penetrant Diameter	Annular Space	Movement	Sealant Depth	F Rating	L Rating with Movement
Y	2A, 2C*	2 in.	Max 2-1/4 in.	5%	5/8 in.	1 hr	N/A
Z	2A, 2C*	2 in.	2-1/4 in.	0.25 in.	5/8 in.	1 hr	N/A

* Rigid steel conduit

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2020-01-21
Last Updated on 2020-01-21

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XHEZ - Through-penetration Firestop Systems

[See General Information for Through-penetration Firestop Systems](#)

System No. W-L-1228

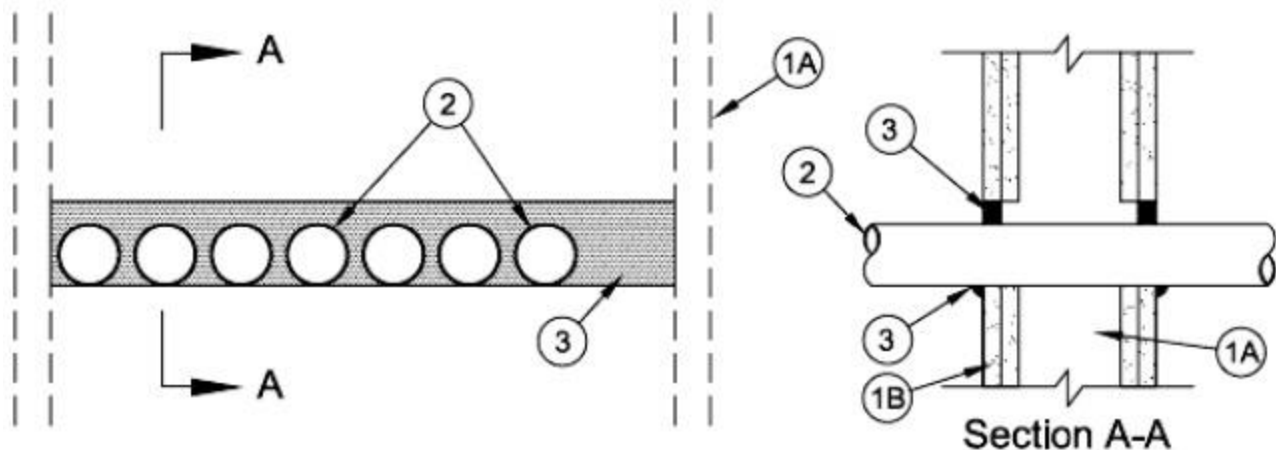
June 28, 2010

F Rating — 1 and 2 Hr (See Item 1)

T Ratings — 0, 1/2 and 1 Hr (See Item 3)

L Rating At Ambient — Less Than 1 CFM/sq ft

L Rating At 400 F — 2 CFM/sq ft



1. Wall Assembly — The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 series Wall and Partition Design in the UL Fire Resistance Directory and shall

include the following construction features:

A. **Studs** — Wall framing shall consist of min 3-5/8 in. (92 mm) wide steel channel studs spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — Thickness, type, number of layers and fasteners shall be as specified in the individual U400 or V400 series Wall and Partition Design in the UL Fire Resistance Directory. Max area of opening is 67-1/2 sq. in. (435 sq cm) with max dimension of 22-1/2 in. (572 mm).

The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Through-Penetrant** — One or more nom 2 in. (51 mm) diam (or smaller) rigid steel conduit or electrical metallic tubing (EMT) installed either concentrically or eccentrically within the firestop system. The annular space between conduits or tubing and periphery of opening shall be min 0 in. (0 mm, point contact) to max 1-1/4 in. (32 mm). The space between conduits or tubing shall be min 1/4 in. (6 mm) to max 1 in. (25 mm). Conduit or tubing to be rigidly supported on both sides of wall assembly.

3. **Fill, Void or Cavity Material* - Caulk or Sealant** — Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. Min 1/2 in. (13 mm) diam bead of caulk applied to the penetrant/gypsum board interface at the point contact location on both sides of wall.

The hourly T Rating of the firestop system is 0 Hr when used in 1 Hr rated assemblies. The T Rating for 2 Hr rated assemblies is 1/2 Hr for FireDam 150+ and IC 15WB and is 1 Hr for CP-25WB+ and FB-3000 WT .

3M COMPANY — CP 25WB+, FireDam 150+, IC 15WB+ caulk or FB-3000 WT sealant

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Last Updated on 2010-06-28

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

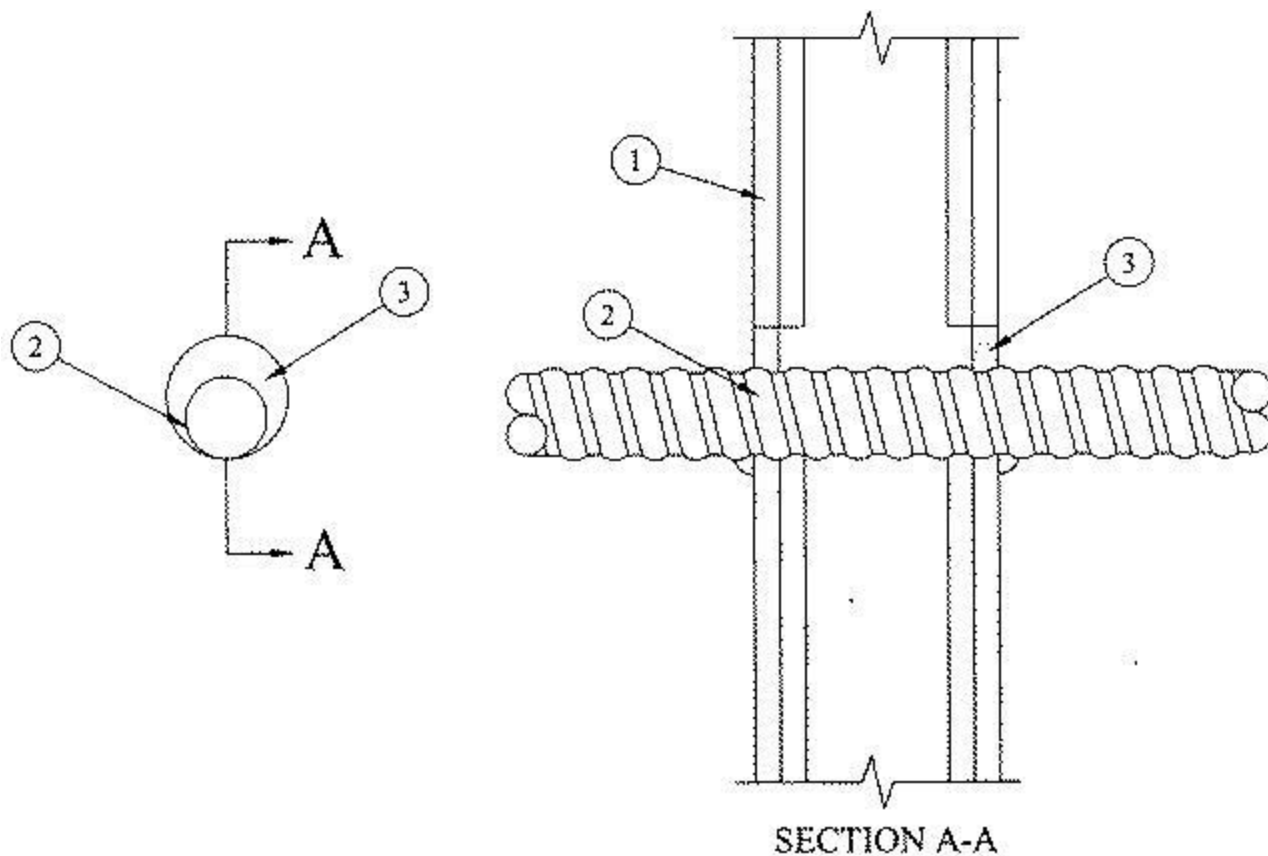
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-1243

January 23, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Rating — 0 Hr	FT Rating — 0 Hr
L Rating at Ambient - 5 CFM/sq ft	FH Ratings — 1 and 2 Hr (See Item 1)
L Rating at 400°F - Less Than 1 CFM/sq ft	FTH Rating — 0 Hr
	L Rating at Ambient - 5 CFM/sq ft
	L Rating at 400°F - Less Than 1 CFM/sq ft



1. Wall Assembly — The 1 or 2 Hr. fire-rate gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Design in the Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing shall consist of either wood studs or channel shaped steel studs. Wood studs to consist of 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide, fabricated from min 25 MSG galvanized steel, spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — 5/8 in. (16 mm) thick, 4 ft. (1.2 m) wide with square or tapered edges. The gypsum board type, number of layers and sheet orientation shall be as specified in the individual Wall and Partition Designs. Max diam of opening is 3-1/2 in. (89 mm).

The hourly F, FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.

2. Through-Penetrant — Max one flexible metal pipe or conduit installed concentrically or eccentrically within opening. The annular space between penetrant and periphery of opening shall be min 0 in. (point contact) to max 1 in. (25 mm). Penetrant to be rigidly supported on both sides of wall assembly. The following types and sizes of penetrants may be used:

A. **Flexible Metal Conduit*** — Nom 2 in. (51 mm) diam (or smaller) aluminum or steel flexible conduit installed either concentrically or eccentrically within the firestop system. The annular space between conduit and periphery of opening shall be min 0 in. (point contact) to max 1 in. (25 mm). Conduit to be rigidly supported on both sides of wall assembly.

See **Flexible Metal Conduit** (DXUZ) category in the Electrical Construction Materials Directory for names of manufacturers.

B. **Through Penetrating Product* — Flexible Metal Piping** — The following types of steel flexible metal gas piping may be used:

1. Nom 2 in. (51 mm) diam (or smaller) steel flexible metal gas piping.

OMEGA FLEX INC

2. Nom 1 in. (25 mm) diam (or smaller) steel flexible metal gas piping.

GASTITE, DIV OF TITEFLEX

3. Min 5/8 in. (16 mm) thickness of fill material applied with annulus, flush with both surfaces of the wall. At point contact location between penetrant and gypsum board, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the penetrant /gypsum board interface on both sides of wall.

WARD MFG L L C

3. **Fill, Void or Cavity Material*- Sealant** — Min 5/8 in. thickness of fill material applied with annulus, flush with both surfaces of the wall. At point contact location between penetrant and gypsum board, a min 1/2 in. bead of fill material shall be applied at the penetrant /gypsum board interface on both sides of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant or FS-ONE MAX Intumescent Sealant

+Bearing the UL Listing Mark

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Last Updated on 2015-01-23

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XHEZ - Through-penetration Firestop Systems

[See General Information for Through-penetration Firestop Systems](#)

System No. W-L-1290

January 21, 2020

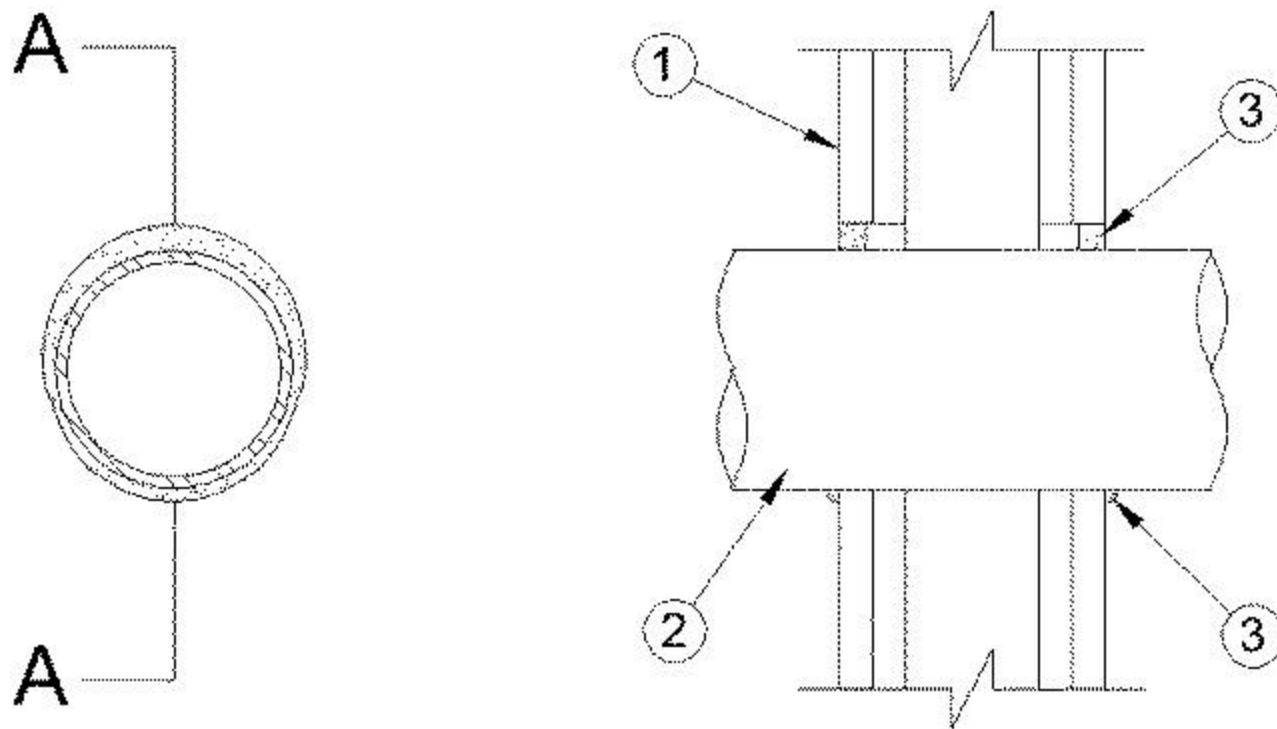
F Rating — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr

L Rating (Without Movement) at Ambient — Less than 1 CFM/Sq Ft

L Rating (Without Movement) at 400°F — Less than 1 CFM/Sq Ft

M Rating (Movement) — See Table 1



SECTION A-A

1. Wall Assembly — The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features.

A. **Studs** — Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC. For M Rating, steel studs to be min 3-5/8 in. (92 mm) wide.

B. **Gypsum Board*** — Nom 5/8 in. (16 mm) thick, 4 ft (1.2 m) wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Design in the Fire Resistance Directory. Max diam of opening is 5 in. (127 mm). For M Rating, max diam of opening is 4-3/8 in. (111 mm).

The hourly F and T Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed. The M Rating is applicable only to 1 hr rated walls.

2. Through Penetrant — One metallic pipe, conduit or tubing installed concentrically or eccentrically within the firestop system. Pipe, conduit or tube to be rigidly supported on both sides of wall assembly. The annular space between the pipe or tube and periphery of the opening shall be min 0 in (point contact) to max 1/2 in. (13 mm). As an option, for through penetrant types 2A, 2B and 2C only in nom diameters not exceeding 4 in. (102 mm), the penetrant can be installed with continuous point contact. **As an option, for 1 hr F Rating, the annular space between pipe and opening can be max 1 in. (25 mm) for Item 2A penetrant in 2 in. (51 mm) diam (or smaller).** The following types and sizes of metallic pipes, conduit or tube may be used:

- A. **Steel Pipe** — Nom 4 in. (102 mm) diam (or smaller) Schedule 40 (or heavier) steel pipe.
- B. **Iron Pipe** — Nom 4 in. (102 mm) diam (or smaller) cast or ductile iron pipe.
- C. **Conduit** — Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing (EMT) or steel conduit.
- D. **Copper Tube** — Nom 4 in. (102 mm) diam (or smaller) Type L (or heavier) copper tube.
- E. **Copper Pipe** — Nom 4 in. (102 mm) diam (or smaller) Regular (or heavier) copper pipe.

3. **Fill, Void or Cavity Material*-Sealant** — Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact and continuous point contact locations between pipe and wall, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the pipe/wall interface.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP606 Flexible Firestop Sealant

The M Rating for the firestop system is dependent on the variables as noted in the Table 1 below.

Table 1

Movement Direction	Penetrant Item	Nominal Penetrant Diameter	Annular Space	Movement	Sealant Depth	F Rating	L Rating
Y	2A	2 in.	Max 1 in.	5%	5/8 in.	1 hr	N/A
Z	2A	2 in.	1 in.	0.25 in.	5/8 in.	1 hr	N/A

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Last Updated on 2020-01-21

Last Updated on 2020-01-21

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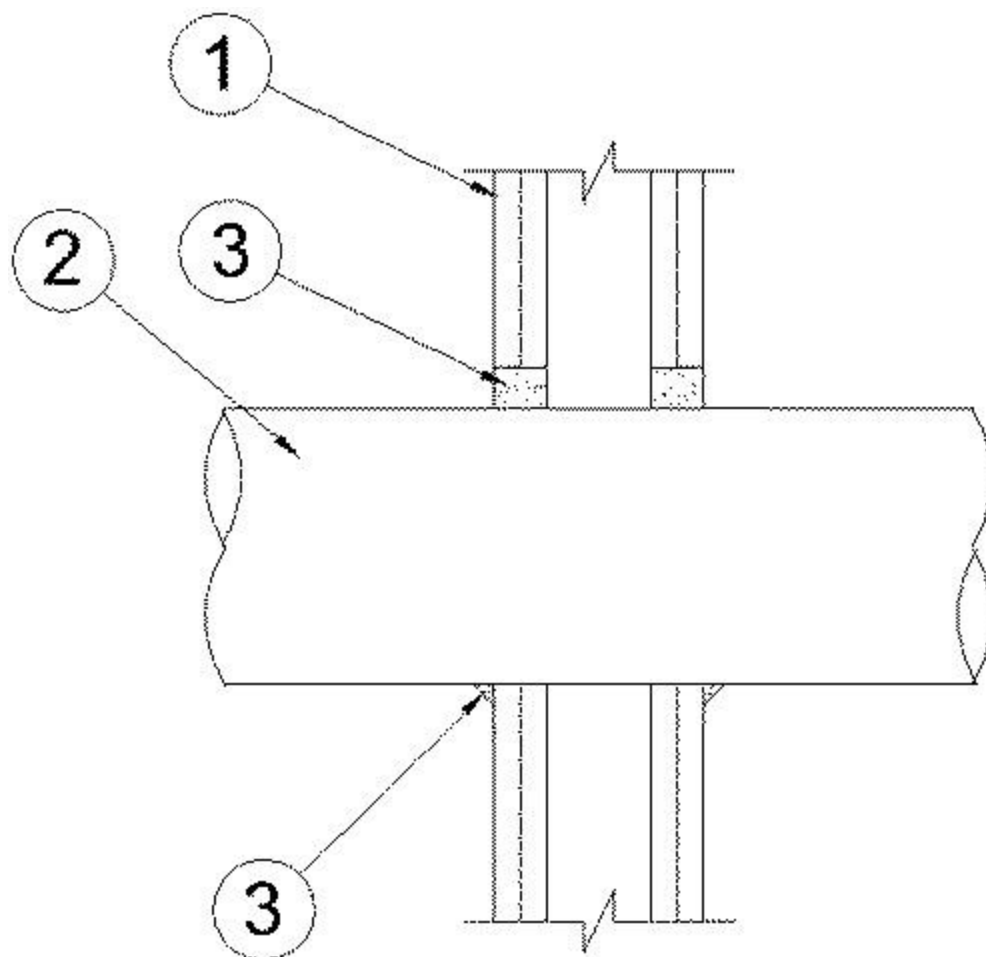
XHEZ - Through-penetration Firestop Systems
XHEZ7 - Through-penetration Firestop Systems Certified for Canada

[See General Information for Through-penetration Firestop Systems](#)
[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-1297

July 07, 2020

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Rating — 0 Hr	FT Rating — 0 Hr
L Rating at Ambient — Less than 1 CFM/Sq Ft	FH Ratings — 1 and 2 Hr (See Item 1)
L Rating at 400°F — Less than 1 CFM/Sq Ft	FTH Rating — 0 Hr
	L Rating at Ambient — Less than 5.1 L/s/m ²
	L Rating at 204°C — Less than 5.1 L/s/m ²



1. Wall Assembly — The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features.

A. **Studs** — Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — Nom 5/8 in. (16 mm) thick, 4 ft (1.22 m) wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300, U400, V400 or W400 Series Design in the Fire Resistance Directory. Max diam of opening is 32 in. (813 mm).

The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.

2. Through Penetrant — One metallic pipe, conduit or tubing installed concentrically or eccentrically within the firestop system. Pipe, conduit or tube to be rigidly supported on both sides of wall assembly. The annular space between the pipe, conduit or tube and periphery of the opening shall be min 0 in (0 mm, point contact) to max 2 in. (51 mm) in 2 hr fire rated walls and min 0 in (0 mm, point contact) to max 1 in. (25 mm) in 1 hr fire rated walls. As an option, for through penetrant types 2A, 2B and 2C only in nom diameters not exceeding 4 in. (102 mm), the penetrant can be installed with continuous point contact. The following types and sizes of metallic pipes, conduit or tube may be used:

- A. **Steel Pipe** — Nom 30 in. (762 mm) diam (or smaller) Schedule 40 (or heavier) steel pipe.
- B. **Iron Pipe** — Nom 30 in. (762 mm) diam (or smaller) cast or ductile iron pipe.
- C. **Conduit** — Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing (EMT) or 6 in. diam steel conduit.
- D. **Copper Tube** — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tube.
- E. **Copper Pipe** — Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

3. **Fill, Void or Cavity Material*-Sealant** — Min 5/8 in. (16 mm) or 1-1/4 in. (32 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall, for 1 hr and 2 hr fire rated wall assemblies, respectively. A min 1/2 in. (13 mm) diam bead of fill material shall be applied at the pipe/wall interface at the point contact and continuous point contact location.
HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP606 Flexible Firestop Sealant

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Last Updated on 2020-07-07

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- Only products which bear UL's Mark are considered Certified.

XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

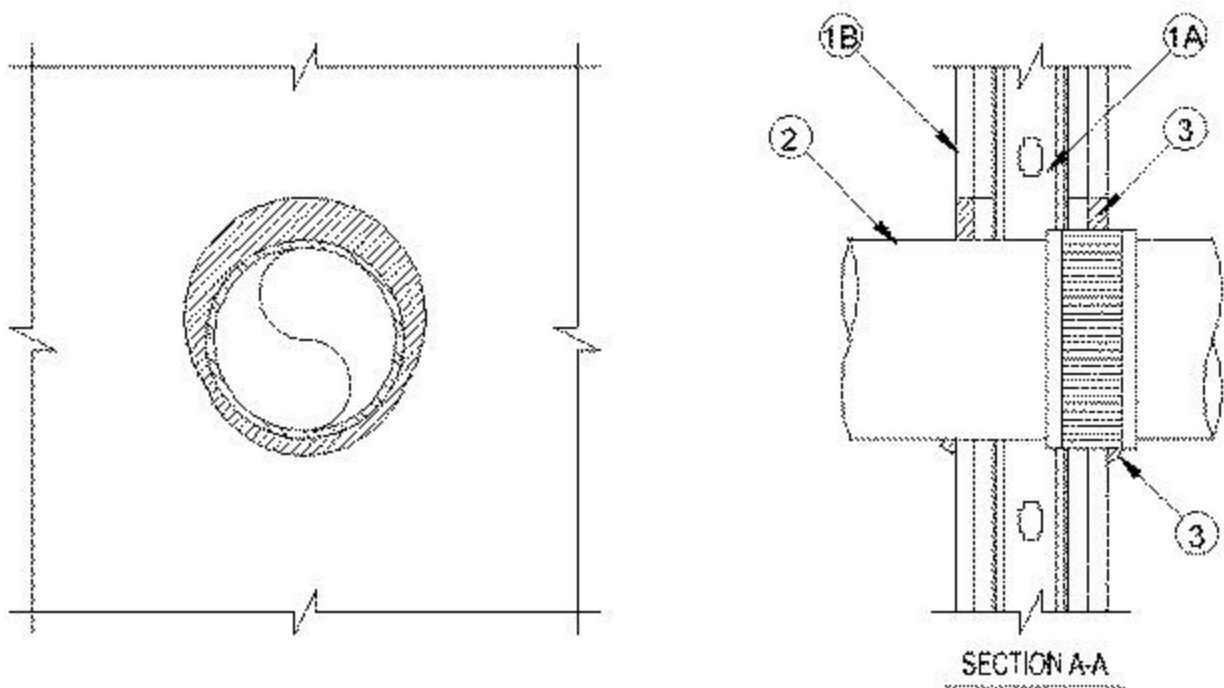
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-1359

January 22, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Rating — 1/4 Hr	FT Rating — 1/4 Hr
	FH Ratings — 1 and 2 Hr (See Item 1)
	FTH Rating — 1/4 Hr



1. Wall Assembly — The 1 or 2 h fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — Thickness, type and number of layers as specified in the individual Wall and Partition Design. Max diam of opening is 8 in. (203 mm).

The hourly F, FH Ratings of the firestop system are equal to the hourly assembly rating of the wall assembly in which it is installed.

2. Through Penetrant — One Nom 6 in. (102 mm) diam (or smaller) cast or ductile iron pipe to be installed eccentrically or concentrically within the firestop system. Pipe to be rigidly supported on both sides of the wall assembly.

3. Compression Coupling — Metallic pipes to be secured together with compression type pipe coupling with elastomeric gasket and a stainless steel jacket with stainless steel band clamps. Coupling to be installed entirely within opening or partially within opening. The annular space between the pipe or coupling and the periphery of the opening shall be min 0 in. (0 mm, point contact) to max 1 in. (25 mm).

4. Fill, Void or Cavity Material* - Sealant — Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact location between pipe and wall, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the gypsum board/coupling interface on both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE or FS-ONE MAX Intumescent Sealant

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

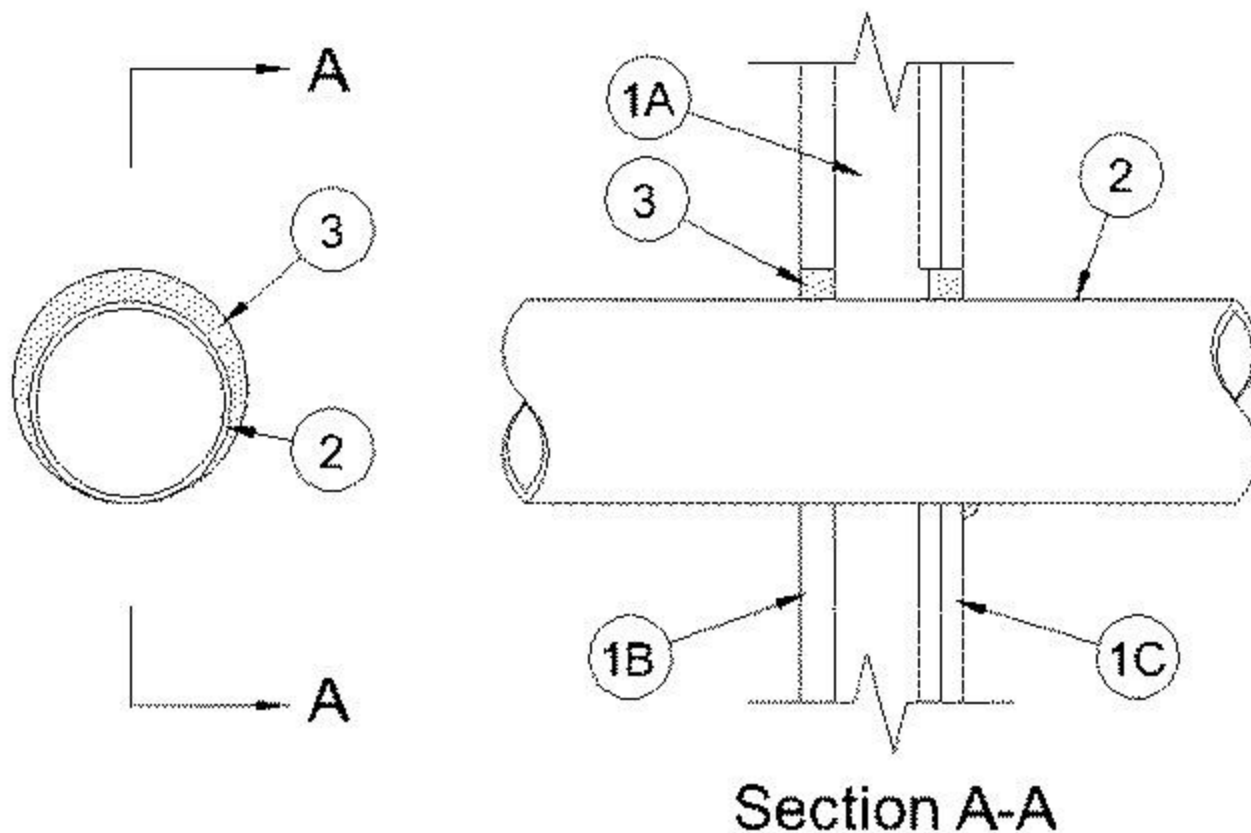
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-1380

January 22, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Rating — 2 Hr	F Rating —2 Hr
T Rating — 0 Hr	FT Rating — 0 Hr
	FH Rating — 2 Hr
	FTH Rating — 0 Hr



1. Wall Assembly — The 2 hr fire-rated gypsum board/stud shaft wall assembly shall be constructed of the materials and in the manner specified in the individual U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall incorporate the following construction features:

A. **Steel Studs** — "C-H" or "C-T" shaped studs, min 2-1/2 in. (64 mm) wide by 1-1/2 in. (38 mm) deep, fabricated from min No. 25 gauge galv steel, spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — 1 in. (25 mm) thick, 24 in. (610 mm) wide gypsum liner panels installed vertically. Max diam of circular cutout in gypsum liner panel is 9-1/2 in. (241 mm).

C. **Gypsum Board*** — 1/2 in. or 5/8 in. (13 or 16 mm) thick, 48 in. (1.22 m) wide gypsum boards. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design. Max diam of circular cutout in gypsum board is 9-1/2 in. (241 mm).

2. Through-Penetrants — One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space shall be min 0 in. (0 mm, point contact) to max 7/8 in. (22 mm). Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:

A. **Steel Pipe** — Nom 8 in. (203 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe** — Nom 8 in. (203 mm) diam (or smaller) cast or ductile iron pipe.

C. **Conduit** — Nom 4 in (102 mm) diam (or smaller) steel electrical metallic tubing or 6 in. (152 mm) diam steel conduit.

D. **Copper Tubing** — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

E. **Copper Pipe** — Nom 6 in. (152 mm) diam (or smaller) regular (or heavier) copper pipe.

3. Fill, Void or Cavity Material* - Sealant — Min 1 in. (25 mm) thickness of fill material applied within the annulus, flush with each surface of wall. A min 1/2 in. (13 mm) diam bead of fill material shall be applied at the point contact location between pipe and wall on the finished side of wall.

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

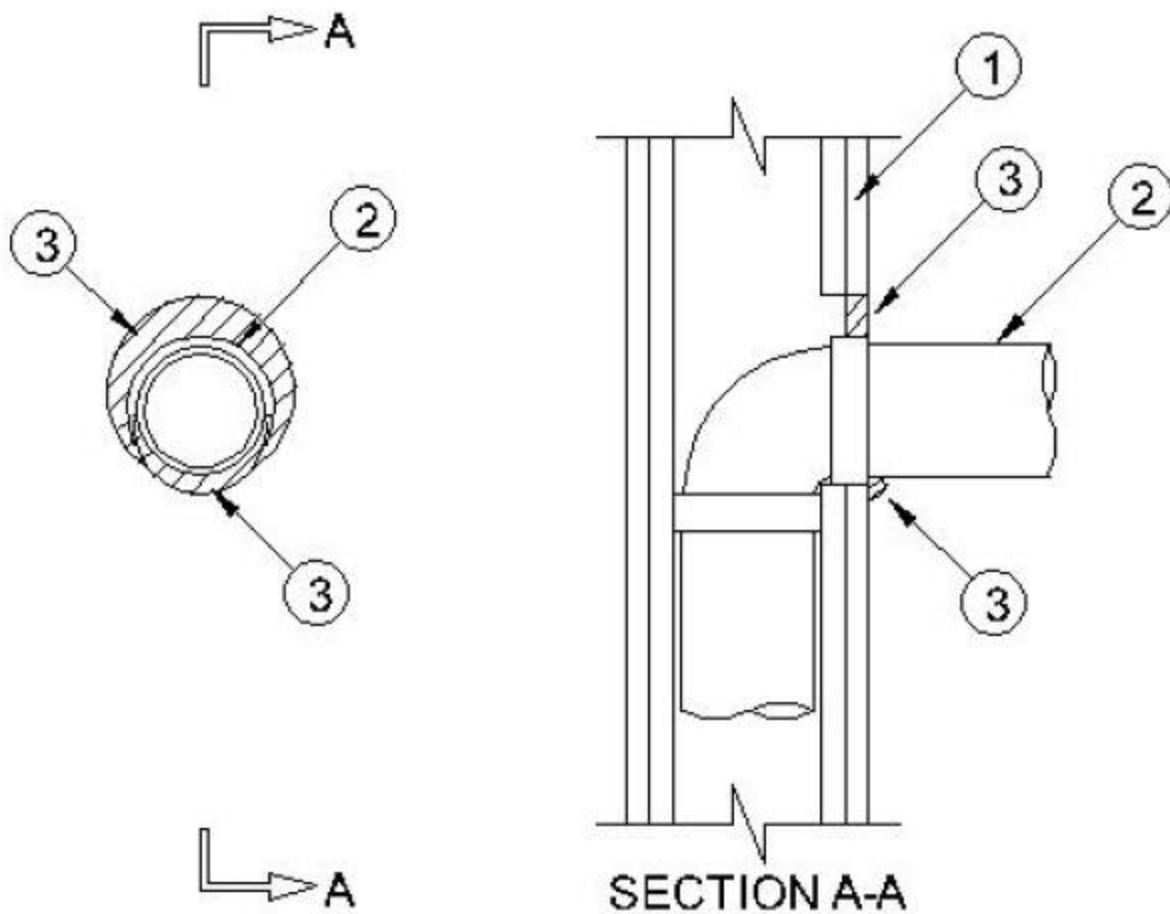
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. **W-L-1410**

June 7, 2023

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Rating — 0 Hr	FT Rating — 0 Hr
L Rating at Ambient — Less Than 1 CFM/sq ft	FH Ratings — 1 and 2 Hr (See Item 1)
L Rating at 400°F — Less Than 1 CFM/sq ft	FTH Rating — 0 Hr
	L Rating at Ambient — Less Than 5.1 L/s/m ²
	L Rating at 204°C — Less Than 5.1 L/s/m ²



1. **Wall Assembly** — The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — One or two layers of nom 5/8 in. (16 mm) thick gypsum board as specified in the individual Wall and Partition Design. The max diam of opening is dependent upon the type of fill material as shown in Item 3.

The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly.

2. **Through Penetrants** — One metallic pipe or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space is dependent upon the type of fill material as shown in Item 3. Pipe or conduit to be rigidly supported on the penetrated side of the wall assembly. The following types and sizes of metallic pipes or conduits may be used:

A. **Steel pipe** — Nom 3 in. (76 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.

B. **Conduit** — Nom 3 in. (76 mm) diam (or smaller) steel electrical metallic tubing (EMT), nom 3 in. (76 mm) diam steel conduit or nom 1 in. (25 mm) diam (or smaller) flexible steel conduit.

C. **Copper Tubing** — Nom 1 in. (25 mm) diam (or smaller) Type L (or heavier) copper tubing.

D. **Copper Pipe** — Nom 1 in. (25 mm) diam (or smaller) Regular (or heavier) copper pipe.

E. **Iron Pipe** — Nom 3 in. (76 mm) diam (or smaller) cast or ductile iron pipe.

3. **Fill, Void or Cavity Material*— Sealant** — Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with surface of wall. Min 1/2 in. (13 mm) diam bead of sealant applied at point contact location.

Type of Fill Material	Max Diameter of Opening, in. (mm)	Min Annular Space, in. (mm)	Max Annular Space, in. (mm)
FS-ONE MAX Intumescent Sealant	6 (152)	0 (0), point contact	2 (51)
CFS-S-SIL GG Sealant	5 (127)	0 (0), point contact	1 (25)
CP601S Elastomeric Sealant	5 (127)	0 (0), point contact	1 (25)
CP 606 Sealant	5 (127)	0 (0), point contact	1 (25)
CP618 Putty	5 (127)	0 (0), point contact	1 (25)

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE MAX Intumescent Sealant, CFS-S-SIL GG Sealant, CP601S Elastomeric Sealant, CP 606 Sealant,or CP618 Putty.

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Last Updated on 2023-06-07

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

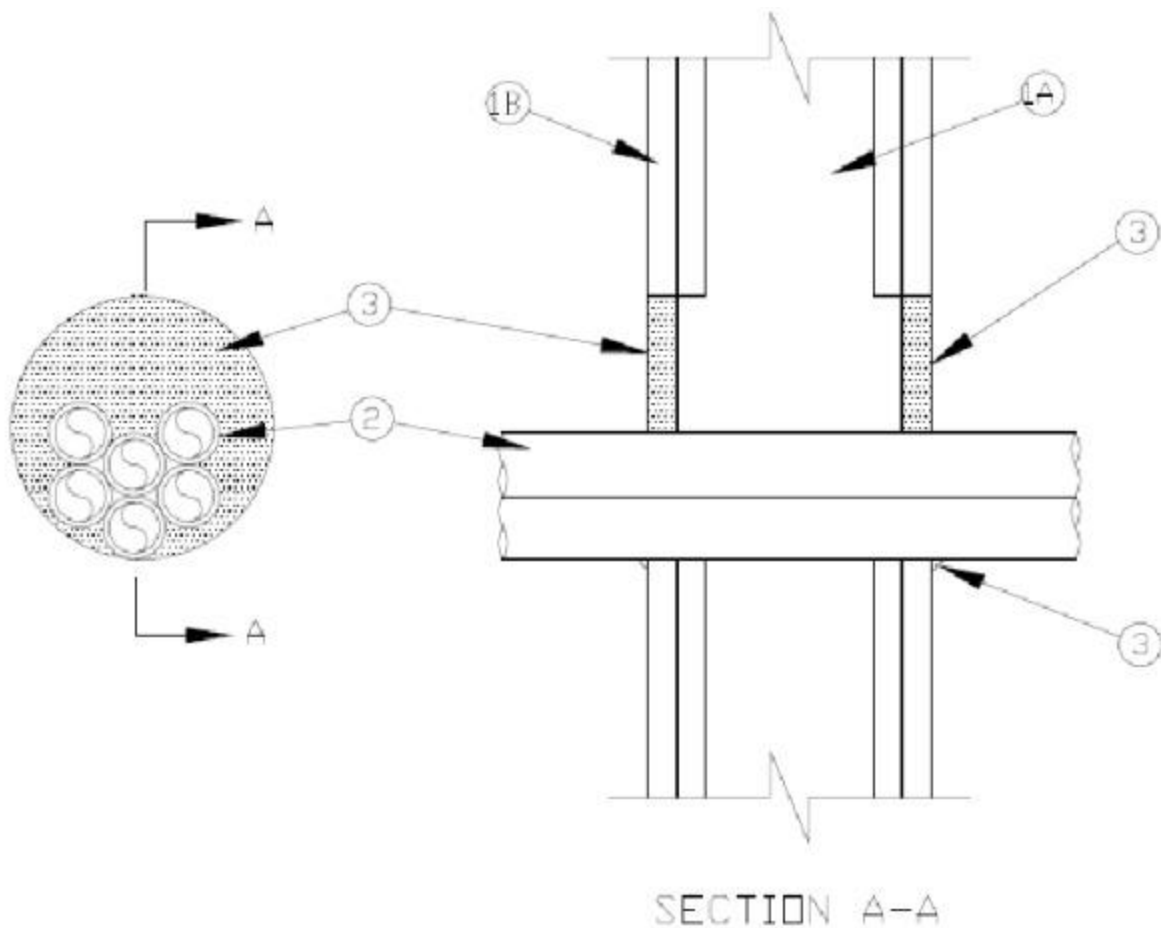
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-1464

January 26, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings - 1 and 2 Hr (See Item 1)	F Ratings - 1 and 2 Hr (See Item 1)
T Ratings - 0 and 1-1/2 Hr (See Item 1)	FT Ratings - 0 and 1-1/2 Hr (See Item 1)
	FH Ratings - 1 and 2 Hr (See Item 1)
	FTH Ratings - 0 and 1-1/2 Hr (See Item 1)



1. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced max 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — Thickness, type, number of layers and orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening is 5-1/2 in. (140 mm).

The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed. The hourly T, FT and FTH Ratings of the firestop system are 0 and 1-1/2 hr for 1 and 2 hr rated assemblies, respectively.

2. Through Penetrants — Max six nom 1 in. (25 mm) diam (or smaller) flexible steel conduits to be installed either concentrically or eccentrically within the firestop system. The annular space between the conduits and the periphery of the opening shall be min 0 in. (point contact) to max 3 in. (76 mm). Conduits to be rigidly supported on both sides of wall.

3. Fill, Void or Cavity Material* — Sealant — Min 5/8 in. (16 mm) thickness of sealant applied within annulus, flush with both surfaces of wall. A min 1/2 in. bead of sealant to be applied at the conduit/wall interface at the point contact location.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant or FS-ONE MAX Intumescent Sealant

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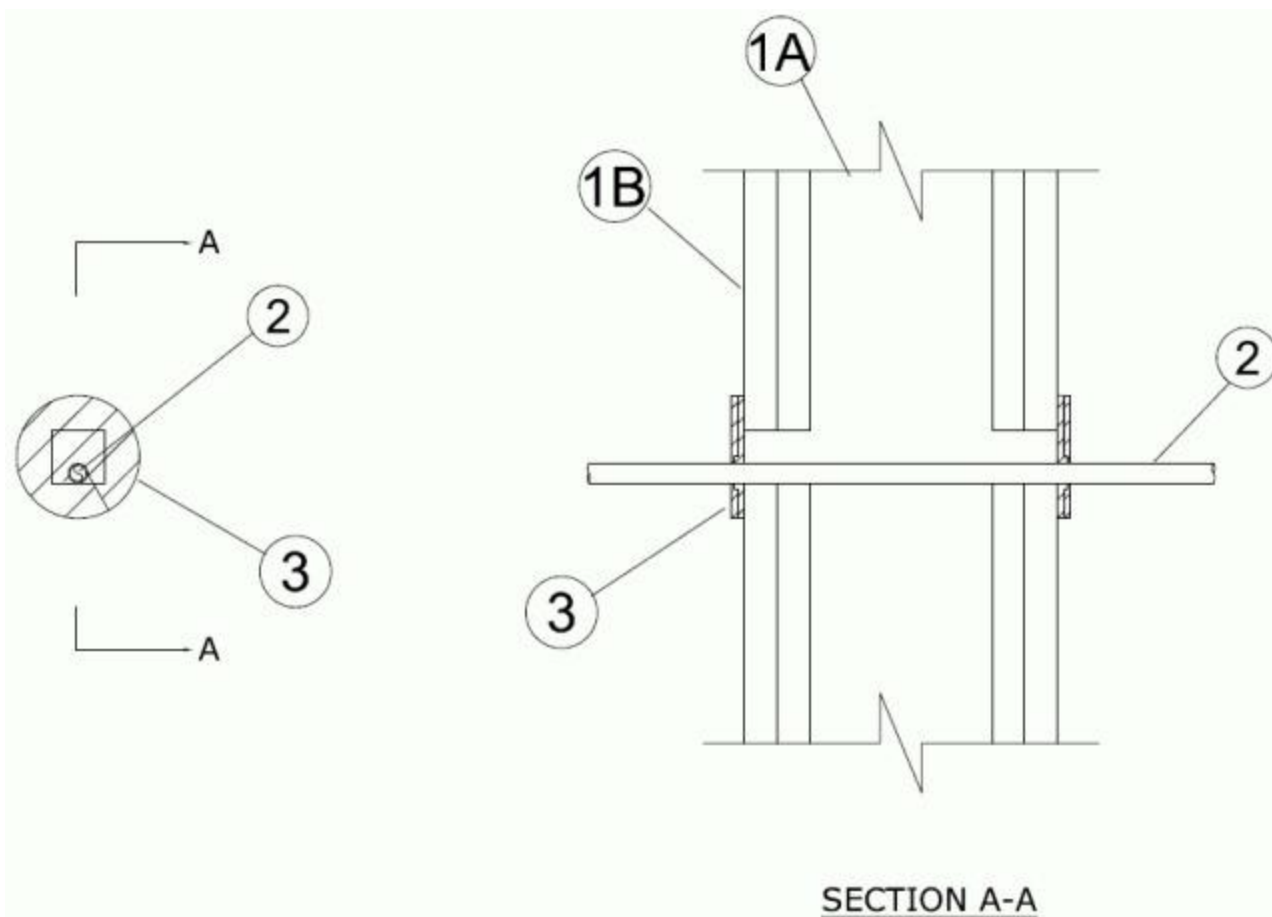
XHEZ - Through-penetration Firestop Systems
XHEZ7 - Through-penetration Firestop Systems Certified for Canada

[See General Information for Through-penetration Firestop Systems](#)
[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-1506

April 29, 2020

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Ratings — 1 and 2 Hr (See Item 1)	FT Ratings — 1 and 2 Hr (See Item 1)
L Rating at Ambient — Less than 1 CFM/Opening	FH Ratings — 1 and 2 Hr (See Item 1)
L Rating at 400 F — Less than 1 CFM/Opening	FTH Ratings — 1 and 2 Hr (See Item 1)
	L Rating at Ambient — Less than 1 CFM/Opening
	L Rating at 400 F — Less than 1 CFM/Opening



1. Wall Assembly — The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 in. (51 mm) by 4 in. (102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — 5/8 in. (16 mm) thick, 4 ft (1219 cm) wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design. Opening may be round, rectangular or irregular with a max diam or dimension of 1 in. (25 mm), or round with a max diam of 1-1/8 in. (29 mm).

The hourly F, FH, FT and FTH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.

2. Through Penetrant — Max one metallic pipe, tubing or conduit installed either concentrically or eccentrically within the firestop system. The annular space between penetrant and periphery of the opening shall be min 0 in. (point contact). When opening dimension exceeds 1 in. (25 mm), the max annular space is 3/8 in. (9.5 mm). Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of pipes, tubing or conduit may be used:

A. **Steel Pipe** — Nom 3/4 in. (19 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.

B. **Iron Pipe** — Nom 3/4 in. (19 mm) diam (or smaller) cast or ductile iron pipe.

C. **Copper Tubing** — Nom 1/2 in. (13 mm) diam (or smaller) Type L and Type K (or heavier) copper tubing.

D. **Copper Pipe** — Nom 1/2 in. (13 mm) diam (or smaller) Regular (or heavier) copper pipe.

E. **Conduit** — Nom 3/4 in. (19 mm) diam (or smaller) rigid or flexible steel conduit.

F. **Conduit** — Nom 3/4 in. (19 mm) diam (or smaller) electrical metallic tubing (EMT).

3. **Fill, Void or Cavity Material*** — Nom 60 mm diam by 3 mm thick putty disc with one seam at radius. Paper-backer of disc to be removed and disc firmly pressed around the penetrant lapping nom 5 mm onto penetrant to completely cover opening and firmly pressed to lap onto the wall around periphery of opening. Disc seam to be firmly pressed and sealed tight, Disc to be installed at both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-D 1" Firestop Putty Disc

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

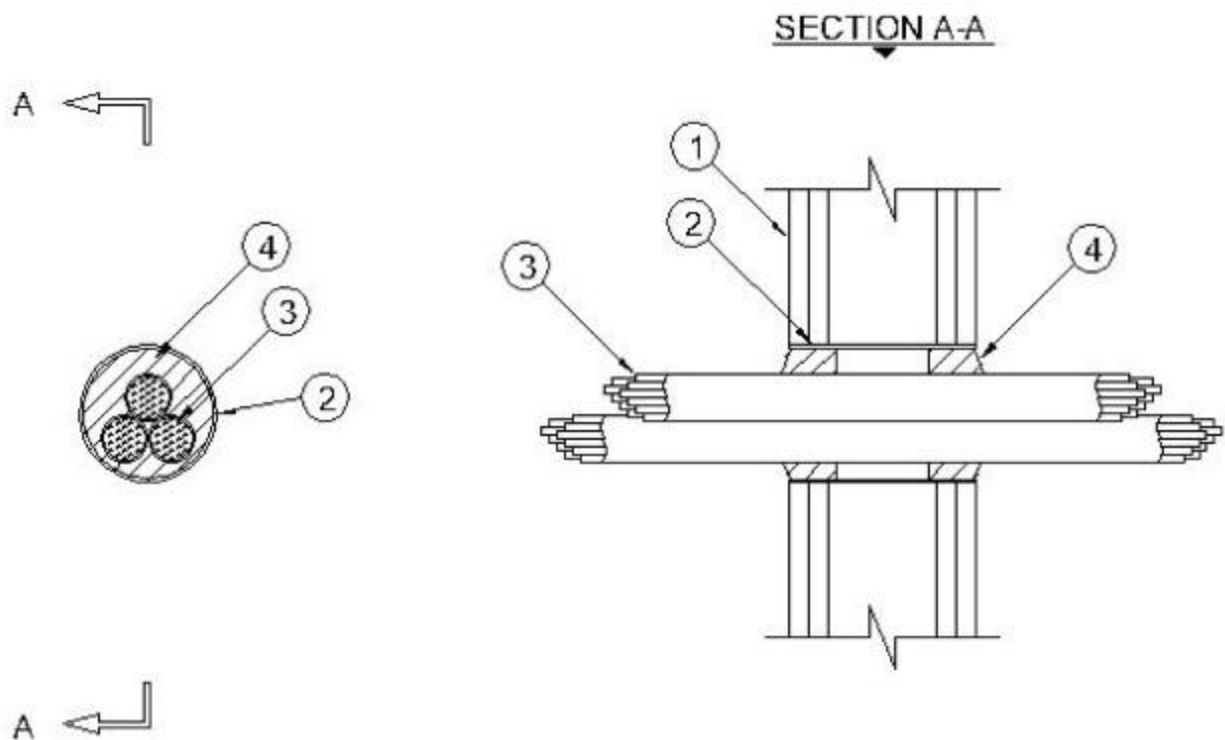
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-2568

January 28, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Ratings — 0 and 1 Hr (See Item 2)	FT Ratings — 0 and 1 Hr (See Item 2)
	FH Ratings — 1 and 2 Hr (See Item 1)
	FTH Ratings — 0 and 1 Hr (See Item 2)



System tested with a pressure differential of 2.5 Pa between the exposed and the unexposed surfaces with the higher pressure on the exposed side.

1. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced max 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — One or two layers of gypsum board, as specified in the individual Wall and Partition Design. Max diam of opening is 5-1/2 in. (140 mm).

The hourly F and FH Ratings of the firestop system are equal to the hourly rating of the wall assembly in which it is installed.

2. Steel Sleeve — Nom 4 in. (102 mm) diam (or smaller) Schedule 10 (or heavier) steel sleeve or nom 4 in. (102 mm) diam (or smaller) rigid steel conduit or electrical metallic tubing. Sleeve to be flush with wall surfaces or may extend up to 12 in. (305 mm) beyond either or both wall surfaces. The annular space between steel sleeve and periphery of opening shall be min 0 in. (continuous point contact) to max 1 in. (25 mm).

When sleeve extends beyond wall surface the T, FT and FTH Ratings are 0 Hr.

3. Cables — One max 3 in. (76 mm) diam flexible nylon **Optical Fiber Raceway Assembly**+ with a max of three 1-1/2 in. (38 mm) diam cells to have a max 80 percent cable fill for each cell. Aggregate cross-sectional area of bundled cables in opening to be max 60 percent of the cross-sectional area of the opening. The annular space between the cable bundle and the periphery of the opening or sleeve to be min 0 in. (point contact) to max 3 in. (76 mm). Cables to be rigidly supported on both sides of the wall assembly. Any combination of the following types and sizes of cables may be used:
See **Optical Fiber Raceway Assemblies** (QAZQ) category in the Electrical Construction Directory for names of manufacturers.

A. Max 100 pair No. 24 AWG telephone cable with polyvinyl chloride (PVC) insulation and jacket.

B. Max 24 fiber optical fiber communication cable jacketed with PVC.

4. Firestop System — The firestop system shall consist of the following:

A. Fill, Void or Cavity Materials* - Plug — Two nom 4 in. (102 mm) diam (or smaller) plugs firmly installed within the sleeve or opening such that the outer circumference of each dome-shaped plug is flush with both surfaces of the wall or both ends of sleeve. Plugs are cut to fit around the cable bundle and installed tightly within the opening or sleeve.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP 658T Firestop Plug or CFS-PL Firestop Plug

B. Fill, Void or Cavity Material* — Sealant or Putty — Min 5/8 in. (16 mm) thickness of fill material applied within the annulus between sleeve and periphery of opening, flush with both sides of wall. At point contact, a min 1/2 in. (13 mm) bead of fill material shall be applied at sleeve/wall interface when sleeve extends beyond surface of wall. Additional sealant or putty may or may not be used to fill interstices between cables.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant or FS-ONE MAX Intumescent Sealant or CP618 Firestop Putty Stick

+Bearing the UL Listing Mark for Plenum Installations

*Bearing the UL Classification Mark

Last Updated on 2015-01-28

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XHEZ - Through-penetration Firestop Systems

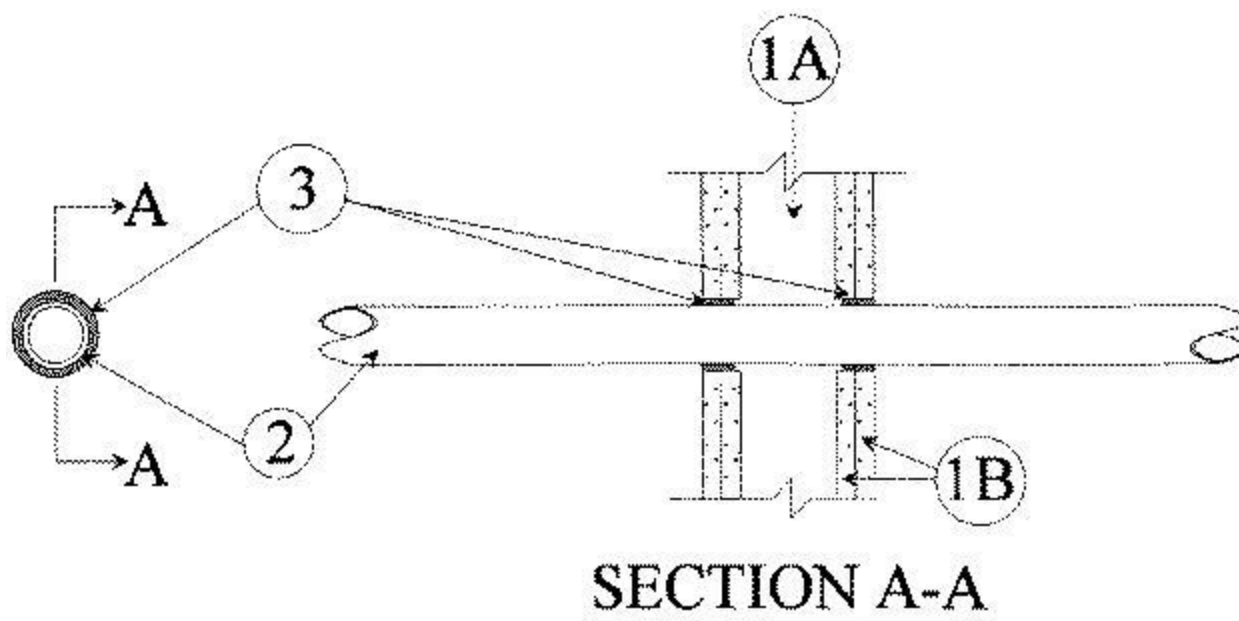
[See General Information for Through-penetration Firestop Systems](#)

System No. W-L-2708

January 30, 2019

F Ratings — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr



1. Wall Assembly — The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and

shall include the following construction features:

- A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC.
- B. **Gypsum Board*** — Min 5/8 in. (16 mm) thick, 4 ft (1.2 m) wide with square on tapered edges. The gypsum wallboard type, thickness, number of layers and orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening is 3 in. (76 mm)

The hourly F rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. **Through Penetrants** — One nonmetallic pipe or tube to be centered within the firestop system with a nom 5/16 in. (8 mm) annular space. Pipe or tube to be rigidly supported on both sides of wall assembly. The following types and sizes of pipes may be used:

- A. **Polyvinyl Chloride (PVC) Pipe** — Nom 2 in. (51 mm) diam (or smaller) Schedule 40 cellular or solid core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.
- B. **Acrylonitrile Butadiene Styrene (ABS) Pipe** — Nom 2 in. (51 mm) diam (or smaller) Schedule 40 cellular or solid core ABS pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.
- C. **Chlorinated Polyvinyl Chloride (CPVC) Pipe** — Nom 2 in. (51 mm) diam (or smaller) SDR 17 CPVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.
- D. **Crosslinked Polyethylene (PEX) Tubing** — Nom 1 in. (25 mm) diam (or smaller) SDR 9 PEX tube for use in closed (process or supply) piping systems.

3. **Fill, Void or Cavity Material* — Wrap Strip** — Nom 1/4 in. (6 mm) thick by 1 in. (25 mm) wide intumescent wrap strip. The wrap strip is continuously wrapped around the outer circumference of the pipe once and slid into annular space such that the ends are flush with the surface of the wall. Wrap strips are installed on each surface of the wall.

RELIANCE WORLDWIDE CORPORATION DBA HOLDRITE HYDROFLAME — HydroFlame Wrap Strip

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2019-01-30

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

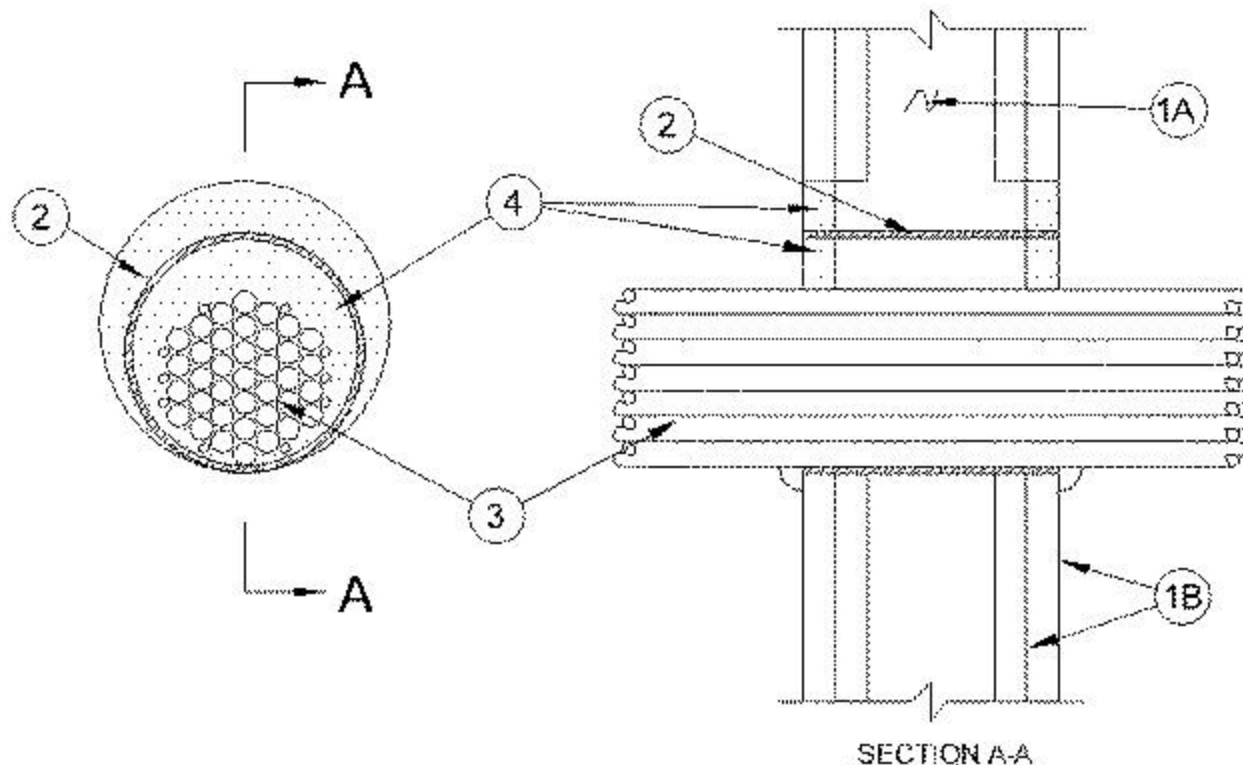
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-3065

October 14, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Rating — 1 and 2 Hr (See Item 1)	F Rating — 1 and 2 Hr (See Item 1)
T Rating — 0 and 3/4 Hr (See item 3)	FT Rating — 0 and 3/4 Hr (See item 3)
L Rating At Ambient — 15 CFM/sq ft	FH Rating — 1 and 2 Hr (See Item 1)
L Rating At 400 F — 8 CFM/sq ft	FTH Rating — 0 and 3/4 Hr (See item 3)
	L Rating At Ambient — 15 CFM/sq ft
	L Rating At 400 F — 8 CFM/sq ft



1. Wall Assembly — The 1 or 2 fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — Nom 5/8 in. (16 mm) thick gypsum board, with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory. Max diam of opening is 5-1/2 in. (138 mm) when sleeve (Item 2) is employed. Max diam of opening is 4 in. (102 mm) when sleeve (Item 2) is not employed.

The F, FH Ratings of the firestop system are equal to the fire rating of the wall assembly.

2. Metallic Sleeve — (Optional) - Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing (EMT) or Schedule 5 (or heavier) steel pipe or min 0.016 in. thick (0.41 mm, No. 28 ga) galv steel sleeve installed flush with wall surfaces. The annular space between steel sleeve and periphery of opening shall be min 0 in. (0 mm, point contact) to max 1 in. (25mm). When Schedule 5 steel pipe or EMT is used, sleeve may extend up to 18 in. (457 mm) beyond the wall surfaces. As an option when Schedule 5 steel pipe or EMT is used, sleeve may extend continuously beyond one wall surface. When cable bundle penetrates wall assembly at an angle of 45 degrees, no metallic sleeve is used.

3. Cables — Aggregate cross-sectional area of cable in opening to be max 45 percent of the cross-sectional area of the opening. The annular space between the cable bundle and the periphery of the opening to be min 0 in. (point contact) to max 1 in. (25 mm). When sleeve is continuous on one side of wall (see Item 2), the cable fill may be 0 to 45% and the max annular space is not limited. Cables to be rigidly supported on both sides of the wall assembly. Any combination of the following types and sizes of copper conductor cables may be used:

A. Max 7/C No. 12 AWG with polyvinyl chloride (PVC) insulation and jacket.

B. Max 25 pair No. 24 AWG telephone cable with PVC insulation and jacket.

B1. Max 4 pr No. 22 AWG Cat 5 or Cat 6 computer cables.

C. Type RG/U coaxial cable with polyethylene (PE) insulation and PVC jacket having a max outside diameter of 1/2 in. (13 mm).

C1. Max RG 6/U coaxial cable with fluorinated ethylene insulation and jacketing.

D. Multiple fiber optical communication cable jacketed with PVC and having a max OD of 5/8 in. (16 mm).

E. Through Penetrating Products*— Max three copper conductor No. 8 AWG **.Metal-Clad Cable+ .**
AFC CABLE SYSTEMS INC

F. Max 3/C (with ground)(or smaller) No. 8 AWG copper conductor cable with PVC insulation and jacketing.

G. Max 3/4 in. (19 mm) diam copper ground cable with or without a PVC jacket.

H. Fire Resistive Cables* - Max 1-1/4 in. (32 mm) diam single conductor or multi conductor Type MI cable. A min 1/8 in. (3 mm) separation shall be maintained between MI cables and any other types of cable.

I. Max 4/C with ground 300 kcmil (or smaller) aluminum SER cable with PVC insulation and jacket.

J. **Through Penetrating Product*** - Any cables, **Metal-Clad Cable+** or **Armored Cable+** currently Classified under the **Through Penetrating Products** category.

K. Maximum 3/C No. 8 AWG metal-clad cable.

L. Maximum 5/8 diam fiber-optic cable with PVC jacket.

For cable bundle penetrating the wall assembly at an angle of 45 degrees, the T, FT, FTH Ratings are 0 hr and 3/4 hr for 1 and 2 hr wall assemblies, respectively.

See **Through Penetrating Product** (XHLY) category in the Fire Resistance Directory for names of manufacturers.

4. **Fill, Void or Cavity Material*— Sealant or Putty** — Fill material applied within the annulus, flush with each end of the steel sleeve or wall surface. Fill material installed symmetrically on both sides of the wall. A min 5/8 in. (16 mm) thickness of sealant is required for the 1 or 2 hr F Rating . An additional 1/2 in. (13 mm) diam bead of fill material shall be applied at the interface of sleeve with gypsum board.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP601S, CP606, FS-One Sealants or FS-ONE MAX Intumescent Sealant or CP618 Putty

5. **Packing Material** — (Optional, Not Shown) — Mineral wool forming material may be used as a backer for the fill material (Item 4). When used, it shall be firmly packed into annular space within the sleeve as a permanent form and recessed from end of sleeve to accommodate the required thickness of fill material.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

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Last Updated on 2015-10-14

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XHEZ - Through-penetration Firestop Systems

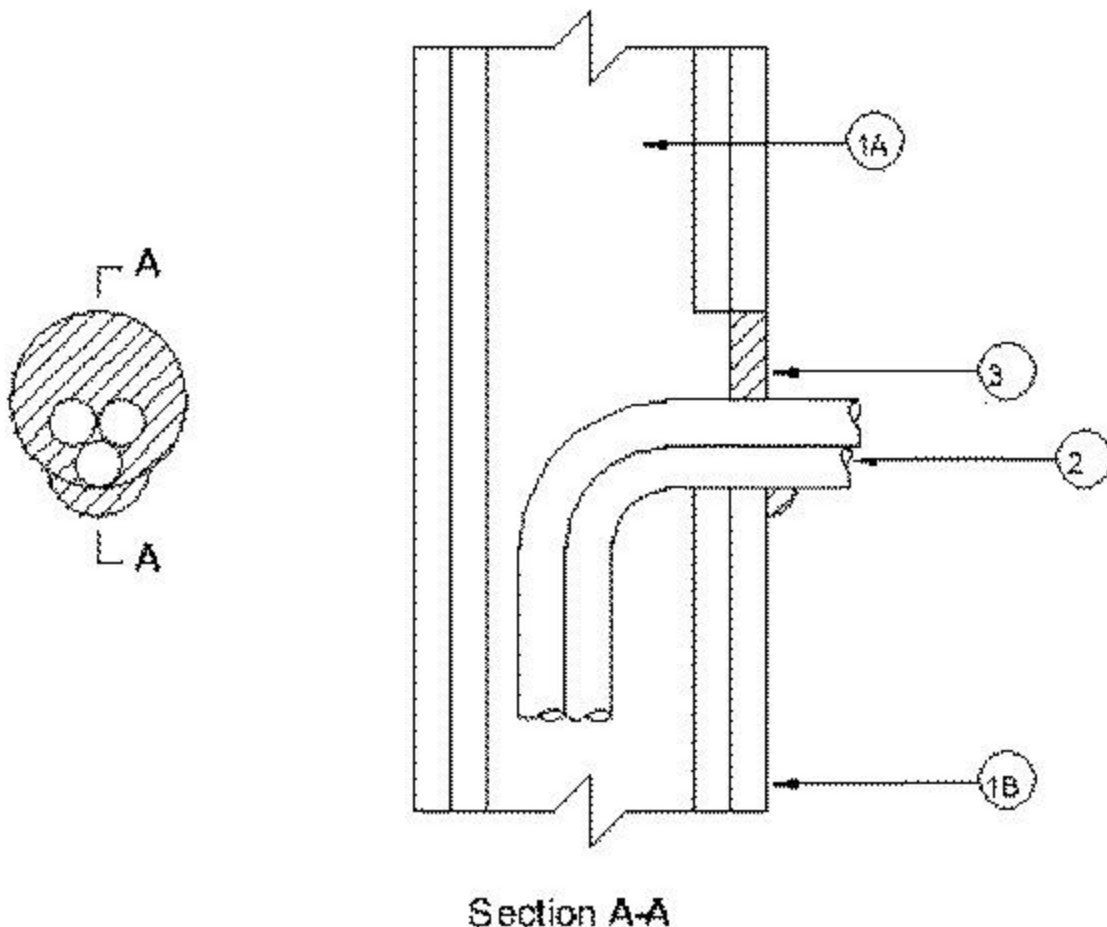
[See General Information for Through-penetration Firestop Systems](#)

System No. W-L-3310

February 09, 2015

F Rating — 1 and 2 Hr (See Item 1)

T Rating — 0 Hr



1. **Wall Assembly** — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — One or two layers of nom 5/8 in. (16 mm) thick gypsum board as specified in the individual Wall and Partition Design. Max diam of opening is 3 in. (76 mm).

The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly.

2. **Cables** — Max of three tightly bundled 3/C (with ground) No. 8 AWG bare copper ground metal clad cables with a PVC jacket. Annular space between cable bundle and periphery of opening shall be a min 0 in. (point contact) to a max 1 in. (25 mm). When FS-One sealant is used, max annular space is 1-1/2 in. (38 mm). Cables to be rigidly supported within 24 in. (610 mm) of wall assembly.

3. **Fill, Void or Cavity Material*— Sealant** — Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with surface of wall. Min 1/2 in. (13 mm) diam bead of sealant applied at point contact location.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant, FS-ONE MAX Intumescent Sealant or CP 606 Sealant

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Last Updated on 2015-02-09

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

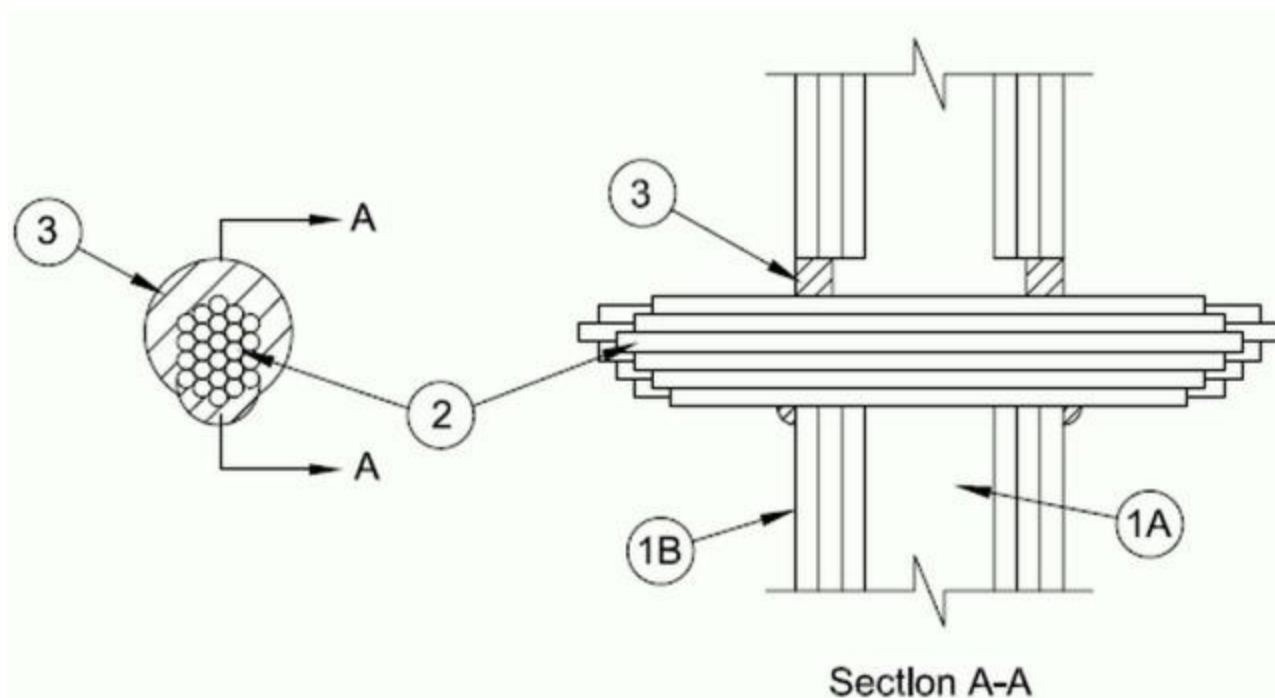
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-3385

October 14, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1, 2 and 3 Hr (See Item 1)	F Ratings — 1, 2 and 3 Hr (See Item 1)
T Rating — 0 Hr	FT Rating — 0 Hr
	FH Ratings — 1, 2 and 3 Hr (See Item 1)
	FTH Ratings — 0 Hr



1. Wall Assembly — The 1, 2 or 3 fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — Nom 5/8 in. (16 mm) thick gypsum board, with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory. Max diam of opening is 4 in. (102 mm).

The F Rating of the firestop system is equal to the fire rating of the wall assembly.

2. Cables — Aggregate cross-sectional area of cable in opening to be max 45 percent of the cross-sectional area of the opening. The annular space between the cable bundle and the periphery of the opening to be min 0 in. (point contact) to max 7/8 in. (22 mm) Cables to be tightly bundled and rigidly supported on both sides of the wall assembly. Any combination of the following types and sizes of copper conductor cables may be used:

- A. Max 7/C No. 12 AWG with polyvinyl chloride (PVC) insulation and jacket.
- B. Max 25 pair No. 24 AWG telephone cable with PVC insulation and jacket.
- C. Max 4 pr No. 22 AWG Cat 5 or Cat 6 computer cables.
- D. Type RG/U coaxial cable with polyethylene (PE) insulation and PVC jacket having a max outside diameter of 1/2 in. (13 mm).
- E. Max RG 6/U coaxial cable with fluorinated ethylene insulation and jacketing.
- F. Multiple fiber optical communication cable jacketed with PVC and having a max OD of 5/8 in. (16 mm).
- G. Max three copper conductor No. 8 AWG Metal-Clad Cable+.
- H. Max 3/C (with ground) (or smaller) No. 8 AWG copper conductor cable with PVC insulation and jacketing.

I. **Through Penetrating Product*** — Any cables, **Metal-Clad Cable+** or **Armored Cable+** currently Classified under the **Through Penetrating Products** category.

3. **Fill, Void or Cavity Material*— Sealant** — Fill material applied within the annulus, flush with both surfaces of wall. A min 5/8 in. (16 mm) thickness of sealant is required for the 1 or 2 hr F Rating. A min 1 in. (25 mm) thickness of sealant is required for the 3 hr F Rating. An additional 1/2 in. (13 mm) diam bead of fill material shall be applied at the point contact location of cable bundle/gypsum board interface on both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP606 or FS-One Sealant or FS-ONE MAX Intumescent Sealant

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

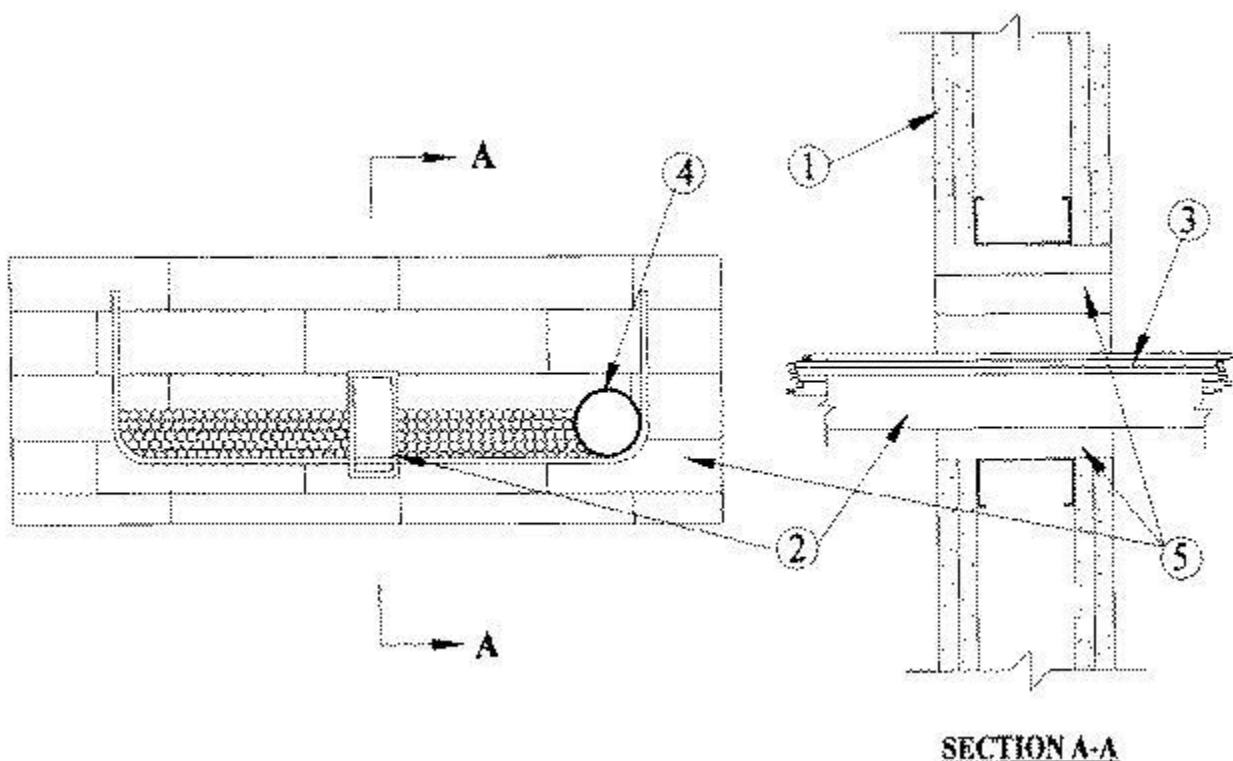
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-4019

July 12, 2016

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Rating — 0 Hr	FT Rating — 0 Hr
	FH Ratings — 1 and 2 Hr (See Item 1)
	FTH Rating — 0 Hr



1. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing shall consist of either wood studs or channel shaped steel studs. Wood studs to consist of 2 in. (51 mm) by 4 in. (102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide, fabricated from min 25 MSG galvanized steel, spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — Nom 5/8 in. (16 mm) thick, 4 ft. (1219 cm) wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual wall or partition design in the UL Fire Resistance Directory. Max area of opening is 216 in² (1394 cm²) with max dimension of 24 in. (610 mm).

The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.

2. Cable Tray+ — Max 18 in. wide by 6 in. (152 mm) deep "spine" cable tray. The 1-1/2 in. (38 mm) wide by 2-3/4 in. (70 mm) deep tubular spine formed of 0.121 in. (3 mm) thick aluminum. The 6 in. (152 mm) deep "U" shaped rungs spaced 6 in. (152 mm) OC formed from 1/2 in. (13 mm) by 1/2 in. (13 mm) extruded aluminum tube. One cable tray to be installed in opening. The max annular space between the periphery of the opening shall be min 1 in. (25 mm) to 2-5/8 in. (67 mm) max. Cable tray to be rigidly supported on both sides of wall assembly.

3. Cables — Aggregate cross-sectional area of cables in cable tray to be max 22 percent of the cross-sectional area of the cable tray based on a max 6 in. (152 mm) cable loading depth within the cable tray. Any combination of the following types and sizes of cables may be used:

- A. 6 pair - No. 24 AWG telephone cable with polyvinyl chloride (PVC) insulation and PVC jacket.
- B. 24 fiber optic cable with polyvinyl chloride (PVC) outer and subunit jacket.
- C. 3 pair No. 24 AWG CMP computer cable with polyvinyl chloride (PVC) insulation and jacket.
- D. Type RGU/59 coaxial cable with polyethylene (PE) insulation and polyvinyl (PVC) jacket.

E. The 2/C No. 10 AWG cable with ground with polyvinyl (PVC) insulation and jacket.

F. 3/C No. 12 AWG MC cable with polyvinyl chloride (PVC) insulation in a nominal 1/2 in. (13 mm) flexible metal conduit.

4. **Electrical Nonmetallic Tubing (ENT)** — One nom 2 in. (51 mm) diam (or smaller) corrugated wall ENT constructed of polyvinyl chloride.

See **Electrical Nonmetallic Tubing** (FKHU) category in the Electrical Construction Materials Directory for names of manufacturers.

5. **Firestop System** — The firestop system shall consist of the following:

A. **Fill, Void or Cavity Material*** — Fire blocks installed min. 5 in. (127 mm) dimension passing through the opening. Blocks to be firmly packed and completely fill the entire opening. Either one or a combination of the block types specified below may be used.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-BL Firestop Block

B. **Fill, Void or Cavity Material*** — Fill material to be forced into interstices of cables, between cables and cable tray and in obvious openings between blocks and between blocks and the periphery of the opening to the max extent possible on both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant, FS-ONE MAX Intumescent Sealant or CP 618 Firestop Putty Stick

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Last Updated on 2016-07-12

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XHEZ - Through-penetration Firestop Systems
XHEZ7 - Through-penetration Firestop Systems Certified for Canada

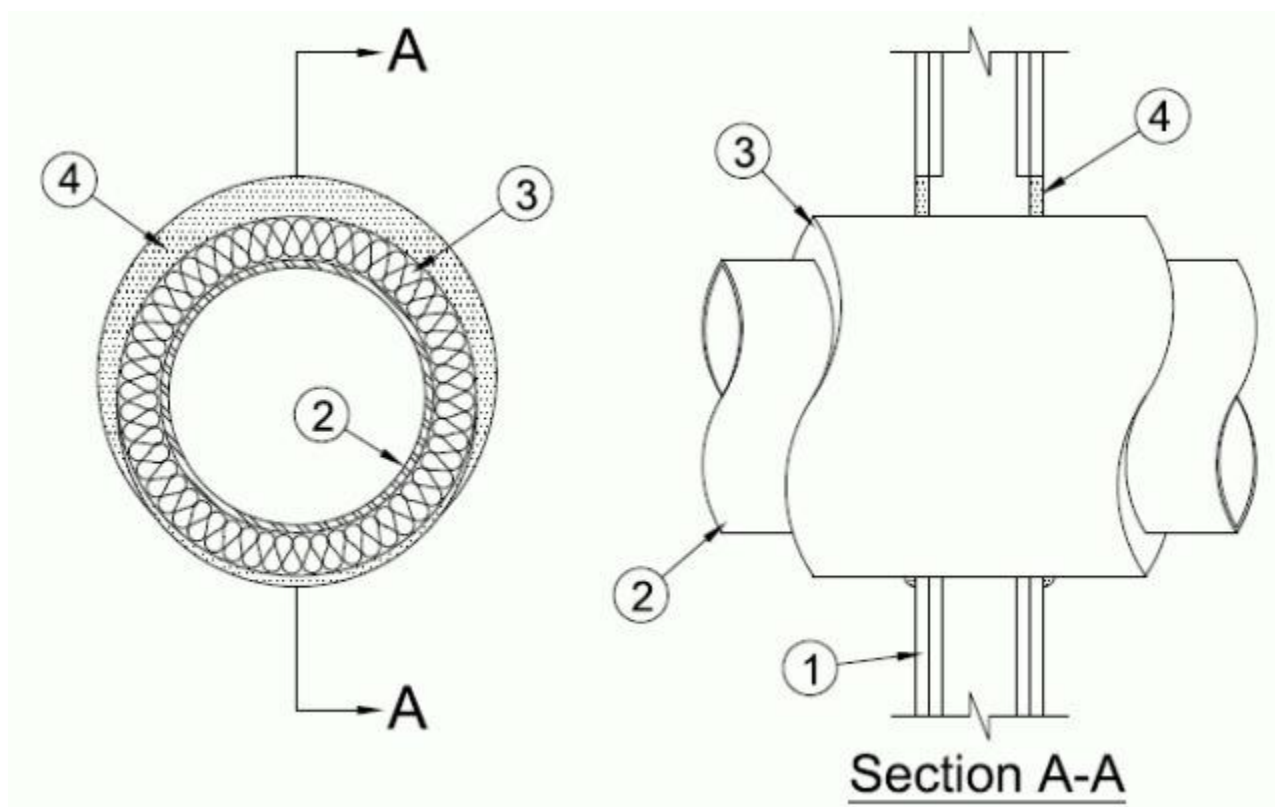
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-5029

July 17, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1, 2 and 3 Hr (See Items 1, 3 and 4)	F Ratings — 1, 2 and 3 Hr (See Items 1, 3 and 4)
T Ratings — 0, 1/2, 1 and 1-1/4 Hr (See Item 3)	FT Ratings — 0, 1/2, 1 and 1-1/4 Hr (See Item 3)
L Rating At Ambient — 4 CFM/Sq Ft	FH Ratings — 1, 2 and 3 Hr (See Items 1, 2 and 4)
L Rating At 400 F — Less Than 1 CFM/Sq Ft	FTH Ratings — 0, 1/2, 1 and 1-1/4 Hr (See Item 3)
	L Rating At Ambient — 4 CFM/Sq Ft
	L Rating At 400 F — Less Than 1 CFM/Sq Ft



1. Wall Assembly — The 1, 2 or 3 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide for 1 and 2 hr F and FH rating and 3-1/2 in. (89 mm) wide for 3 hr F and FH rating and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — Min 5/8 in. (16 mm) thick with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening is 18-5/8 in. (473 mm).

The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.

2. Through Penetrants — One metallic pipe or tubing to be installed within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes or tubing may be used:

A. **Steel Pipe** — Nom 12 in. (305 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe** — Nom 12 in. (305 mm) diam (or smaller) cast or ductile iron pipe.

C. **Copper Tubing** — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing. **When the hourly F or FH Rating of the firestop system is 3 hr, the nom diam of copper tube shall not exceed 4 in. (102 mm).**

D. **Copper Pipe** — Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe. **When the hourly F or FH Rating of the firestop system is 3 hr, the nom diam of copper pipe shall not exceed 4 in. (102 mm).**

3. Pipe Covering* — Nom 1, 1-1/2 or 2 in. (25, 38 or 51 mm) thick hollow cylindrical heavy density (min 3.5 pcf or 56 kg/m³) glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with the product. For 1 and 2 hr F and FH Ratings, the annular space between insulated penetrant and periphery of opening shall be min 0 in. (point contact) to max 1-7/8 in. (48 mm). For 3 hr F and FH Ratings, the annular space shall be min 0 in. (point contact) to max 1-1/4

in. (32 mm).

See **Pipe and Equipment Covering — Materials** (BRGU) category in the Building Material Directory for the names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

The hourly T, FT, FTH Ratings of the firestop system are 1/2 hr for 1 hr rated walls and 1 hr for 2 hr rated walls. For 3 hr rated walls, the hourly T, FT and FTH Ratings when steel and iron pipes are used are 1 hr. For 3 hr rated walls, the hourly T, FT and FTH Ratings when copper penetrants are used are 1-1/4 hr for 2 in. (51 mm) thick pipe covering and 0 hr for pipe covering thickness less than 2 in. (51 mm).

3A. Pipe Covering* — (Not Shown) — As an alternate to Item 3, max 2 in. (51 mm) thick cylindrical calcium silicate (min 14 pcf) units sized to the outside diam of the pipe or tube may be used. Pipe insulation secured with stainless steel bands or min 18 AWG stainless steel wire spaced max 12 in. (305 mm) OC. When the alternate pipe covering is used, the T and FT Rating shall be as specified in item 3 above.

See **Pipe and Equipment Covering — Materials** (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

4. Fill, Void or Cavity Material* — Sealant — For 1 and 2 hr F and FH Rating, min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. For 3 hr F and FH Rating, min 1 in. (25 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact location between pipe covering and gypsum board, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the pipe covering/gypsum board interface on both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-One Sealant or FS-ONE MAX Intumescent Sealant

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**

Last Updated on 2015-07-17

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

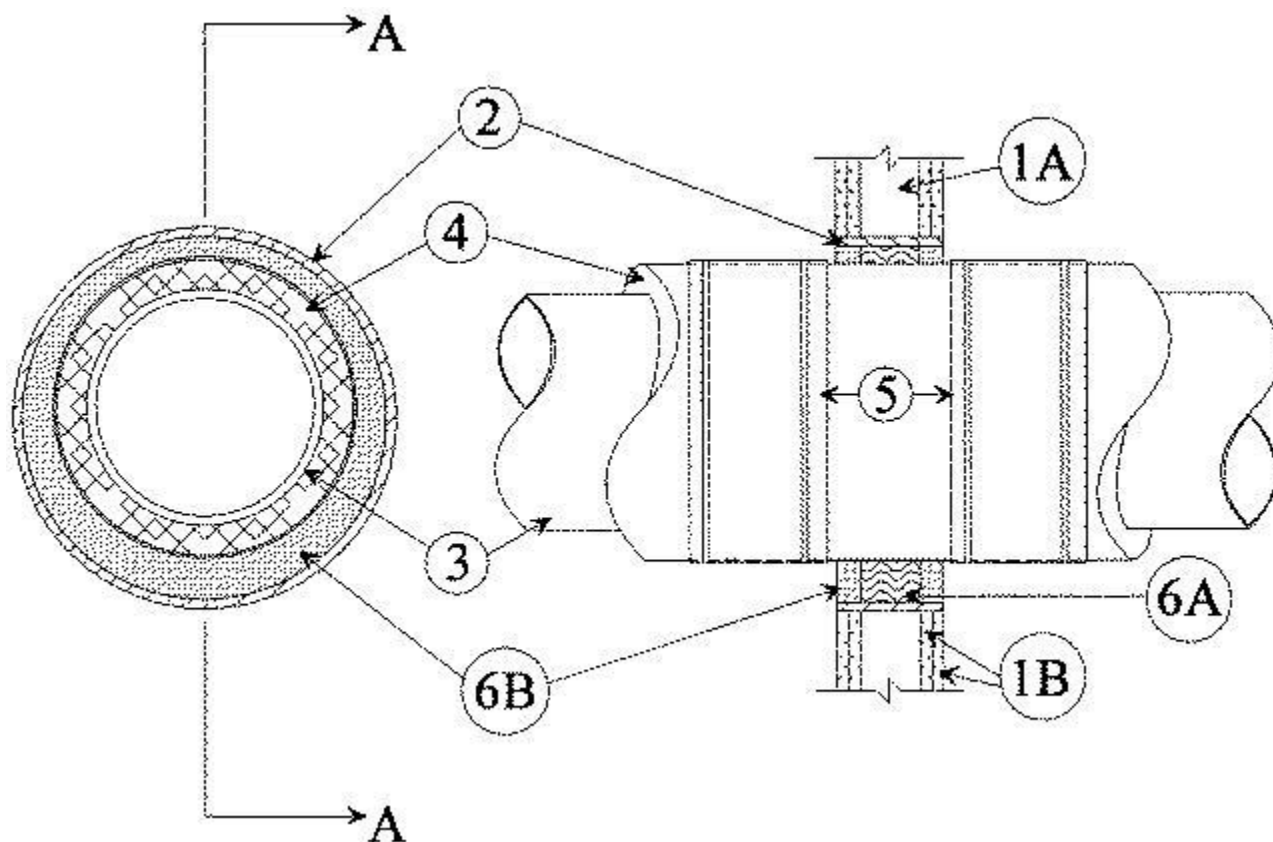
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-5046

December 21, 2017

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Rating — 1 & 2 Hr (See Item 6)	F Rating — 1 & 2 Hr (See Item 6)
T Rating — 0 & 1 Hr (See Item 4)	FT Rating — 0 & 1 Hr (See Item 4)
	FH Rating — 1 & 2 Hr (See Item 6)
	FTH Rating — 0 & 1 Hr (See Item 4)



1. **Wall Assembly** — The fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — Nom 5/8 in. (16 mm) thick gypsum wallboard, as specified in the individual Wall and Partition Design. Max diam of opening is 14-1/2 in. (368 mm) for wood stud walls and 22 in. (559 mm) for steel stud walls.

2. **Metallic Sleeve** — Nom 22 in. (559 mm) diam (or smaller) Schedule 40 (or thinner) steel pipe cast into wall assembly with joint compound and installed flush with wall surfaces.

3. **Through Penetrants** — One metallic pipe or tubing to be positioned within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The annular space shall be min 3/4 in. (19 mm) to max 3 in. (76 mm). The following types and sizes of metallic pipes or tubing may be used:

A. **Steel Pipe** — Nom 12 in. (305 mm) diam (or smaller) Schedule 40 (or heavier) steel pipe.

B. **Copper Tubing** — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

C. **Copper Pipe** — Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

4. **Pipe Covering Materials*** — **Cellular Glass Insulation** — Nom 1-1/2 in. (38 mm) or 3 in. (76 mm) thick cellular glass pipe insulation sized to the outside diam of the steel pipe or tube and installed in accordance with the manufacturer's instructions. T Rating is 0 hr when nom 1-1/2 in. (38 mm) thick pipe insulation is used in 1 hr and 2 hr fire-rated wall assembly. T Rating is 0 hr when nom 3 in. (76 mm) thick pipe insulation is used in 1 hr fire-rated wall assembly. T Rating is 1 hr when nom 3 in. (76 mm) thick pipe insulation is used in 2 hr fire-rated wall assembly.

5. **Metal Jacket (Optional)** — Min 12 in. (305 mm) long jacket formed of min 0.010 in. (.254 mm) thick steel or aluminum sheet cut to wrap tightly around the pipe insulation with a min 2 in. (51 mm) lap. Jacket secured with min 1/2 in. (13 mm) wide stainless steel hose clamps or bands located within 2 in. (51 mm) of each end of the jacket and spaced a max of 10 in. (254

mm) OC. Jacket to be installed with abutting surface of sealant (Item 6B) on both surfaces of wall. Metal jacket to be used in addition to any other jacketing material which may be required or desired on the pipe insulation.

6. Firestop System — Installed symmetrically on both sides of the wall. **The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.**

A. **Packing Material** — Min 2-1/4 or 3-1/2 in. (57 to 89 mm) thickness of min 4.0 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form for 1 or 2 hr walls, respectively. Packing material to be recessed from both surfaces of wall as required to accommodate the required thickness of fill material.

B. **Fill, Void or Cavity Material* — Sealant** — Min 3/4 in. (19 mm) thickness of fill material applied within the annulus, flush with both surfaces of the wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE MAX Intumescent Sealant

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Last Updated on 2017-12-21

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

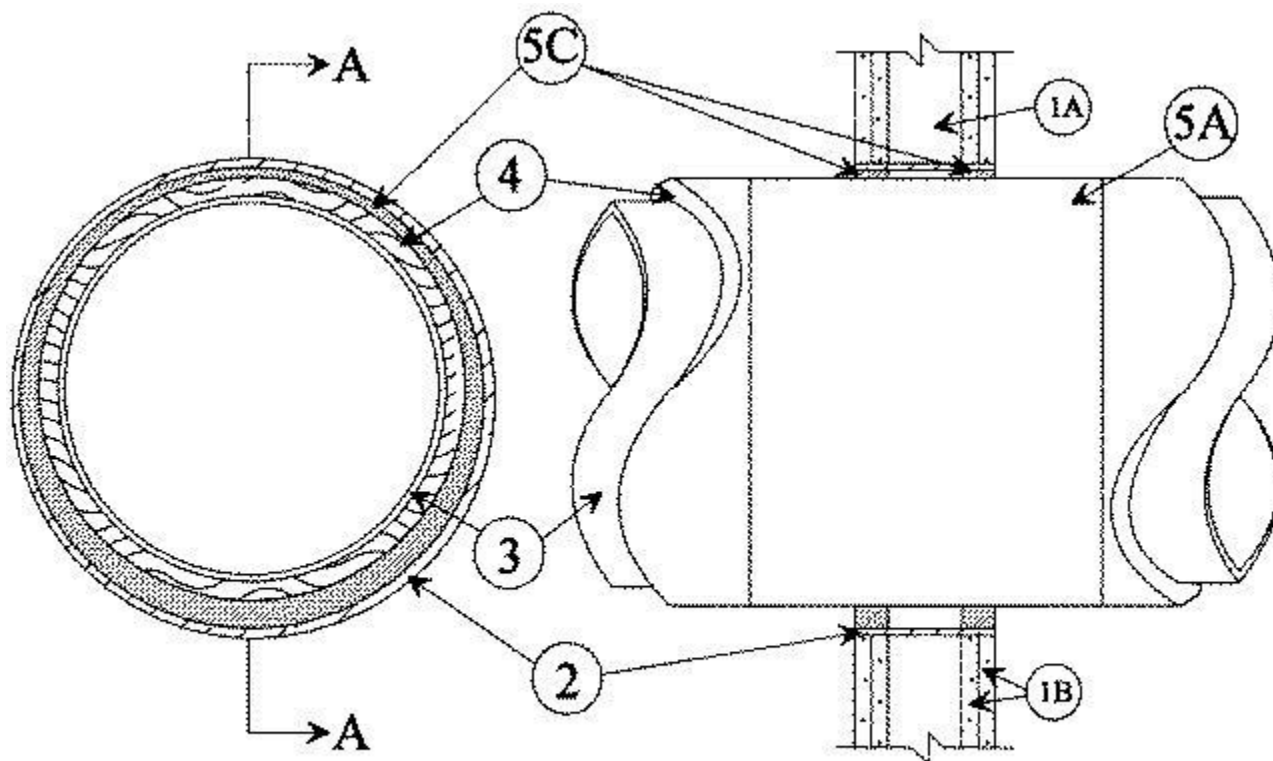
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-5047

January 27, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Rating — 1 & 2 Hr (See Item 1)	F Rating — 1 & 2 Hr (See Item 1)
T Rating — 0 & 1-1/2 Hr (See Item 1)	FT Rating — 0 & 1-1/2 Hr (See Item 1)
	FH Rating — 1 & 2 Hr (See Item 1)
	FTH Rating — 0 & 1-1/2 Hr (See Item 1)



SECTION A-A

1. Wall Assembly — The fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC. When steel studs are used and the diam of opening exceeds the width of the stud cavity, the opening shall be framed on all sides using lengths of studs installed between the vertical studs and attached to the studs at each end. The framed opening in the wall shall be 4 to 6 in. (102 to 152 mm) wider and 4 to 6 in. (102 to 152 mm) higher than the diam of the metallic sleeve (Item 2) such that a clearance of 2 to 3 in. (51 to 76 mm) is present between the sleeve and the framing on all four sides.

B. Gypsum Board* — Two layers of nom 5/8 in. (16 mm) thick gypsum board, as specified in the individual Wall and Partition Design. Max diam of opening is 14-1/2 in. (368 mm) for wood stud walls and 30 in. (762 mm) for steel stud walls.

The hourly F, FH Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed. The T, FT, FTH Rating is 0 hr when installed in 1 hr wall assembly or when optional metallic sleeve (Item 2) is used. The T, FT, FTH Rating is 1-1/2 hr when installed in 2 hr wall assembly and optional sleeve is not used.

2. Metallic Sleeve (Optional) — Nom 30 in. (762 mm) diam (or smaller) Schedule 40 (or thinner) steel pipe cast into wall assembly with joint compound and installed flush with wall surfaces.

3. Through Penetrants — One metallic pipe or tubing to be positioned within the firestop system. Pipe or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes or tubing may be used:

A. **Steel Pipe** — Nom 20 in (508 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

B. **Iron Pipe** — Nom 20 in. (508 mm) diam (or smaller) cast or ductile iron pipe.

C. **Copper Tubing** — Nom 6 in. (152 mm) diam (or smaller) Type L (or heavier) copper tubing.

D. **Copper Pipe** — Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.

4. **Pipe Covering*** — 1 to 3 in. (25 to 76 mm) thick hollow cylindrical heavy density (min 3.5 pcf or 56 kg/m³) glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners of factory-applied self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with the product. Pipe covering to terminate 6 in. (152 mm) from each side of the assembly.

5. **Firestop System** — The firestop system shall consist of the following:

A. **Pipe Covering Materials*** — Nom 1 to 3 in. (25 to 76 mm) thick unfaced mineral fiber pipe insulation sized to the outside diam of pipe or tube and extending 6 in. (152 mm) beyond each surface of the wall surface. Pipe insulation secured with min 18 AWG steel wire 3 in. (76 mm) beyond each surface of the wall assembly. When steel sleeve is not used, the annular space shall be min 1/4 in. (6 mm) to max 3 in. (76 mm), or when sleeve is used, min 1 in. (25 mm) to max 2-1/4 in. (57 mm).

INDUSTRIAL INSULATION GROUP L L C — High Temperature Pipe Insulation 1200, High Temperature Pipe Insulation BWT or High Temperature Pipe Insulation Thermaloc

B. **Sheathing Material*** — All service jacket material shall be wrapped around the outer circumference of the pipe covering material (Item 4A) with kraft side exposed. Longitudinal joints sealed with metal fasteners or self-sealing lap tape.

See **Sheathing Material** (BVDV) category in the Building Materials Directory for names of manufacturers. Any sheathing material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

C. **Fill, Void or Cavity Material* — Sealant** — Min 5/8 in. or 1-1/4 in. (16 mm or 32 mm) thickness of fill material applied within the annulus flush with both surfaces of wall, for 1 or 2 hr walls, respectively.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant or FS-ONE MAX Intumescent Sealant-

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

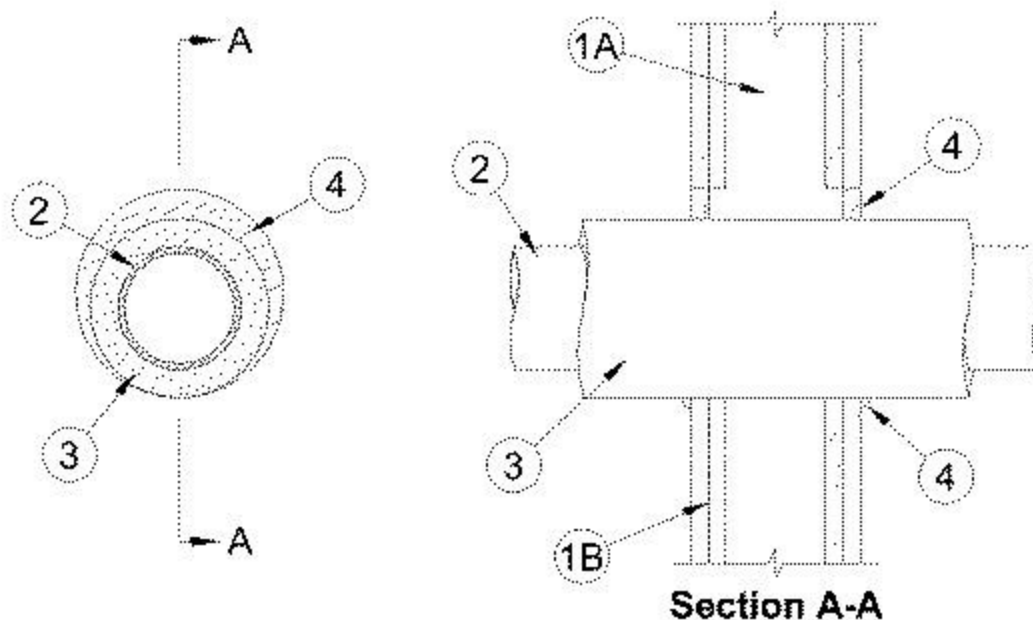
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-5257

January 26, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Ratings — 0 and 1 Hr (See Items 1 and 3)	FT Ratings — 0 and 1 Hr (See Items 1 and 3)
L Rating At Ambient — 4 CFM/sq 4 ft (See Item)	FH Ratings — 1 and 2 Hr (See Item 1)
L Rating At 400 F — Less Than 1 CFM/sq ft (See Item)	FTH Ratings — 0 and 1 Hr (See Items 1 and 3)
	L Rating At Ambient — 4 CFM/sq ft (See Item)
	L Rating At 400 F — Less Than 1 CFM/sq ft (See Item)



1. Wall Assembly — The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — 5/8 in. (16 mm) thick, 4 ft (122 cm) wide, with square or tapered edges. Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design. Max diam of opening is 8 in. (203 mm). **The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed. The hourly T, FT and FTH Ratings of the firestop system are 1 hr for 2 hr fire rated walls and 0 hr for 1 hr fire rated walls.**

2. Through Penetrant — One metallic pipe or tube to be installed eccentrically or concentrically within the firestop system. Pipe or tube to be rigidly supported on both sides of the wall assembly. The following types and sizes of metallic pipes and tubes may be used:

A. **Steel Pipe** — Nom 4 in. (102 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.

B. **Iron Pipe** — Nom 4 in. (102 mm) diam (or smaller) cast or ductile iron pipe.

C. **Copper Pipe** — Nom 4 in. (102 mm) diam (or smaller) Regular (or heavier) copper pipe.

D. **Copper Tube** — Nom 4 in. (102 mm) diam (or smaller) Type L (or heavier) copper tube.

3. Pipe Covering* — Min 1 in. (25 mm) to max 1-1/2 in. (38 mm) thick hollow cylindrical heavy density (3.5 pcf or 24 kg/m³) glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with the product. The annular space between the insulated pipe and the periphery of the opening shall be min 0 in. (point contact) to max 7/8 in. (22 mm). **When pipe covering material thickness is less than 1-1/2 in. (38 mm), the T, FT and FTH Ratings are 0 Hr.**

See **Pipe Equipment Covering — Materials** — (BRGU) Category in the Building Materials Directory for names of manufacturers.

Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

4. Fill, Void or Cavity Material* — Sealant — Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall assembly. At point contact location, min 1/2 in. (13 mm) diam bead of fill material applied at insulated

metallic pipe/wall interface on both surfaces of wall. **L Ratings apply only when FS-One Sealant is used.**

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-One Sealant, FS-ONE MAX Intumescent Sealant, CFS-S-SIL GG Sealant, CP 606 Sealant or CP 601S Sealant

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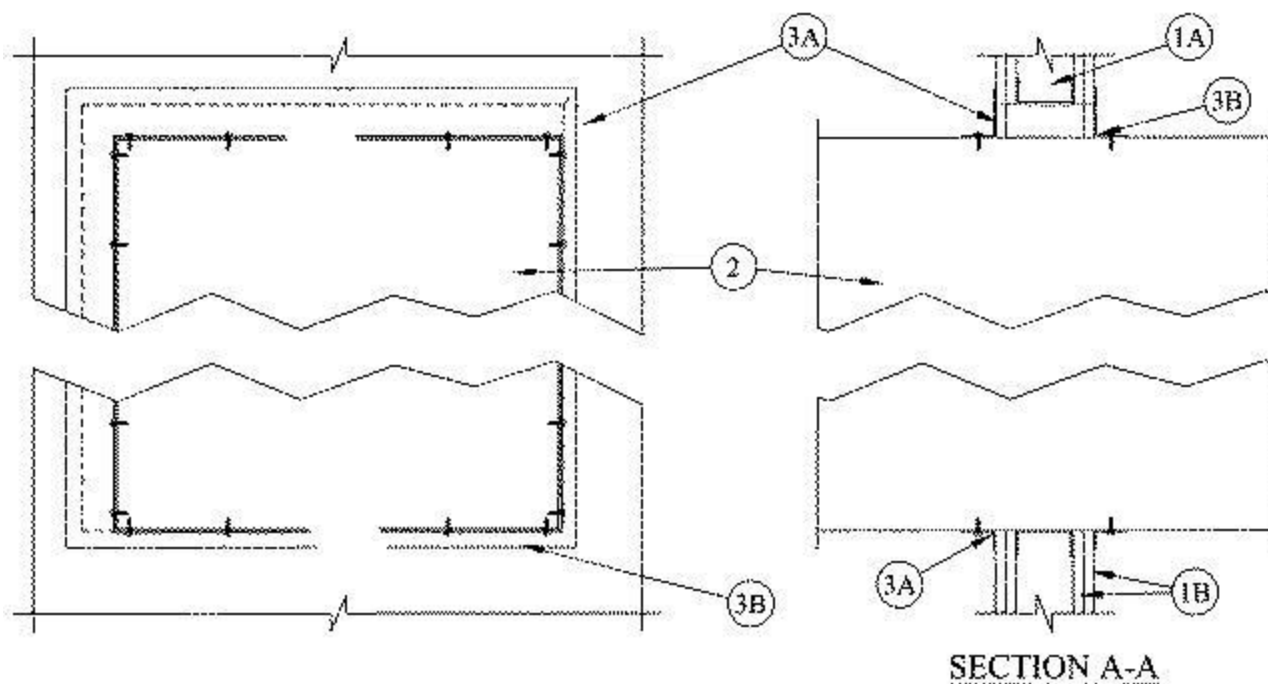
XHEZ - Through-penetration Firestop Systems
XHEZ7 - Through-penetration Firestop Systems Certified for Canada

[See General Information for Through-penetration Firestop Systems](#)
[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-7040

September 16, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings - 1 and 2 Hr (See Items 1 and 3)	F Ratings - 1 and 2 Hr (See Items 1 and 3)
T Rating - 0 Hr	FT Rating - 0 Hr
L Rating at Ambient - Less Than 1 CFM/sq ft	FH Ratings - 1 and 2 Hr (See Items 1 and 3)
L Rating at 400°F - Less Than 1 CFM/sq ft	FTH Rating - 0 Hr
	L Rating at Ambient - Less Than 1 CFM/sq ft
	L Rating at 400°F - Less Than 1 CFM/sq ft



1. **Wall Assembly** — The fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or V400 Series Wall and Partition Designs in the Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (61 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm). Additional framing members shall be used to completely frame around opening.

B. **Gypsum Board*** — Nom 5/8 in. (16 mm) thick with square or tapered edges. The gypsum wallboard type, number of layers and sheet orientation shall be as specified in the individual Wall and Partition Design Number. Max area of opening is 1300 in.² (0.84 m²) with the dimension of 50 in. (1.27 m). **The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.**

2. **Steel Duct** — Nom 24 in. by 48 in. (610 by 1219 mm) (or smaller) No. 24 gauge (or heavier) galv steel duct to be installed within the firestop system. The annular space shall be min 0 (point contact) in. to a max 2 in. (51 mm) Duct to be rigidly supported on both sides of the wall assembly.

3. **Firestop System** — The firestop system shall consist of the following:

A. **Fill, Void or Cavity Material*—Sealant** — Min 5/8 in. (16 mm) thickness of fill material applied within annulus flush with both surfaces of wall. At point contact location, a min 1/2 in. (13 mm) diam bead of fill material shall be applied to the wall/duct interface on both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant, FS-ONE MAX Intumescent Sealant, CP601S Elastomeric Firestop Sealant or CP606 Flexible Sealant

B. **Steel Retaining Angle** — No. 18 MSG (0.048 in.) galv steel angles cut to fit contour of duct with a 2 in. overlap on the duct and a min 1 in. overlap on the gypsum board assembly on both surfaces of wall. 2 in. leg of angle secured to duct with min No. 8 by 3/4 in. long sheet metal screws, spaced a max of 6 in. OC. When bead of fill material is used at joint contact locations, angles shall be installed prior to full material curing.

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Last Updated on 2015-09-16

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

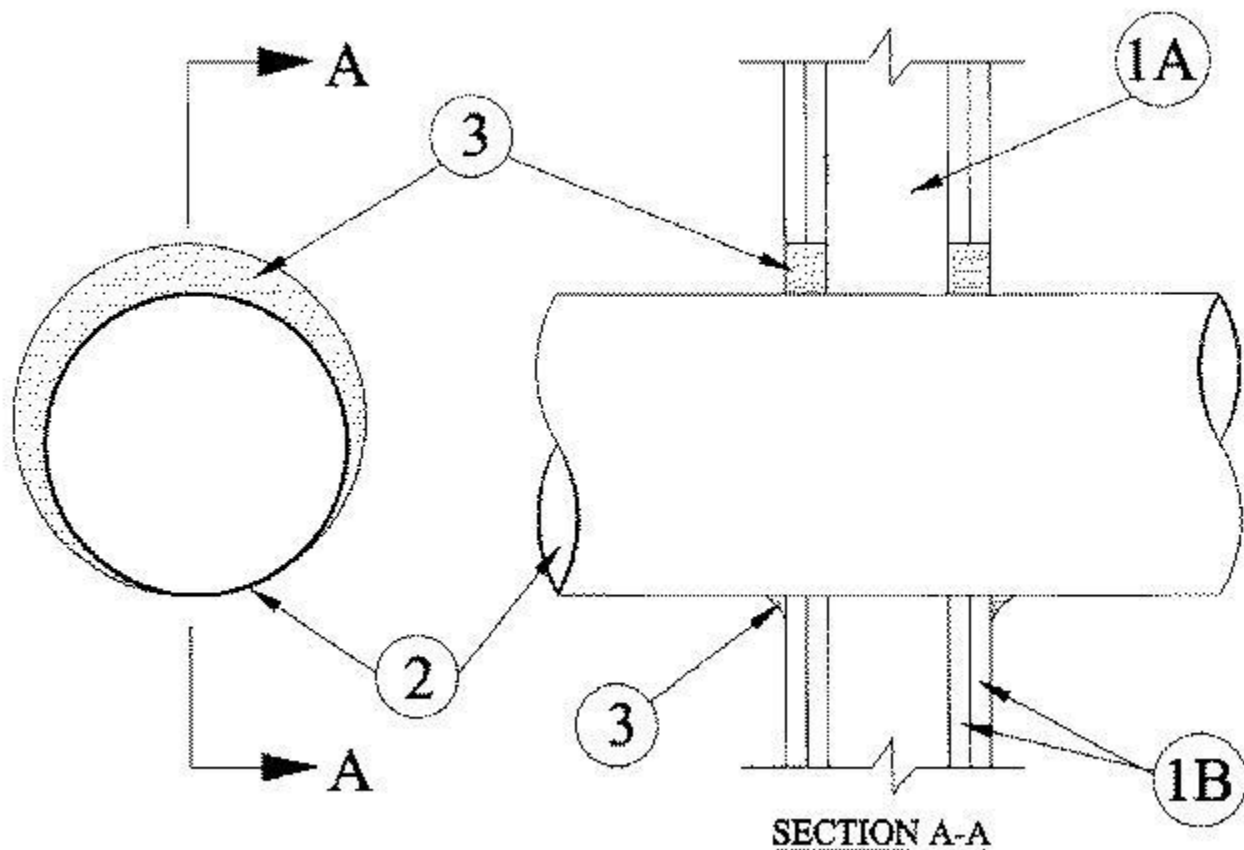
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-7042

October 12, 2017

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings - 1 and 2 Hr (See Items 1 and 3)	F Ratings - 1 and 2 Hr (See Items 1 and 3)
T Rating - 0 Hr	FT Rating - 0 Hr
	FH Ratings - 1 and 2 Hr (See Items 1 and 3)
	FTH Rating - 0 Hr



1. Wall Assembly — The 1 or 2 hr fire rated wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features.

A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced 24 in. (610 mm) OC. Additional framing members shall be used to completely frame the opening for all ducts greater than 20 in. (502 mm) diam.

B. Gypsum Board* — For 1 hr assembly, one layer of min 5/8 in. (16 mm) thick wallboard as required in the individual Wall and Partition Design. For 2 hr assembly, two layers of min 5/8 in. (16 mm) thick wallboard as required in the individual Wall and Partition Design. Max diam of opening is 14-1/2 in. (368 mm) for wood stud walls and 25-1/2 in. (648 mm) for steel stud walls.

The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.

2. Through Penetrant — Galv steel duct to be installed concentrically or eccentrically within the firestop system. The annular space between the duct and periphery of opening shall be 0 in. (0 mm, point contact) and max 1-1/2 in. (64 mm) Duct to be rigidly supported on both sides of wall assembly.

A. Spiral Wound HVAC Duct — Nom 24 in. (610 mm) diam (or smaller) No. 28 MSG (or heavier) galv steel spiral wound duct.

B. Sheet Metal Duct — Nom 12 in. (305 mm) diam (or smaller) No. 28 MSG (or heavier) galv sheet steel duct.

3. Fill, Void or Cavity Material*—Sealant — Min 5/8 in. (16 mm) and 1-1/4 in. (32 mm) thickness of fill material applied within annulus, flush with both surfaces of wall assembly for 1 and 2 hr F Ratings, respectively. When FS-ONE Max is used, min 5/8 in. (16mm) thickness for both 1 and 2 hr F Ratings. At the point contact location between duct and wallboard, a min 1/2 in.

(13 mm) diam bead of sealant shall be applied at the wallboard/duct interface on both surfaces of wall assembly.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CP601S Elastomeric Firestop Sealant, FS-ONE Sealant, FS-ONE MAX Intumescent Sealant or CP606 Flexible Firestop Sealant

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

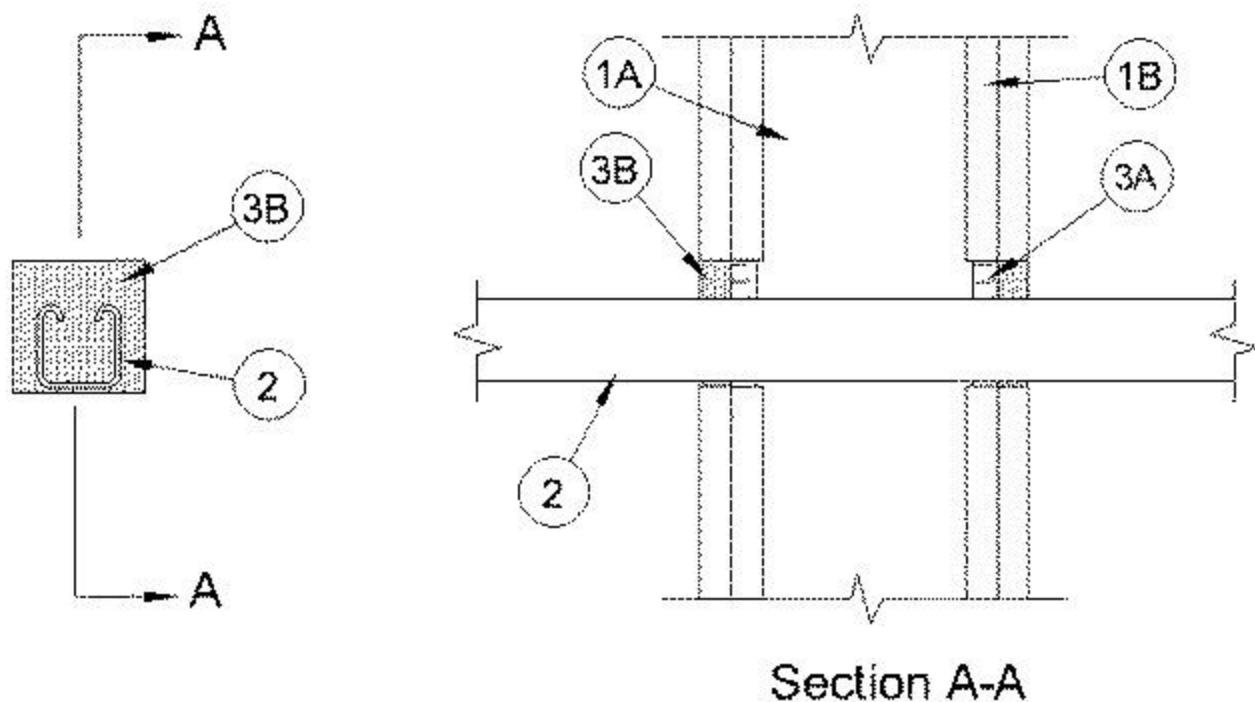
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-7130

January 27, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings - 1 and 2 Hr (See Item 1)	F Ratings - 1 and 2 Hr (See Item 1)
T Rating - 0 Hr	FT Rating - 0 Hr
	FH Ratings - 1 and 2 Hr (See Item 1)
	FTH Rating - 0 Hr



1. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced max 16 in. (406 mm) OC. Steel studs to be min 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC.

B. Gypsum Board* — One or two layers of gypsum board, as specified in the individual Wall and Partition Design. Max area of rectangular opening is 15 sq in. (96 cm²) with max dimension of 5 in. (127 mm). In lieu of rectangular opening max diam of circular opening is 3 in. (76 mm).

The F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly.

2. Through Penetrants — One metallic strut, cable, rod or angle service support to be installed within the firestop system. An annular space of min 1/8 in. (3 mm) to max 7/8 in. (22 mm) is required within the firestop system. Strut, cable, rod or angle service support to be rigidly supported on both sides of floor or wall assembly. The strut, cable, rod or angle service support may be installed at an angle not greater than 45 degrees from the perpendicular. The following types and sizes of metallic strut, cable, rod or angle service support may be used:

A. Steel Strut — Max 1-5/8 by 1-5/8 in. (41 by 41 mm) channel strut formed from min 0.105 in. (2.7 mm) thick galv or painted steel.

B. Steel Strut — Max 3-1/4 by 1-5/8 in. (83 by 41 mm) H strut formed from min 0.105 in. (2.7 mm) thick galv or painted steel.

C. Cable — Max 3/8 in. (9.5 mm) diam unjacketed galv steel cable.

D. Threaded Rod — Max 1 in. (25 mm) diam galv steel threaded rod.

E. Steel Angle — 2 by 2 by 1/8 in. (51 by 51 by 3 mm) thick steel angle.

3. Firestop System — The firestop system shall consist of the following:

A. Packing Material — Min 1/2 in. (13 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be located between penetrant and periphery of opening, and within channels of struts. Packing material to be recessed from both surfaces of wall to accommodate the

required thickness of fill material. When through penetrant is oriented perpendicular to wall or when Type FS-ONE Sealant (Item 3B) is used, packing material is optional.

B. Fill, Void or Cavity Material* - Sealant — Min 5/8 in. (16 mm) thickness of fill material applied within the annulus and within the channel struts, flush with both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant, CP 606 Sealant or FS-ONE MAX Intumescent Sealant

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Last Updated on 2015-01-27

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

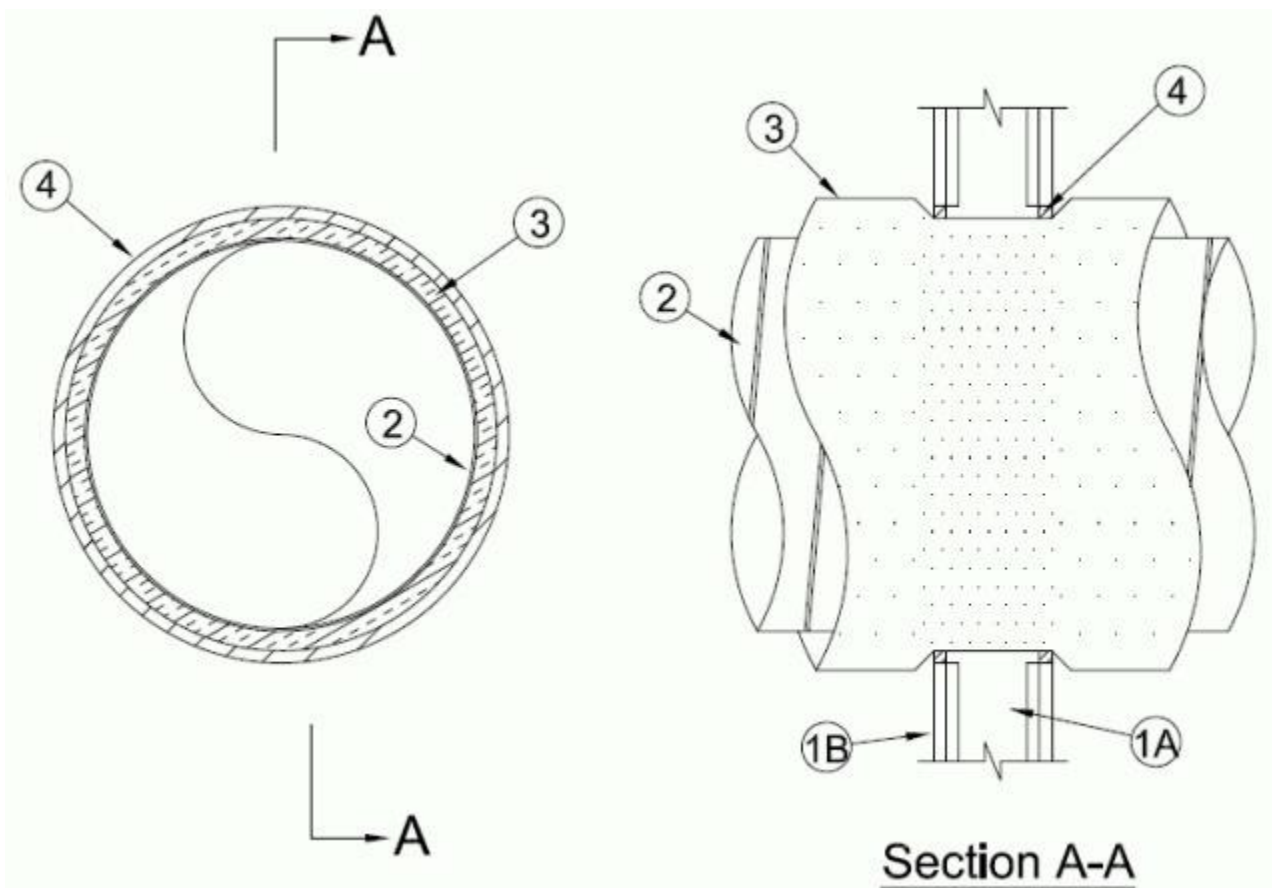
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-7153

November 15, 2017

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings - 1 and 2 Hr (See Item 1)	F Ratings - 1 and 2 Hr (See Item 1)
T Rating - 1/2 Hr	FT Rating - 1/2 Hr
	FH Ratings - 1 and 2 Hr (See Item 1)
	FTH Rating - 1/2 Hr



1. Wall Assembly — The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U400, V400 or W400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing shall consist of channel studs. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.

B. **Wallboard, Gypsum*** — 5/8 in. (16 mm) thick, 4 ft (122 cm) wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory. Max diam of opening is 24 in. (610 mm).

The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.

2. Steel Duct — Galv steel duct to be installed concentrically or eccentrically within the firestop system. Duct to be rigidly supported on both sides of wall assembly.

A. **Spiral Wound HVAC Duct** — Nom 20 in. (508 mm) diam (or smaller) No. 24 MSG (or heavier) galv steel spiral wound duct.

B. **Sheet Metal Duct** — Nom 12 in. (305 mm) diam (or smaller) No. 28 MSG (or heavier) galv sheet steel duct.

3. Duct Insulation* — Nom 1-1/2 in. or 2 in. (38 or 51 mm) thick glass fiber batt or blanket (min 3/4 pcf or 56 kg/m³) jacketed on the outside with a foil-scrim-kraft facing. Longitudinal and transverse joints sealed with aluminum foil tape. During the installation of the fill material, the batt or blanket shall be compressed 50% such that the annular space within the firestop system shall be min 1/4 in. (6 mm) to max 1-1/2 in. (38 mm).

See **Batts and Blankets** - (BKNV) category in the Building Materials Directory for names of manufacturers. Any batt or blanket meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index 50 or less may be used.

4. Fill, Void or Cavity Material* — Sealant — Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall. If voids develop after the fill materials cures, the voids shall be sealed with additional fill material.

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Last Updated on 2017-11-15

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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

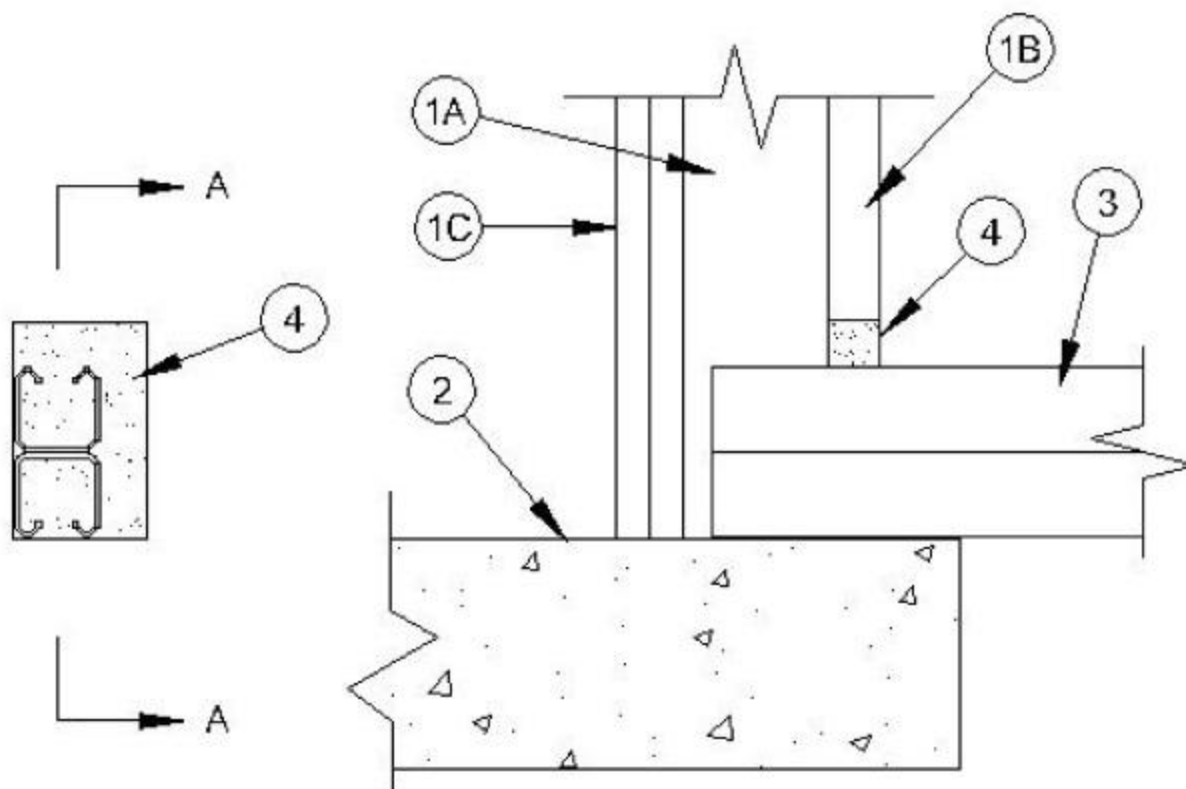
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-7154

January 27, 2015

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings - 1 and 2 Hr (See Items 1 and 2)	F Ratings - 1 and 2 Hr (See Items 1 and 2)
T Rating - 0 Hr	FT Rating - 0 Hr
	FH Ratings - 1 and 2 Hr (See Items 1 and 2)
	FTH Rating - 0 Hr



Section A-A

1. Wall Assembly — The 1 or 2 hr fire rated shaft wall assembly shall be constructed of the materials and in the manner specified in the individual U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Steel Studs** — C-H -shaped studs, 2-1/2 in. (64 mm) wide by 1-1/2 in. (38 mm) deep, spaced 24 in. (610 mm) OC.

B. **Gypsum Board*** — 1 in. (25 mm) thick gypsum board liner panels, supplied in nom 24 in. (610 mm) widths as specified in the individual Wall and Partition Design. Max area of opening is 8.6 sq in. (55 sq cm) with a max dimension of 6-7/8 in. (175 mm). The opening cutout shall follow the contour of the penetrant when steel angle or steel channel is used.

C. **Gypsum Board*** — One or two layers of 5/8 in. (16 mm) thick gypsum board for 1 or 2 hr rated assemblies, respectively, as specified in the individual Wall and Partition Design.

1A. Alternate Wall Assembly — (Not shown) As an alternate to the shaft wall described above, the 1 or 2 hr fire rated wall assembly shall be constructed of the materials and in the manner specified in the individual U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing shall consist of min 2-1/2 in. (64 mm) steel channel studs spaced max 24 in. (610 mm) OC.

B. **Gypsum Board*** — Thickness, type, number of layers and fasteners as required in the individual Wall and Partition Design. Max area of opening is 8.6 sq in. (55 sq cm) with a max dimension of 6-7/8 in. (175 mm). The opening cutout shall follow the contour of the penetrant when steel angle or steel channel is used.

The hourly F and FH Ratings of the firestop system are equal to the hourly rating of the wall.

2. Floor Assembly — Min 2-1/2 and 4-1/2 in. (64 or 114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete for 1 and 2 hr rated assemblies, respectively. Floor may also be constructed of any min 6 in. (152 mm) UL Classified **Precast Concrete Units***.

See **Precast Concrete Units** (CFTV) category in the Fire Resistance Directory for names of manufacturers.

3. **Penetrants** — One metallic strut, steel angle or steel channel to be installed within the firestop system. An annular space of min 0 in. (point contact) to max 7/8 in. (22 mm) is required within the firestop system. Penetrant to terminate within the stud cavity and shall be secured to floor assembly within 2 in. (51 mm) of the fill material (Item 4) on either side of the fill material with at least one min 1/4 in. (6 mm) diam by min 1-1/4 in. (32 mm) long steel masonry anchor in conjunction with steel washers or Hilti 1/4 in. diam by 1-3/4 in. long KWIK-BOLT 3 steel expansion anchor. The following types and sizes of metallic struts, angles or channels may be used:

A. **Steel Strut** — Max 1-5/8 by 1-5/8 in. (41 by 41 mm) channel strut formed from min 0.105 in. (2.7 mm) thick galv or painted steel.

B. **Steel Strut** — Max 3-1/4 by 1-5/8 in. (83 by 41 mm) H strut formed from min 0.105 in. (2.7 mm) thick galv or painted steel.

C. **Steel Angle** — Max 2 by 2 in. (51 by 51 mm) by min 1/8 in. (3.2 mm) thick or max 3 by 3 in. (76 by 76 mm) by min 1/4 in. (6 mm) thick steel angle.

D. **Steel Channel** — C6 x 8.2 (or smaller) steel channel.

4. **Fill, Void or Cavity Material* - Sealant** — Fill material to be installed to completely fill the annular space, flush with the surface of the wall. The thickness of the fill material shall be the thickness of the gypsum board(s) in which it is installed. An additional min 1/2 in. (13 mm) diam bead of sealant to be installed at the point contact location at the penetrant/gypsum board interface.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant or FS-ONE MAX Intumescent Sealant

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Last Updated on 2015-01-27

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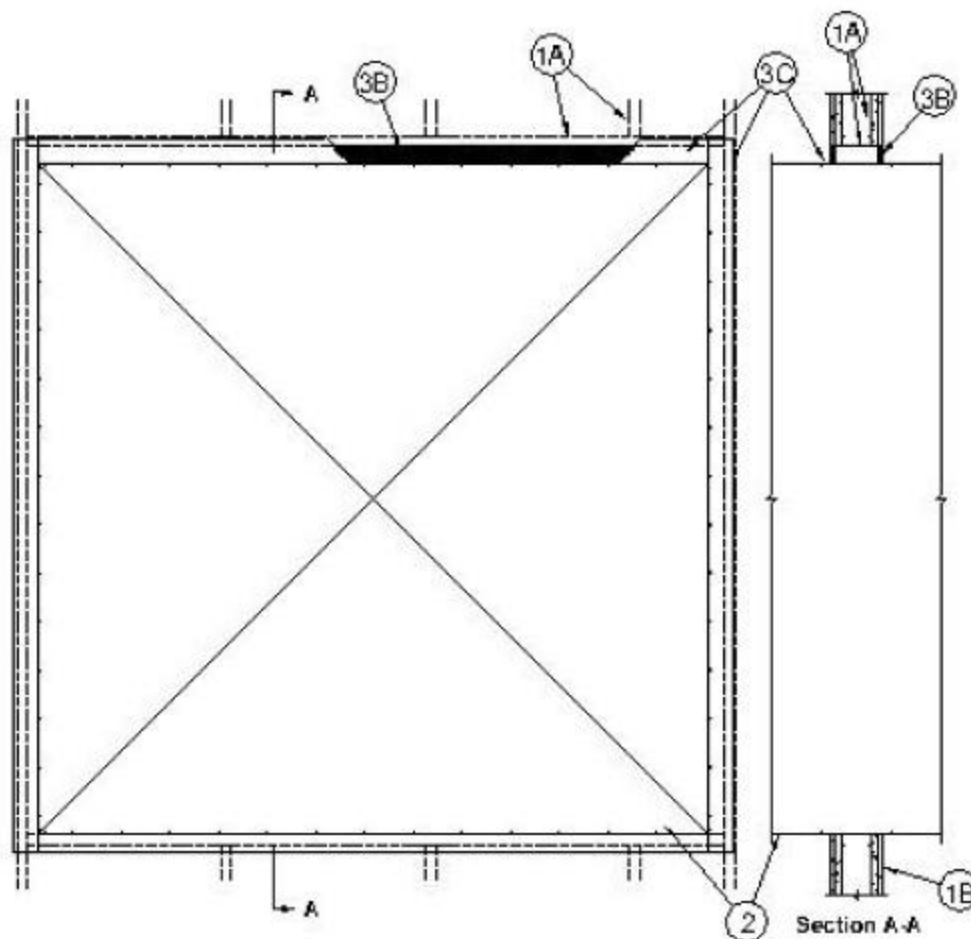
XHEZ - Through-penetration Firestop Systems
XHEZ7 - Through-penetration Firestop Systems Certified for Canada

[See General Information for Through-penetration Firestop Systems](#)
[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-7155

December 26, 2017

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Ratings — 0 Hr	FT Ratings — 0 Hr
L Rating at Ambient — Less Than 1 CFM/sq ft	FH Ratings — 1 and 2 Hr (See Item 1)
L Rating at 400 F — Less Than 1 CFM/sq ft	FTH Ratings — 0 Hr
	L Rating at Ambient — Less Than 1 CFM/sq ft
	L Rating at 400 F — Less Than 1 CFM/sq ft



1. Wall Assembly — The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U400, V400 or W400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. **Studs** — Wall framing shall consist of min 3-1/2 in. (89 mm) wide steel channel studs spaced max 24 in. (610 mm) OC. Additional steel studs shall be used to completely frame the opening.

B. **Gypsum Board*** — 5/8 in. (16 mm) thick, 4 ft (1.22 m) wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design in the UL Fire Resistance Directory. Max area of opening is 73.7 sq ft (6.85 m²) with a max dimension of 104 in. (2.64 m).

The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.

2. Steel Duct — Max 100 in. by 100 in. (2.5 by 2.5 m) galv steel duct to be installed either concentrically or eccentrically within the firestop system. The duct shall be constructed and reinforced in accordance with SMACNA construction standards. The space between the steel duct and periphery of opening shall be min 0 in. (point contact) to max 2 in. (51 mm). Steel duct to be rigidly supported on both sides of the wall assembly.

2A1. Through-Penetrating Product* — As an alternate to Item 2. Fiber cement with galvanized steel facing, 3/8 in. (10 mm) thick composite metallic duct, with a max cross-sectional area of 43.0 sq ft, (4 m²) and a max individual dimension of 78 3/4 in. (2 m). Duct to be installed either concentrically or eccentrically within the firestop system such that the annular space is min 0 in. (point contact) to max 2 in. (51 mm). Duct to be rigidly supported on both sides of wall assembly. Refer to Ventilation Duct Assemblies in Vol. 2 of the Fire Resistance Directory.

DURASYSTEMS BARRIERS INC — Type DuraDuct HP.

2A3. Through-Penetrating Product* — As an alternate to Item 2. Galvanized steel faced duct panel, with a max cross-sectional area of 2450 sq in. (1.58 m²), and a max individual dimension of 49-1/2 in. (1258 mm) Duct to be installed either concentrically or eccentrically within the firestop system such that the annular space is min 0 in. (point contact) to max 2 in. (51 mm). Duct to be rigidly supported on both sides wall assembly. Refer to Ventilation Duct Assemblies in Vol. 2 of the Fire Resistance Directory.

DURASYSTEMS BARRIERS INC — Type DuraDuct GNX.

2A4. Through-Penetrants — Coated Ducts* — As an alternate to Item 2, rectangular steel air duct supplied coated with BW11 coating material. Max 40 by 40 in. (1.02 by 1.02 m) duct size. One duct to be installed within the firestop system with an annular space of min 0 in. (point contact) to max 2 in. (51 mm). Reinforcement stiffener or transverse joint with bolted flanges shall be located approximately at the mid depth of the annular space. Duct to be rigidly supported on both sides of the wall assembly. Duct sections shall be assembled using bolted flanges or SMACNA approved Transverse Joint Reinforcements.

FIRESPRAY INTERNATIONAL LTD — FLAMEBAR BW11 FIRE RATED DUCTWORK

3 Firestop System — The firestop system shall consist of the following:

A. Packing Material — (Optional, Not Shown) — Polyethylene backer rod, mineral wool batt insulation or fiberglass batt insulation friction fitted into annular space. Packing material to be recessed from both surfaces of wall to accommodate the required thickness of fill material.

A1. Packing Material — Required as specified in Table below. Min 3-3/4 in. (95 mm) or 5 in. (127 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form for 1 and 2 hr rated assemblies, respectively. Packing material to be recessed from both surfaces of wall to accommodate the required thickness of fill material.

B. Fill, Void or Cavity Material* — Sealant — Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with both surfaces of wall. Min 1/4 in. (6 mm) diam bead of fill material shall be applied at the point contact location between the steel duct or coated duct and the gypsum board.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-S SIL GG Sealant, FS-ONE Sealant, FS-ONE MAX Intumescent Sealant or CP606 Flexible Firestop Sealant

C. Steel Retaining Angles — Min No. 16 gauge galv steel angles sized to lap steel duct a min of 2 in. (51 mm) and to lap wall surfaces a min of 1 in. (25 mm). When max duct dimension does not exceed 48 in. (122 cm) and duct area does not exceed 1300 in² (8387 cm²), angles may be min No. 18 gauge galv steel. Angles attached to steel duct or coated duct on both sides of wall with min No. 10 by 1/2 in. (13 mm) long steel sheet metal screws located a max of 1 in. (25 mm) from each end of steel duct and spaced a max of 6 in. (152 mm) OC. Steel angles are optional for those sides of duct that do not exceed the dimension specified in Table below, dependent on packing material, sealant and annular space as specified.

Max Duct Dimension	Duct Thickness	Annular Space	Sealant	Packing Material	Angle (Item 3C) Required
24 in. (610 mm)	24 ga or heavier	1/2 in. min to 1 in. max (13 to 25 mm)	FS-ONE Sealant or CP606 Flexible Firestop Sealant	Item 3A1	No

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- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

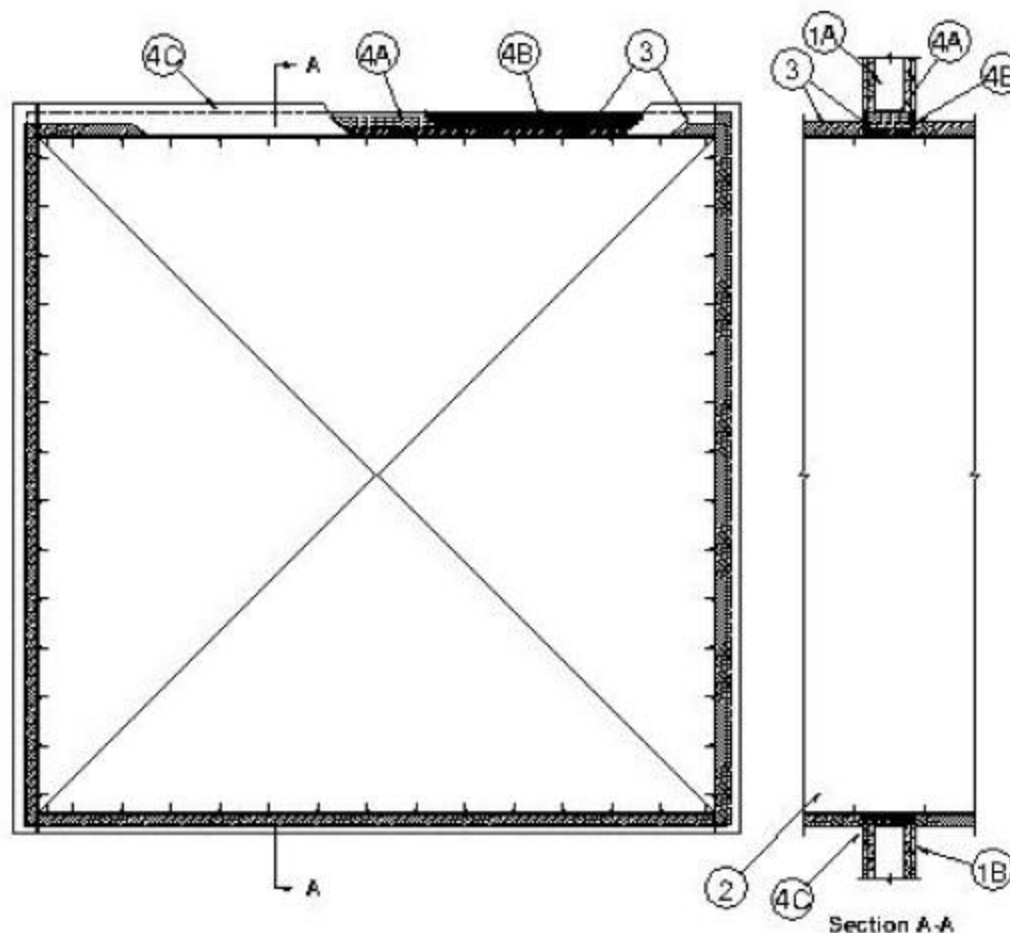
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-7156

August 22, 2018

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Rating — 0, 1 and 2 Hr (See Item 4C)	FT Rating — 0, 1, and 2 Hr (See Item 4C)
	FH Ratings — 1 and 2 Hr (See Item 1)
	FTH Rating — 0, 1, and 2 Hr (See Item 4C)



1. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. Studs — Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced max 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC. Additional framing members shall be used to completely frame around opening.

B. Gypsum Board* — Min 5/8 in. (16 mm) thick, 4 ft (1.2 m) wide with square or tapered edges. The gypsum board type, thickness, number of layers and orientation shall be as specified in the individual Wall and Partition Design. Max size of opening is 210 sq in. (1355 cm²) with a max width of 14-1/2 in. (368 mm) for wood studs. Max size of opening is 76.2 sq ft. (7 m²) with a max width of 105-1/2 in. (2.7 m) for steel studs.

The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall in which it is installed.

2. Steel Duct — Max 100 by 100 in. (2.5 by 2.5 m) steel duct to be installed within the framed opening. The duct shall be constructed and reinforced in accordance with SMACNA construction standards. Steel duct to be rigidly supported on both sides of wall assembly.

3. Batts and Blankets* — Nom 1-1/2 or 2 in. (38 or 51 mm) thick glass fiber batt or blanket (min 3/4 pcf or 12 kg/m³) jacketed on the outside with a foil-scrim-kraft facing. Longitudinal and transverse joints sealed with aluminum foil tape. During the installation of the fill material, the batt or blanket shall be compressed minimum 50% such that the annular space within the firestop system shall be min 1/2 in. (13 mm) to max 3-1/2 in. (89 mm); refer to the table below.

See **Batts and Blankets** (BKNV) category in the Building Materials Directory for names of manufacturers. Any batt or blanket meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index 50 or less may be used.

4. Firestop System — The firestop system shall consist of the following:
- A. Packing Material — Min 3-5/8 (92 mm) or 4-7/8 in. (124 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form for 1 or 2 hr fire-rated walls, respectively. Packing material to be recessed from both surfaces of wall to accommodate the required thickness of fill material.

B. Fill, Void or Cavity Material* — Sealant — Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE MAX Intumescent Sealant

C. Steel Retaining Angles — Min No. 16 gauge (0.059 in. or 1.5 mm) galv steel angles sized to lap steel duct a min of 2 in. 51 mm) and lap wall surfaces a min of 1 in. (25 mm). Angles attached to steel duct on both sides of wall with min No. 10 steel sheet metal screws spaced a max of 1 in. (25 mm) from each end of steel duct and spaced a max of 6 in. (152 mm) OC. When max duct dimension does not exceed 48 in. (122 cm) and duct area does not exceed 1300 in² (8387 cm²), angles may be min No. 18 gauge galv steel. Angles attached to steel duct on both sides of wall with min No. 10 by 1/2 in. (13 mm) long steel sheet metal screws located a max of 1 in. (25 mm) from each end of steel duct and spaced a max of 6 in. (152 mm) OC. In addition, see table below for additional conditions and options regarding retaining angles.

Max Duct Dimension	Duct Thickness	Max Insulation Thickness (Item 3)	Annular Space	Packing Material (Item 4A) Required	Angle (Item 4C) Required	T-Rating Hr
**24 in. (610 mm)	24 ga or heavier	1-1/2 in (38 mm)	1/4 in. min to 1 in. max (6 to 25 mm)	No	No	0
25 in. (635mm) wide by 45 in. (1143 mm) high	24 ga or heavier	2 in. (51mm)	1/4 in. min to 3-1/2 in. max (6. to 89 mm)	Yes	No	1 and 2 (Same as wall rating)

** Indicates that when max 1-1/2 in. (38 mm) thick insulation is used, steel angles are optional for those sides of the duct that do not exceed the dimension specified.

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Last Updated on 2018-08-22

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- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
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XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

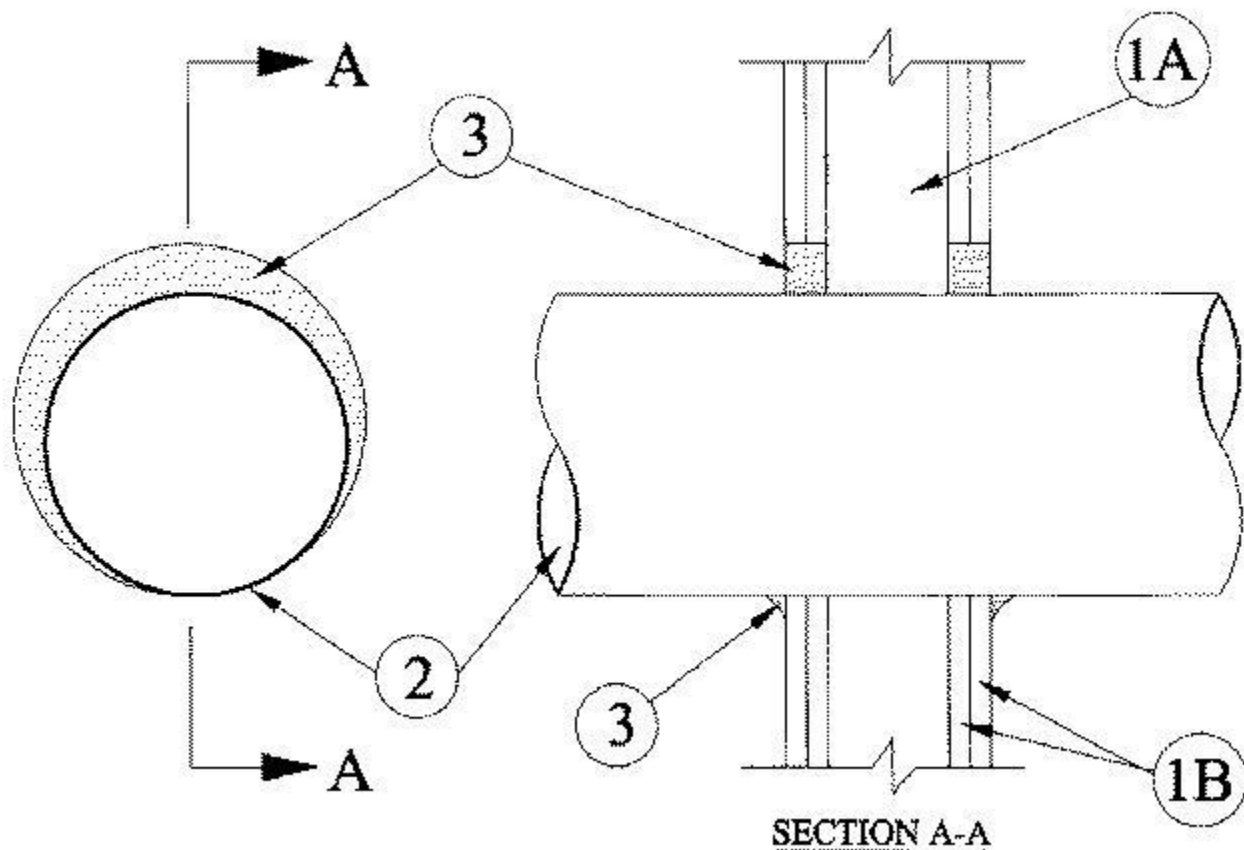
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-7214

January 14, 2014

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Items 1 and 3)	F Ratings — 1 and 2 Hr (See Items 1 and 3)
T Rating — 0 Hr	FT Rating — 0 Hr
	FH Ratings — 1 and 2 Hr (See Items 1 and 3)
	FTH Rating — 0 Hr



1. Wall Assembly — The 1 or 2 hr fire rated wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features.

A. **Studs** — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced 24 in. (610 mm) OC.

B. **Gypsum Board*** — For 1 hr assembly, one layer of min 5/8 in. (16 mm) thick wallboard as required in the individual Wall and Partition Design. For 2 hr assembly, two layers of min 5/8 in. (16 mm) thick wallboard as required in the individual Wall and Partition Design. Max diam of opening is 14-1/2 in. (368 mm) for wood stud walls and 21-3/4 in. (552 mm) for steel stud walls.

The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.

2. Through Penetrant — Galv steel duct to be installed concentrically or eccentrically within the firestop system. The annular space between the duct and periphery of opening shall be 0 in. (point contact) and max 1-1/2 in. (38 mm). Duct to be rigidly supported on both sides of wall assembly.

A. **Spiral Wound HVAC Duct** — Nom 20 in. (508 mm) diam (or smaller) No. 24 MSG (or heavier) galv steel spiral wound duct.

B. **Sheet Metal Duct** — Nom 12 in. (305 mm) diam (or smaller) No. 28 MSG (or heavier) galv sheet steel duct.

3. Fill, Void or Cavity Material* — Sealant — Min 5/8 in. and 1-1/4 in. (16 and 32 mm) thickness of fill material applied within annulus, flush with both surfaces of wall assembly for 1 or 2 hr rated walls, respectively. At the point contact location between duct and wallboard, a min 1/2 in. (13 mm) diam bead of sealant shall be applied at the wallboard/duct interface on both surfaces of wall assembly.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — CFS-S SIL GG Sealant

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Last Updated on 2014-01-14

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- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

XHEZ - Through-penetration Firestop Systems

XHEZ7 - Through-penetration Firestop Systems Certified for Canada

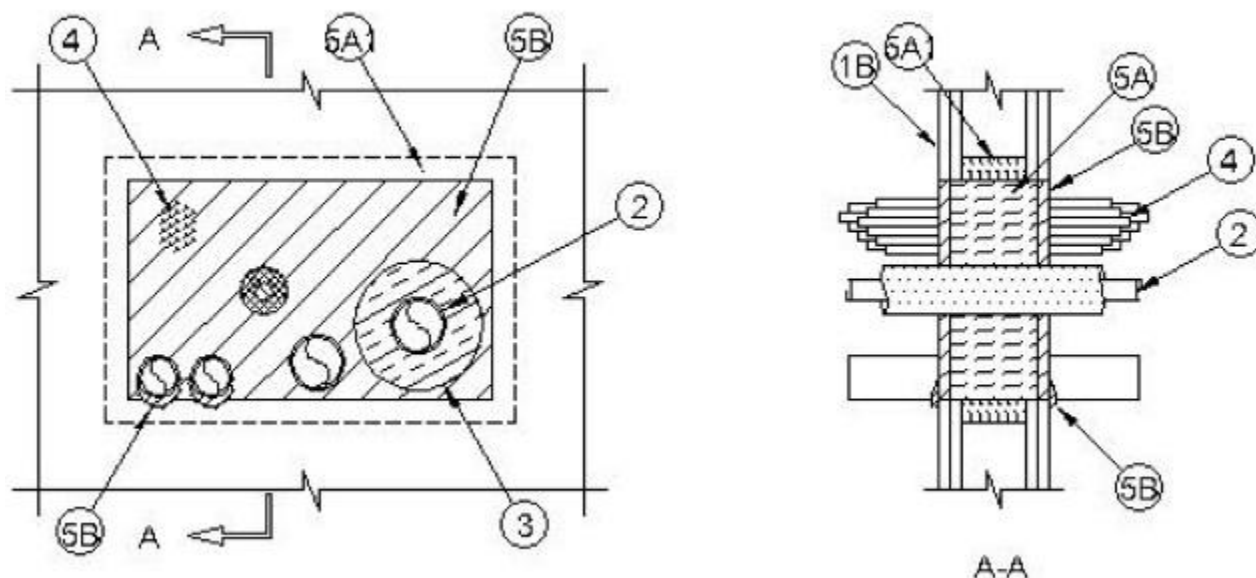
[See General Information for Through-penetration Firestop Systems](#)

[See General Information for Through-penetration Firestop Systems Certified for Canada](#)

System No. W-L-8079

April 26, 2017

ANSI/UL1479 (ASTM E814)	CAN/ULC S115
F Ratings — 1 and 2 Hr (See Item 1)	F Ratings — 1 and 2 Hr (See Item 1)
T Ratings — 0, 1/2, 3/4, 1-1/2 and 2 Hr (See Items 1, 2, 3 and 4)	FT Ratings — 0, 1/2, 3/4, 1-1/2 and 2 Hr (See Items 1, 2, 3 and 4)
	FH Ratings — 1 and 2 Hr (See Item 1)
	FTH Ratings — 0, 1/2, 3/4, 1-1/2 and 2 Hr (See Items 1, 2, 3 and 4)



System tested with a pressure differential of 2.5 Pa between the exposed and the unexposed surfaces with the higher pressure on the exposed side.

1. Wall Assembly — The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

A. Studs — Wall framing may consist of either wood studs or channel shaped steel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced max 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC. When Item 5A1 is not used, additional framing members (not shown) shall be installed to frame the periphery of the wall opening. **When the additional framing members are used to frame the opening, the hourly T, FT and FTH Ratings of the firestop system are 0 hr.**

B. Gypsum Board* — 5/8 in. (16 mm) thick with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300, U400 or V400 Wall and Partition Design. If the through penetrants are installed in a wood stud/gypsum board assembly, the max area of square, rectangular, or circular opening is 210 sq in. (1355 cm²) with max dimension of 14-1/2 in. (368 mm). If the through penetrants are installed in a steel stud/gypsum board assembly, max area of square, rectangular, or circular opening is 240 sq in. (1548 cm²) with max dimension of 20 in. (508 mm) wide.

The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.

2. Through-Penetrant — One or more pipes, conduit or tubes to be installed within the opening. The total number of through-penetrants is dependent on the size of the opening and the types and sizes of the penetrants. Any combination of the penetrants described below may be used provided that the following parameters relative to the annular spaces and the spacing between the through penetrants are maintained. The separation between the penetrants shall be min 1 in. (25 mm) to max 20 in. (508mm). The annular space between penetrants and the periphery of opening shall be min 0 in. (point contact) to max 20 in. (508 mm). Pipes, conduit or tubes to be rigidly supported on both sides of wall assembly. The following types and sizes of pipes, conduit or tubes may be used.

A. Copper Tubing — Nom 3 in. (76 mm) diam (or smaller) Type L (or heavier) copper tube.

B. Copper Pipe — Nom 3 in. (76 mm) diam (or smaller) Regular (or heavier) copper pipe.

C. Steel Pipe — Nom 4 in. (102 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.

D. Iron Pipe — Nom 4 in. (102 mm) diam (or smaller) cast or ductile iron pipe.

E. **Conduit** — Nom 3 in. (76 mm) diam (or smaller) electric metallic tubing (EMT) or rigid steel conduit.

F. **Polyvinyl Chloride (PVC) Pipe** — Nom 2 in. (51 mm) diam (or smaller) Schedule 40 cellular or solid core PVC pipe for use in closed (process or supply) or vented (drain, waste, or vent) piping systems.

G. **Chlorinated Polyvinyl Chloride (CPVC) Pipe** — Nom 2 in. (51 mm) diam (or smaller) SDR 13.5 CPVC pipe for use in closed (process or supply) piping systems.

The T, FT and FTH Ratings are 0 Hr if bare pipe and tubing is used.

3. **Pipe Insulation** — One or more metallic penetrants (pipe or tubing) may be insulated with the following types of pipe coverings:

A. **Pipe Covering*** — Min 1 in. (25 mm) to max 2 in. (51 mm) thick hollow cylindrical heavy density min 3.5 pcf (56 kg/m³) glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with the product.

See **Pipe and Equipment Covering - Materials** (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

B. **Tube Insulation-Plastics+** — Min 1/2 in. (13 mm) to max 3/4 in. (19 mm) thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing.

See **Plastics+** (QMFZ2) category in the Plastics Recognized Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL 94 Flammability Classification of 94-5VA may be used.

The annular space between the insulated penetrants and the periphery of the opening shall be min 0 in. (0 mm, point contact) The separation between the insulated penetrants and the other penetrants shall be a min 1 in. (25 mm).

The T, FT and FTH Ratings are 1-1/2 hour if Item 3B is used. The T, FT and FTH Ratings are 2 hr if Item 3A is used.

4. **Cables** — One max 3 in. (76 mm) diam bundle of cables installed within the opening and rigidly supported on both surfaces of wall. The annular space between the tightly-bundled cables and the periphery of the opening shall be min 0 in. (point contact) to max 20 in. (508 mm). The separation between the cable bundle and the other penetrants shall be min 1 in. (25 mm) to max 20 in. (508 mm). Any combination of the following types and sizes of cables may be used:

A. Max 25 pair No. 24 AWG telephone cable with polyvinyl chloride (PVC) insulation and jacket.

B. Max 7/C No. 12 AWG copper conductor power and control cable with PVC or cross-linked polyethylene (XLPE) insulation and PVC jacket.

C. Multiple fiber optical communication cable jacketed with PVC and having a max outside diam of 1/2 in. (13 mm).

D. Max 3/C No. 8 AWG with bare aluminum ground, PVC insulated steel Metal-Clad+ Cable currently Classified under the **Through Penetrating Product*** (XHLY) category.

E. Max 3/C (with ground) No. 8 AWG (or smaller) nonmetallic sheathed (Romex) cable with PVC insulation and jacket materials.

F RG/U coaxial cable with polyethylene (PE) insulation and polyvinyl chloride (PVC) jacket having a max outside diam of 1/2 in. (13 mm).

G Max 3/4 in. (19 mm) diam copper ground cable with or without PVC jacket.

H Max 1-1/4 in. (32 mm) Diam single or multi conductor mineral-insulated copper-clad cable.

The T, FT and FTH Ratings are 1/4 hr if cables D, G and H are used. The T, FT and FTH Ratings are 3/4 Hr for any other combination.

4A. **Through Penetrants** — (Not shown) - Max six nom 1 in. (25 mm) diam (or smaller) flexible steel conduits to be installed either concentrically or eccentrically within the firestop system. The annular space between the conduits and the periphery of the opening shall be min 0 in. (point contact) to a max 3 in. (76 mm). Conduits to be rigidly supported on both sides of wall.

The T, FT and FTH Ratings are 0 Hr if this penetrant is used.

4B. **Through Penetrants** — (Not Shown) - Max twelve nom 3/8 in. (10 mm) diam (or smaller) polyvinyl chloride (PVC) pneumatic tubing for use in closed (process or supply) piping systems. Tubing to be installed either concentrically or eccentrically within the firestop system. The annular space between the tubing and the periphery of the opening shall be min 0 in. (point contact) to a max 1 in. (25 mm). Tubing to be rigidly supported on both sides of wall.

5 Firestop System — The firestop system shall consist of the following:

A. **Packing Material** — In 2 hr fire rated wall assemblies, min 4-3/4 in. (121 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form. In 1 hr fire rated wall assemblies, min 3-1/2 in. (89 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form. Packing material recessed from both surfaces of the wall to accommodate the required thickness of fill material.

A1. **Packing Material** — Min 1-1/4 in. (32 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed as a backer around the perimeter of opening as a permanent form. When additional framing members are used to frame the opening (see Item 1A), this packing material is optional. Packing material can be used in combination with the additional framing members.

B. **Fill, Void or Cavity Material* — Sealant** — Min 5/8 in. (16 mm) thickness of fill material applied within annulus, flush with both surfaces of wall. At the point contact location between through penetrants and gypsum board, a min 1/2 in. (13 mm) diam bead of fill material shall be applied at the gypsum board/through penetrant interface on both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant or FS-ONE MAX Intumescent Sealant

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Last Updated on 2017-04-26

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OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION

APPLICATION FOR OSHPD PREAPPROVAL
OF MANUFACTURER'S CERTIFICATION (OPM)

OFFICE USE ONLY

APPLICATION #: OPM-0201-13

OSHPD Preapproval of Manufacturer's Certification (OPM)

Type: ☒ New ☐ Renewal ☐ Update to Pre-CBC 2013 OPA Number: _____

Manufacturer Information

Manufacturer: MIDMARK CORPORATION

Manufacturer's Technical Representative: Joe Martin

Mailing Address: 60 Vista Drive, Versailles, OH 45380

Telephone: 1-800-MIDMARK, ext. 8446 Email: JMartin@midmark.com

Product Information

Product Name: Midmark Corporation Base Cabinet

Product Type: Cabinet

027-1946-00; 027-1946-01; 027-1946-02; 027-1946-03; 027-1946-04; 027-1946-05; 027-1946-06; 027-1946-07; 027-1946-08; 027-1946-09; 027-1946-10; 027-1946-11; 027-1946-12; 027-1946-13; 027-1946-14; 027-1946-15; 027-1946-16; 027-1946-17; 027-1946-18; 027-1946-19; 027-1946-20; 027-1946-21; 027-1946-22; 027-1946-23; 027-1946-24; 027-1946-25; 027-1946-26; 027-1946-27; 027-1946-28; 027-1946-29; 027-1946-30; 027-1946-31; 027-1946-32; 027-1946-33; 027-1946-34; 027-1946-35; 027-1946-36; 027-1946-37; 027-1946-38; 027-1946-39; 027-1946-40; 027-1946-41; 027-1946-42; 027-1946-43; 027-1946-44; 027-1946-45; 027-1946-46; 027-1946-47; 027-1946-48; 027-1946-49; 027-1946-50; 027-1946-51; 027-1946-52; 027-

Product Model Number: 1946-53

General Description: Floor supported cabinet

Applicant Information

Applicant Company Name: ZFA Structural Engineers

Contact Person: Mark Moore

Mailing Address: 100 Bush Street, Suite 1850, San Francisco, CA, 94104

Telephone: 415-243-4091 Email: markm@zfa.com

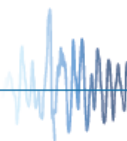
I hereby agree to reimburse the Office of Statewide Health Planning and Development review fees in accordance with the California Administrative Code, 2013.

Signature of Applicant:  Date: 3/26/2015

Title: Executive Principal Company Name: ZFA Structural Engineers

"Access to Safe, Quality Healthcare Environments that Meet California's Diverse and Dynamic Needs"

STATE OF CALIFORNIA – HEALTH AND HUMAN SERVICES AGENCY
OSH-FD-700 (REV 10/22/14)



OSHPD

Page 1 of 2



**OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION**

Registered Design Professional Preparing Engineering Recommendations

Company Name: ZFA Structural Engineers

Name: Mark Moore California License Number: 4443

Mailing Address: 100 Bush Street, Suite 1850, San Francisco, 94104

Telephone: 415-243-4091 Email: markm@zfa.com

OSHPD Special Seismic Certification Preapproval (OSP)

- ☐ Special Seismic Certification is preapproved under OSP-
(Separate application for OSP is required)
- ☒ Special Seismic Certification is not preapproved

Certification Method(s)

- ☐ Testing in accordance with: ☐ ICC-ES AC156 ☐ FM 1950-10
- ☐ Other* (Please Specify): _____

*Use of criteria other than those adopted by the California Building Standards Code, 2013 (CBSC 2013) for component supports and attachments are not permitted. For distribution system, interior partition wall, and suspended ceiling seismic bracings, test criteria other than those adopted in the CBSC 2013 may be used when approved by OSHPD prior to testing.

- ☒ Analysis
- ☐ Experience Data
- ☐ Combination of Testing, Analysis, and/or Experience Data (Please Specify): _____

List of Attachments Supporting the Manufacturer's Certification

- ☐ Test Report ☒ Drawings ☒ Calculations ☐ Manufacturer's Catalog
- ☐ Other(s) (Please Specify): _____

OFFICE USE ONLY – OSHPD APPROVAL VALID FOR CBC 2013 ONLY

Signature:  Date: 05/28/2015

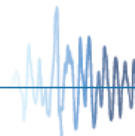
Print Name: Timothy Piland

Title: SSE

Condition of Approval (if applicable): _____

"Access to Safe, Quality Healthcare Environments that Meet California's Diverse and Dynamic Needs"

STATE OF CALIFORNIA – HEALTH AND HUMAN SERVICES AGENCY
OSH-FD-700 (REV 10/22/14)



OSHPD

Page 2 of 2

MIDMARK CORPORATION BASE CABINET
UNITS 027-1946-00 THROUGH 027-1946-53

ENG/CKR:	ARF	DATE:	04/24/15
JOB NO.:	15113.30	SCALE:	

ZFA STRUCTURAL ENGINEERS

100 bush street suite 1850 | san francisco ca 94104 | 415.243.4091 | www.zfa.com

SHEET NO.:

1/4

OPM-0201-13: EQUIPMENT MANUFACTURER: MIDMARK CORPORATION
EQUIPMENT TYPE: BASE CABINETS

GENERAL NOTES

1. THIS OSHPD PREAPPROVAL OF MANUFACTURER'S CERTIFICATION (OPM) IS BASED ON THE CBC 2013. THE DEMAND (DESIGN FORCES) FOR USE WITH THIS OPM SHALL BE BASED ON THE CBC 2013.
2. FORCES PER ASCE 7-10 SECTION 13.3.1, EQUATIONS 13.3-1, 13.3-2, 13.3-3, WHERE $S_{DS} = 2.20$, $a_p = 1.0$, $I_p = 1.5$ & $R_p = 2.5$, $z/h \leq 1.0$. A FACTOR OF 0.7 IS APPLIED TO CALCULATE ASD LOADS.
HORIZONTAL FORCE (E_h) = $1.109 W_p$
VERTICAL FORCE (E_v) = $0.308 W_p$
3. THE DETAILS IN THIS PRE-APPROVAL MAY BE USED AT ANY LOCATION WITH AN S_{DS} OF 2.20g OR LESS.
4. ALL SEISMIC AND ANCHOR FORCES SHOWN ON THE DRAWINGS ARE BASED ON ALLOWABLE STRESS DESIGN.
5. SHEET METAL SCREWS (SMS) SHALL CONFORM TO ICC-ES ESR-1976 OR ICC-ES ESR-2196.
6. SEE SHEET 2 FOR LIGHT GAGE STEEL MINIMUM SPECIFICATIONS.

RESPONSIBILITIES OF THE STRUCTURAL ENGINEER OF RECORD (SEOR)

7. DESIGN BACKING PLATES, STUDS, ETC. WHICH THE UNITS ARE ATTACHED TO AS NOTED ON THE DRAWINGS. THE SEOR SHALL ALSO VERIFY THE ADEQUACY OF THE STRUCTURES (SUCH AS WALLS AND FLOORS) WHICH SUPPORT THE UNITS FOR ALL LOADS.
8. PROVIDE ANY SUPPORTING STRUCTURE REQUIRED TO SUPPORT WEIGHTS AND FORCES SHOWN, IN ADDITION TO ALL OTHER LOADS.
9. VERIFY THAT THE INSTALLATION IS IN CONFORMANCE WITH THE 2013 CBC AND WITH THE DETAILS SHOWN IN THIS DOCUMENT. VERIFY THAT THE ACTUAL EQUIPMENT'S WEIGHT, CG LOCATION, ANCHOR LOCATIONS, ANCHOR DETAILS AND THE MATERIAL AND GAGE OF THE UNIT WHERE ATTACHMENTS ARE MADE AGREE WITH THE INFORMATION SHOWN ON THE PRE-APPROVAL DOCUMENTS.
10. VERIFY THAT THE COMBINATION OF S_{DS} & z/h RESULT IN SEISMIC FORCES (E_h , E_v) THAT ARE NOT GREATER THAN THE VALUES IN THE GENERAL NOTES.
11. VERIFY THAT THE ATTACHMENTS ARE LOCATED AT AN ADEQUATE DISTANCE FROM ANY END OR EDGE OF METAL STUD.



MIDMARK CORPORATION BASE CABINET
UNITS 027-1946-00 THROUGH 027-1946-53

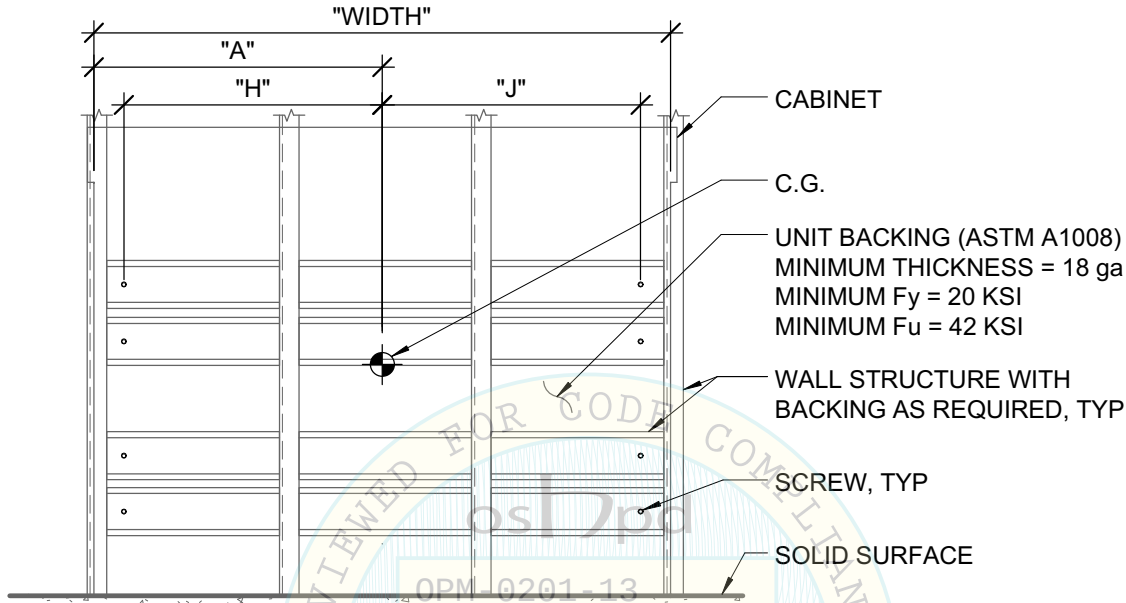
ENG/CKR:	ARF	DATE:	04/24/15
JOB NO.:	15113.30	SCALE:	3/4" = 1'-0"

ZFA STRUCTURAL ENGINEERS

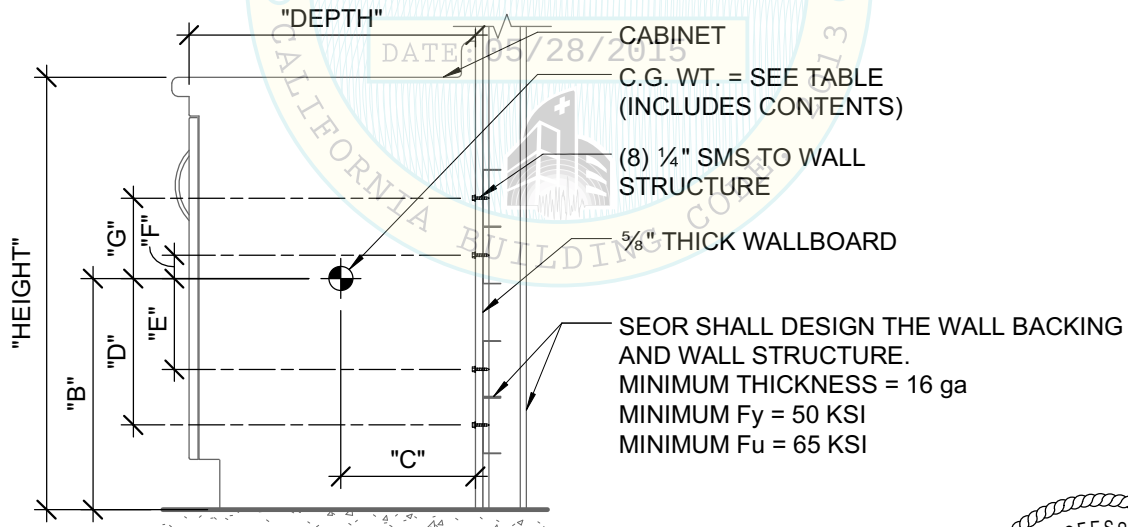
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SHEET NO.:

2/4



BACK ELEVATION



SIDE ELEVATION

NOTES

1. CENTER OF GRAVITY (C.G.) WEIGHT IS A MAXIMUM. THIS PRE-APPROVAL ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
2. FOR GENERAL NOTES, SEE SHEET 1.
3. FOR GEOMETRY, WEIGHT, AND ANCHOR FORCES, SEE SHEETS 3 AND 4.
4. MINIMUM SCREW SPACING = 3/4"; MINIMUM EDGE DISTANCE FOR SCREWS = 3/8"



MIDMARK CORPORATION BASE CABINET
UNITS 027-1946-00 THROUGH 027-1946-53

ENG/CKR: ARF DATE: 04/24/15
JOB NO.: 15113.30 SCALE:

ZFA STRUCTURAL ENGINEERS
100 bush street suite 1850 | san francisco ca 94104 | 415.243.4091 | www.zfa.com

SHEET NO.:
3/4

Unit Name	Max Operating Weight (lbs)	WIDTH (in)	HEIGHT (in)	DEPTH (in)	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)	"F" (in)	"G" (in)	"H" (in)	"J" (in)	T max (lbs/screw)	V max (lbs/screw)
027 - 1946 - 00	124	12.0	30.3	17.8	5.9	16.2	8.7	9.1	4.4	0.3	4.9	3.6	3.4	50	17
027 - 1946 - 01	149	15.0	30.3	17.8	7.4	16.1	8.7	9.0	4.4	0.4	5.0	5.1	4.9	43	21
027 - 1946 - 02	173	18.0	30.3	17.8	8.9	16.1	8.6	9.1	4.4	0.3	4.9	6.6	6.4	40	24
027 - 1946 - 03	197	21.0	30.3	17.8	10.3	16.2	8.6	9.1	4.4	0.3	4.9	8.2	7.8	38	27
027 - 1946 - 04	220	24.0	30.3	17.8	11.8	16.2	8.6	9.1	4.4	0.3	4.9	9.7	9.3	39	31
027 - 1946 - 05	272	30.0	30.3	17.8	15.0	16.2	8.6	9.1	4.4	0.3	4.9	12.5	12.5	45	38
027 - 1946 - 06	320	36.0	30.3	17.8	18.0	16.2	8.6	9.1	4.5	0.3	4.9	15.5	15.5	52	44
027 - 1946 - 07	367	42.0	30.3	17.8	21.0	16.2	8.6	9.1	4.5	0.3	4.9	18.5	18.5	58	51
027 - 1946 - 08	415	48.0	30.3	17.8	24.0	16.2	8.5	9.1	4.5	0.3	4.9	21.5	21.5	64	58
027 - 1946 - 09	135	12.0	33.6	17.8	5.9	17.7	8.7	10.7	6.0	1.3	3.3	3.6	3.4	54	19
027 - 1946 - 10	162	15.0	33.6	17.8	7.4	17.7	8.6	10.6	6.0	1.2	3.4	5.1	4.9	46	22
027 - 1946 - 11	189	18.0	33.6	17.8	8.9	17.7	8.5	10.6	6.0	1.2	3.3	6.6	6.4	43	26
027 - 1946 - 12	214	21.0	33.6	17.8	10.4	17.8	8.5	10.7	6.0	1.3	3.3	8.1	7.9	41	30
027 - 1946 - 13	241	24.0	33.6	17.8	11.9	17.8	8.5	10.7	6.0	1.3	3.3	9.6	9.4	42	33
027 - 1946 - 14	296	30.0	33.6	17.8	15.0	17.8	8.6	10.7	6.0	1.3	3.3	12.5	12.5	50	41
027 - 1946 - 15	349	36.0	33.6	17.8	18.0	17.8	8.5	10.7	6.0	1.3	3.3	15.5	15.5	56	48
027 - 1946 - 16	401	42.0	33.6	17.8	21.0	17.8	8.5	10.7	6.0	1.3	3.3	18.5	18.5	63	56
027 - 1946 - 17	453	48.0	33.6	17.8	24.0	17.8	8.5	10.7	6.1	1.3	3.3	21.5	21.5	70	63
027 - 1946 - 18	148	12.0	36.1	17.8	5.9	19.0	8.5	12.0	7.3	2.2	7.0	3.6	3.4	57	21
027 - 1946 - 19	177	15.0	36.1	17.8	7.4	19.0	8.4	11.9	7.3	2.2	7.0	5.1	4.9	50	25
027 - 1946 - 20	207	18.0	36.1	17.8	8.9	19.0	8.3	11.9	7.3	2.2	7.0	6.6	6.4	46	29
027 - 1946 - 21	235	21.0	36.1	17.8	10.4	19.0	8.3	12.0	7.3	2.2	6.9	8.1	7.9	44	33
027 - 1946 - 22	264	24.0	36.1	17.8	11.9	19.0	8.3	12.0	7.3	2.2	6.9	9.6	9.4	46	37
027 - 1946 - 23	325	30.0	36.1	17.8	15.0	19.1	8.3	12.0	7.3	2.2	6.9	12.5	12.5	54	45
027 - 1946 - 24	382	36.0	36.1	17.8	18.0	19.1	8.3	12.0	7.3	2.2	6.9	15.5	15.5	61	53
027 - 1946 - 25	440	42.0	36.1	17.8	21.0	19.1	8.2	12.0	7.3	2.2	6.9	18.5	18.5	69	61
027 - 1946 - 26	497	48.0	36.1	17.8	24.0	19.1	8.2	12.0	7.3	2.2	6.9	21.5	21.5	77	69
027 - 1946 - 27	162	12.0	30.3	23.8	5.9	16.3	11.8	9.3	4.6	0.1	4.7	3.6	3.4	84	22
027 - 1946 - 28	194	15.0	30.3	23.8	7.4	16.3	11.7	9.2	4.6	0.2	4.8	5.1	4.9	72	27
027 - 1946 - 29	225	18.0	30.3	23.8	8.9	16.3	11.6	9.3	4.6	0.1	4.7	6.6	6.4	66	31
027 - 1946 - 30	256	21.0	30.3	23.8	10.4	16.4	11.6	9.3	4.6	0.1	4.7	8.1	7.9	63	35



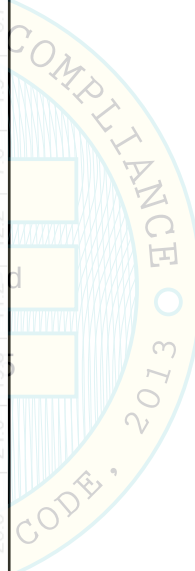
MIDMARK CORPORATION BASE CABINET
UNITS 027-1946-00 THROUGH 027-1946-53

ENG/CKR: ARF DATE: 04/24/15
JOB NO.: 15113.30 SCALE:

ZFA STRUCTURAL ENGINEERS
100 bush street suite 1850 | san francisco ca 94104 | 415.243.4091 | www.zfa.com

SHEET NO.:
4/4

Unit Name	Max Operating Weight (lbs)	WIDTH (in)	HEIGHT (in)	DEPTH (in)	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)	"F" (in)	"G" (in)	"H" (in)	"J" (in)	T max (lbs/screw)	V max (lbs/screw)
027 - 1946 - 31	288	24.0	30.3	23.8	11.9	16.4	11.6	9.3	4.6	0.1	4.7	9.6	9.4	61	40
027 - 1946 - 32	354	30.0	30.3	23.8	15.0	16.4	11.7	9.3	4.7	0.1	4.7	12.5	12.5	63	49
027 - 1946 - 33	417	36.0	30.3	23.8	18.0	16.4	11.6	9.3	4.7	0.1	4.7	15.5	15.5	71	58
027 - 1946 - 34	479	42.0	30.3	23.8	21.0	16.4	11.6	9.3	4.7	0.1	4.7	18.5	18.5	79	66
027 - 1946 - 35	542	48.0	30.3	23.8	24.0	16.4	11.6	9.3	4.7	0.1	4.6	21.5	21.5	87	75
027 - 1946 - 36	176	12.0	33.6	23.8	5.9	17.9	11.7	10.9	6.2	1.5	3.1	3.6	3.4	91	24
027 - 1946 - 37	211	15.0	33.6	23.8	7.4	17.9	11.6	10.8	6.2	1.4	3.2	5.1	4.9	78	29
027 - 1946 - 38	246	18.0	33.6	23.8	8.9	17.9	11.6	10.8	6.2	1.4	3.1	6.6	6.4	72	34
027 - 1946 - 39	280	21.0	33.6	23.8	10.4	18.0	11.5	10.9	6.2	1.5	3.1	8.1	7.9	68	39
027 - 1946 - 40	314	24.0	33.6	23.8	11.9	18.0	11.5	10.9	6.2	1.5	3.1	9.6	9.4	66	44
027 - 1946 - 41	386	30.0	33.6	23.8	15.0	18.0	11.6	10.9	6.3	1.5	3.1	12.5	12.5	68	54
027 - 1946 - 42	455	36.0	33.6	23.8	18.0	18.0	11.5	10.9	6.3	1.5	3.1	15.5	15.5	77	63
027 - 1946 - 43	523	42.0	33.6	23.8	21.0	18.0	11.5	10.9	6.3	1.5	3.1	18.5	18.5	86	73
027 - 1946 - 44	592	48.0	33.6	23.8	24.0	18.0	11.5	10.9	6.3	1.5	3.1	21.5	21.5	95	82
027 - 1946 - 45	195	12.0	36.1	23.8	5.9	19.2	11.4	12.1	7.5	2.0	6.8	3.6	3.4	99	27
027 - 1946 - 46	234	15.0	36.1	23.8	7.4	19.2	11.4	12.1	7.5	2.0	6.8	5.1	4.9	85	32
027 - 1946 - 47	272	18.0	36.1	23.8	8.9	19.2	11.3	12.1	7.5	2.0	6.8	6.6	6.4	78	38
027 - 1946 - 48	310	21.0	36.1	23.8	10.4	19.3	11.3	12.2	7.5	2.0	6.7	8.1	7.9	74	43
027 - 1946 - 49	348	24.0	36.1	23.8	11.9	19.3	11.2	12.2	7.5	2.0	6.7	9.6	9.4	72	48
027 - 1946 - 50	428	30.0	36.1	23.8	15.0	19.3	11.3	12.2	7.6	2.0	6.7	12.5	12.5	75	59
027 - 1946 - 51	504	36.0	36.1	23.8	18.0	19.3	11.3	12.2	7.6	1.9	6.7	15.5	15.5	85	70
027 - 1946 - 52	581	42.0	36.1	23.8	21.0	19.3	11.2	12.2	7.6	1.9	6.7	18.5	18.5	95	80
027 - 1946 - 53	657	48.0	36.1	23.8	24.0	19.3	11.2	12.2	7.6	1.9	6.7	21.5	21.5	105	91





OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION

APPLICATION FOR OSHPD PREAPPROVAL
OF MANUFACTURER'S CERTIFICATION (OPM)

OFFICE USE ONLY

APPLICATION #: OPM-0202-13

OSHPD Preapproval of Manufacturer's Certification (OPM)

Type: ☒ New ☐ Renewal ☐ Update to Pre-CBC 2013 OPA Number: _____

Manufacturer Information

Manufacturer: MIDMARK CORPORATION

Manufacturer's Technical Representative: Joe Martin

Mailing Address: 60 Vista Drive, Versailles, OH 45380

Telephone: 1-800-MIDMARK, ext. 8446

Email: JMartin@midmark.com

Product Information

Product Name: Midmark Corporation ADA Sink

Product Type: Sink

Product Model Number: 027-1948-00; 027-1948-01; 027-1948-02; 027-1948-03; 027-1948-04; 027-1948-05

General Description: Wall hung sink

Applicant Information

Applicant Company Name: ZFA Structural Engineers

Contact Person: Mark Moore

Mailing Address: 100 Bush Street, Suite 1850, San Francisco, CA, 94104

Telephone: 415-243-4091

Email: markm@zfa.com

I hereby agree to reimburse the Office of Statewide Health Planning and Development review fees in accordance with the California Administrative Code, 2013.

Signature of Applicant: 

Date: 3/26/2015

Title: Executive Principal

Company Name: ZFA Structural Engineers

"Access to Safe, Quality Healthcare Environments that Meet California's Diverse and Dynamic Needs"

STATE OF CALIFORNIA – HEALTH AND HUMAN SERVICES AGENCY
OSH-FD-700 (REV 10/22/14)

OSHPD

Page 1 of 2



**OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION**

Registered Design Professional Preparing Engineering Recommendations

Company Name: ZFA Structural Engineers

Name: Mark Moore California License Number: 4443

Mailing Address: 100 Bush Street, Suite 1850, San Francisco, 94104

Telephone: 415-243-4091 Email: markm@zfa.com

OSHPD Special Seismic Certification Preapproval (OSP)

- ☐ Special Seismic Certification is preapproved under OSP-
(Separate application for OSP is required)
- ☒ Special Seismic Certification is not preapproved

Certification Method(s)

- ☐ Testing in accordance with: ☐ ICC-ES AC156 ☐ FM 1950-10
- ☐ Other* (Please Specify): _____

*Use of criteria other than those adopted by the California Building Standards Code, 2013 (CBSC 2013) for component supports and attachments are not permitted. For distribution system, interior partition wall, and suspended ceiling seismic bracings, test criteria other than those adopted in the CBSC 2013 may be used when approved by OSHPD prior to testing.

- ☒ Analysis
- ☐ Experience Data
- ☐ Combination of Testing, Analysis, and/or Experience Data (Please Specify): _____

List of Attachments Supporting the Manufacturer's Certification

- ☐ Test Report ☒ Drawings ☒ Calculations ☐ Manufacturer's Catalog
- ☐ Other(s) (Please Specify): _____

OFFICE USE ONLY – OSHPD APPROVAL VALID FOR CBC 2013 ONLY

Signature:  Date: 06/09/2015

Print Name: Timothy Piland

Title: SSE

Condition of Approval (if applicable): _____

"Access to Safe, Quality Healthcare Environments that Meet California's Diverse and Dynamic Needs"

STATE OF CALIFORNIA – HEALTH AND HUMAN SERVICES AGENCY
OSH-FD-700 (REV 10/22/14)



OSHPD

Page 2 of 2

MIDMARK CORPORATION ADA SINK UNITS
027-1948-00 THROUGH 027-1948-05

ENG/CKR:	ARF	DATE:	05/22/15
JOB NO.:	15113.40	SCALE:	

ZFA STRUCTURAL ENGINEERS

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SHEET NO.:
1/3

OPM-0202-13: EQUIPMENT MANUFACTURER: MIDMARK CORPORATION
EQUIPMENT TYPE: ADA SINK

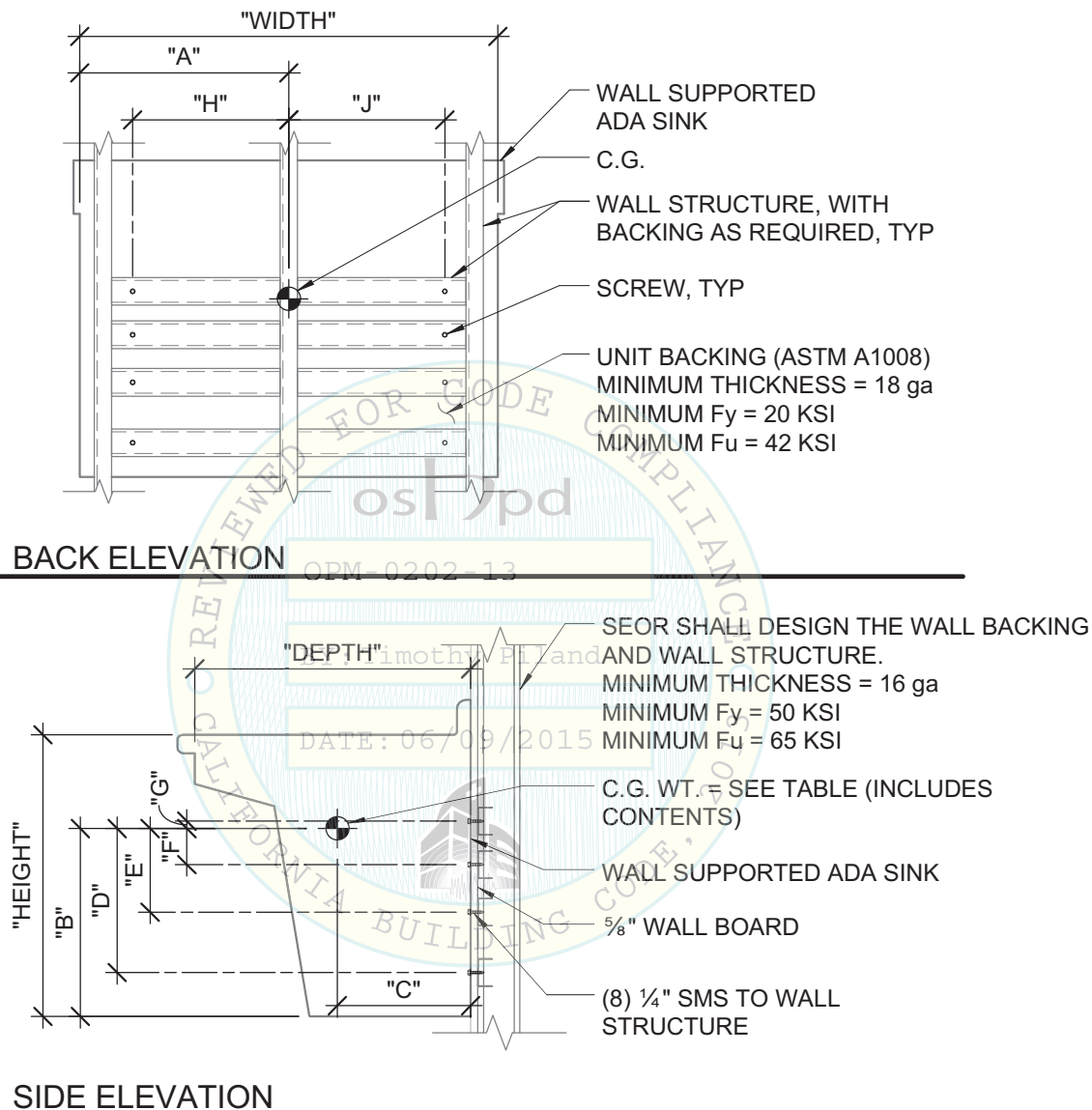
GENERAL NOTES

1. THIS OSHPD PREAPPROVAL OF MANUFACTURER'S CERTIFICATION (OPM) IS BASED ON THE CBC 2013. THE DEMAND (DESIGN FORCES) FOR USE WITH THIS OPM SHALL BE BASED ON THE CBC 2013.
2. FORCES PER ASCE 7-10 SECTION 13.3.1, EQUATIONS 13.3-1, 13.3-2, 13.3-3, WHERE $S_{DS} = 2.20$, $a_p = 1.0$, $I_p = 1.5$ & $R_p = 2.5$, $z/h \leq 1.0$. A FACTOR OF 0.7 IS APPLIED TO CALCULATE ASD LOADS.
HORIZONTAL FORCE (E_h) = $1.109 W_p$
VERTICAL FORCE (E_v) = $0.308 W_p$
3. THE DETAILS IN THIS PRE-APPROVAL MAY BE USED AT ANY LOCATION WITH AN S_{DS} OF 2.20g OR LESS.
4. ALL SEISMIC AND ANCHOR FORCES SHOWN ON THE DRAWINGS ARE BASED ON ALLOWABLE STRESS DESIGN.
5. SHEET METAL SCREWS (SMS) SHALL CONFORM TO ICC-ES ESR-1976 OR ICC-ES ESR-2196.
6. SEE SHEET 2 FOR LIGHT GAGE STEEL MINIMUM SPECIFICATIONS.

RESPONSIBILITIES OF THE STRUCTURAL ENGINEER OF RECORD (SEOR)

7. DESIGN BACKING PLATES, STUDS, ETC. WHICH THE UNITS ARE ATTACHED TO AS NOTED ON THE DRAWINGS. THE SEOR SHALL ALSO VERIFY THE ADEQUACY OF THE STRUCTURES (SUCH AS WALLS AND FLOORS) WHICH SUPPORT THE UNITS FOR ALL LOADS.
8. PROVIDE ANY SUPPORTING STRUCTURE REQUIRED TO SUPPORT WEIGHTS AND FORCES SHOWN, IN ADDITION TO ALL OTHER LOADS.
9. VERIFY THAT THE INSTALLATION IS IN CONFORMANCE WITH THE 2013 CBC AND WITH THE DETAILS SHOWN IN THIS DOCUMENT. VERIFY THAT THE ACTUAL EQUIPMENT'S WEIGHT, CG LOCATION, ANCHOR LOCATIONS, ANCHOR DETAILS AND THE MATERIAL AND GAGE OF THE UNIT WHERE ATTACHMENTS ARE MADE AGREE WITH THE INFORMATION SHOWN ON THE PRE-APPROVAL DOCUMENTS.
10. VERIFY THAT THE COMBINATION OF S_{DS} & z/h RESULT IN SEISMIC FORCES (E_h , E_v) THAT ARE NOT GREATER THAN THE VALUES IN THE GENERAL NOTES.
11. VERIFY THAT THE ATTACHMENTS ARE LOCATED AT AN ADEQUATE DISTANCE FROM ANY END OR EDGE OF METAL STUD.





NOTES

1. CENTER OF GRAVITY (C.G.) WEIGHT IS A MAXIMUM. THIS PRE-APPROVAL ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
2. FOR GENERAL NOTES, SEE SHEET 1.
3. FOR GEOMETRY, WEIGHT, AND ANCHOR FORCES, SEE SHEET 3.
4. MINIMUM SCREW SPACING = $\frac{3}{4}$ "; MINIMUM EDGE DISTANCE FOR SCREWS = $\frac{3}{8}$ "
5. ATTACHMENT FORCES INCLUDE 250 LBS LIVE LOAD APPLIED AT EDGE OF SINK.



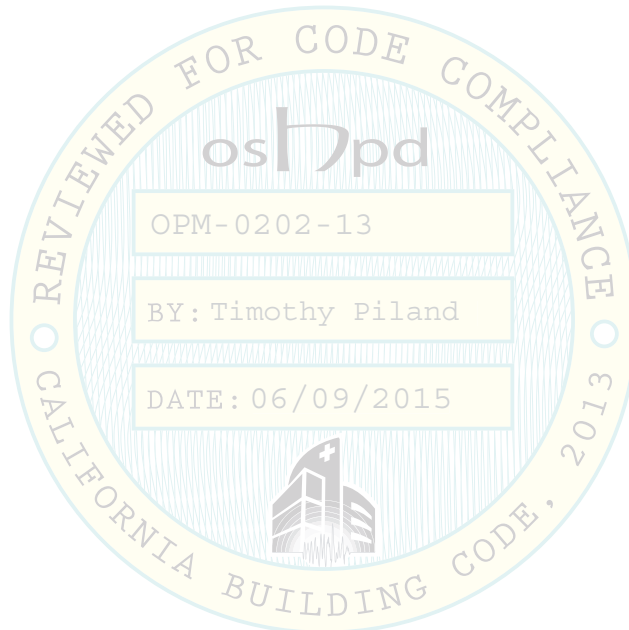
MIDMARK CORPORATION ADA SINK UNITS
027-1948-00 THROUGH 027-1948-05

ENG/CKR: ARF DATE: 05/22/15
JOB NO.: 15113.40 SCALE:

ZFA STRUCTURAL ENGINEERS
100 bush street suite 1850 | san francisco ca 94104 | 415.243.4091 | www.zfa.com

SHEET NO.:
3/3

Part No.	Max Operating Weight (lbs)	Width (in)	Height (in)	Depth (in)	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)	"F" (in)	"G" (in)	"H" (in)	"J" (in)	T max (lbs/screw)	V max (lbs/screw)
027-1948-00	58	24	24.3	17.8	12.0	17.4	8.6	13.1	8.0	3.9	0.15	11.2	11.2	135	36
027-1948-01	66	30	24.3	17.8	15.0	17.1	8.4	12.9	7.8	3.7	0.10	14.2	14.2	141	38
027-1948-02	75	36	24.3	17.8	18.0	17.0	8.3	12.7	7.6	3.5	0.27	17.2	17.2	145	41
027-1948-03	68	24	24.3	23.8	12.0	16.9	11.7	12.7	7.5	3.4	0.34	11.2	11.2	184	39
027-1948-04	77	30	24.3	23.8	15.0	16.7	11.6	12.5	7.4	3.2	0.51	14.2	14.2	190	41
027-1948-05	87	36	24.3	23.8	18.0	16.6	11.5	12.4	7.2	3.1	0.64	17.2	17.2	196	43





OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION

APPLICATION FOR OSHPD PREAPPROVAL
OF MANUFACTURER'S CERTIFICATION (OPM)

OFFICE USE ONLY

APPLICATION #: OPM-0220-13

OSHPD Preapproval of Manufacturer's Certification (OPM)

Type: ☒ New ☐ Renewal ☐ Update to Pre-CBC 2013 OPA Number: _____

Manufacturer Information

Manufacturer: MIDMARK CORPORATION

Manufacturer's Technical Representative: Joe Martin

Mailing Address: 60 Vista Drive, Versailles, OH 45380

Telephone: 1-800-MIDMARK, ext. 8446 Email: JMartin@midmark.com

Product Information

Product Name: Midmark Corporation Tall Cabinet

Product Type: Cabinet OPM-0220-13

Product Model Number: 027-1947-00 through 027-1947-35;

General Description: Floor supported cabinet

Applicant Information

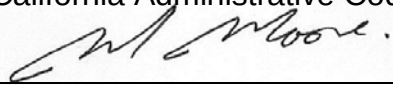
Applicant Company Name: ZFA Structural Engineers

Contact Person: Mark Moore

Mailing Address: 100 Bush Street, Suite 1850, San Francisco, CA, 94104

Telephone: 415-243-4091 Email: markm@zfa.com

I hereby agree to reimburse the Office of Statewide Health Planning and Development review fees in accordance with the California Administrative Code, 2013.

Signature of Applicant:  Date: 4/06/2015

Title: Executive Principal Company Name: ZFA Structural Engineers

"Access to Safe, Quality Healthcare Environments that Meet California's Diverse and Dynamic Needs"

STATE OF CALIFORNIA – HEALTH AND HUMAN SERVICES AGENCY
OSH-FD-700 (REV 10/22/14)

OSHPD

Page 1 of 2



**OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION**

Registered Design Professional Preparing Engineering Recommendations

Company Name: ZFA Structural Engineers

Name: Mark Moore California License Number: 4443

Mailing Address: 100 Bush Street, Suite 1850, San Francisco, 94104

Telephone: 415-243-4091 Email: markm@zfa.com

OSHPD Special Seismic Certification Preapproval (OSP)

- ☐ Special Seismic Certification is preapproved under OSP-
(Separate application for OSP is required)
- ☒ Special Seismic Certification is not preapproved

Certification Method(s)

- ☐ Testing in accordance with: ☐ ICC-ES AC156 ☐ FM 1950-10
- ☐ Other* (Please Specify): _____

*Use of criteria other than those adopted by the California Building Standards Code, 2013 (CBSC 2013) for component supports and attachments are not permitted. For distribution system, interior partition wall, and suspended ceiling seismic bracings, test criteria other than those adopted in the CBSC 2013 may be used when approved by OSHPD prior to testing.

- ☒ Analysis
- ☐ Experience Data
- ☐ Combination of Testing, Analysis, and/or Experience Data (Please Specify): _____

List of Attachments Supporting the Manufacturer's Certification

- ☐ Test Report ☒ Drawings ☒ Calculations ☐ Manufacturer's Catalog
- ☐ Other(s) (Please Specify): _____

OFFICE USE ONLY – OSHPD APPROVAL VALID FOR CBC 2013 ONLY

Signature:  Date: 05/21/2015

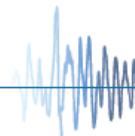
Print Name: Timothy Piland

Title: SSE

Condition of Approval (if applicable): _____

"Access to Safe, Quality Healthcare Environments that Meet California's Diverse and Dynamic Needs"

STATE OF CALIFORNIA – HEALTH AND HUMAN SERVICES AGENCY
OSH-FD-700 (REV 10/22/14)



OSHPD

Page 2 of 2

MIDMARK CORPORATION TALL CABINET
UNITS 027-1947-00 THROUGH 027-1947-35

ENG/CKR:	ARF	DATE:	05/19/15
JOB NO.:	15113.50	SCALE:	

ZFA STRUCTURAL ENGINEERS

100 bush street suite 1850 | san francisco ca 94104 | 415.243.4091 | www.zfa.com

SHEET NO.:

1/5

OPM-0220-13: EQUIPMENT MANUFACTURER: MIDMARK CORPORATION
EQUIPMENT TYPE: TALL CABINETS

GENERAL NOTES

1. THIS OSHPD PREAPPROVAL OF MANUFACTURER'S CERTIFICATION (OPM) IS BASED ON THE CBC 2013. THE DEMAND (DESIGN FORCES) FOR USE WITH THIS OPM SHALL BE BASED ON THE CBC 2013.
2. FORCES PER ASCE 7-10 SECTION 13.3.1, EQUATIONS 13.3-1, 13.3-2, 13.3-3, WHERE $S_{DS} = 2.20$, $a_p = 1.0$, $I_p = 1.5$ & $R_p = 2.5$, $z/h \leq 1.0$. A FACTOR OF 0.7 IS APPLIED TO CALCULATE ASD LOADS.
HORIZONTAL FORCE (E_h) = 1.109 W_p
VERTICAL FORCE (E_v) = 0.308 W_p
3. THE DETAILS IN THIS PRE-APPROVAL MAY BE USED AT ANY LOCATION WITH AN S_{DS} OF 2.20g OR LESS.
4. ALL SEISMIC AND ANCHOR FORCES SHOWN ON THE DRAWINGS ARE BASED ON ALLOWABLE STRESS DESIGN.
5. SHEET METAL SCREWS (SMS) SHALL CONFORM TO ICC-ES ESR-1976 OR ICC-ES ESR-2196.
6. SEE SHEET 2 FOR LIGHT GAGE STEEL MINIMUM SPECIFICATIONS.

RESPONSIBILITIES OF THE STRUCTURAL ENGINEER OF RECORD (SEOR)

7. DESIGN BACKING PLATES, STUDS, ETC. WHICH THE UNITS ARE ATTACHED TO AS NOTED ON THE DRAWINGS. THE SEOR SHALL ALSO VERIFY THE ADEQUACY OF THE STRUCTURES (SUCH AS WALLS AND FLOORS) WHICH SUPPORT THE UNITS FOR ALL LOADS.
8. PROVIDE ANY SUPPORTING STRUCTURE REQUIRED TO SUPPORT WEIGHTS AND FORCES SHOWN, IN ADDITION TO ALL OTHER LOADS.
9. VERIFY THAT THE INSTALLATION IS IN CONFORMANCE WITH THE 2013 CBC AND WITH THE DETAILS SHOWN IN THIS DOCUMENT. VERIFY THAT THE ACTUAL EQUIPMENT'S WEIGHT, CG LOCATION, ANCHOR LOCATIONS, ANCHOR DETAILS AND THE MATERIAL AND GAGE OF THE UNIT WHERE ATTACHMENTS ARE MADE AGREE WITH THE INFORMATION SHOWN ON THE PRE-APPROVAL DOCUMENTS.
10. VERIFY THAT THE COMBINATION OF S_{DS} & z/h RESULT IN SEISMIC FORCES (E_h , E_v) THAT ARE NOT GREATER THAN THE VALUES IN THE GENERAL NOTES.
11. VERIFY THAT THE ATTACHMENTS ARE LOCATED AT AN ADEQUATE DISTANCE FROM ANY END OR EDGE OF METAL STUD.

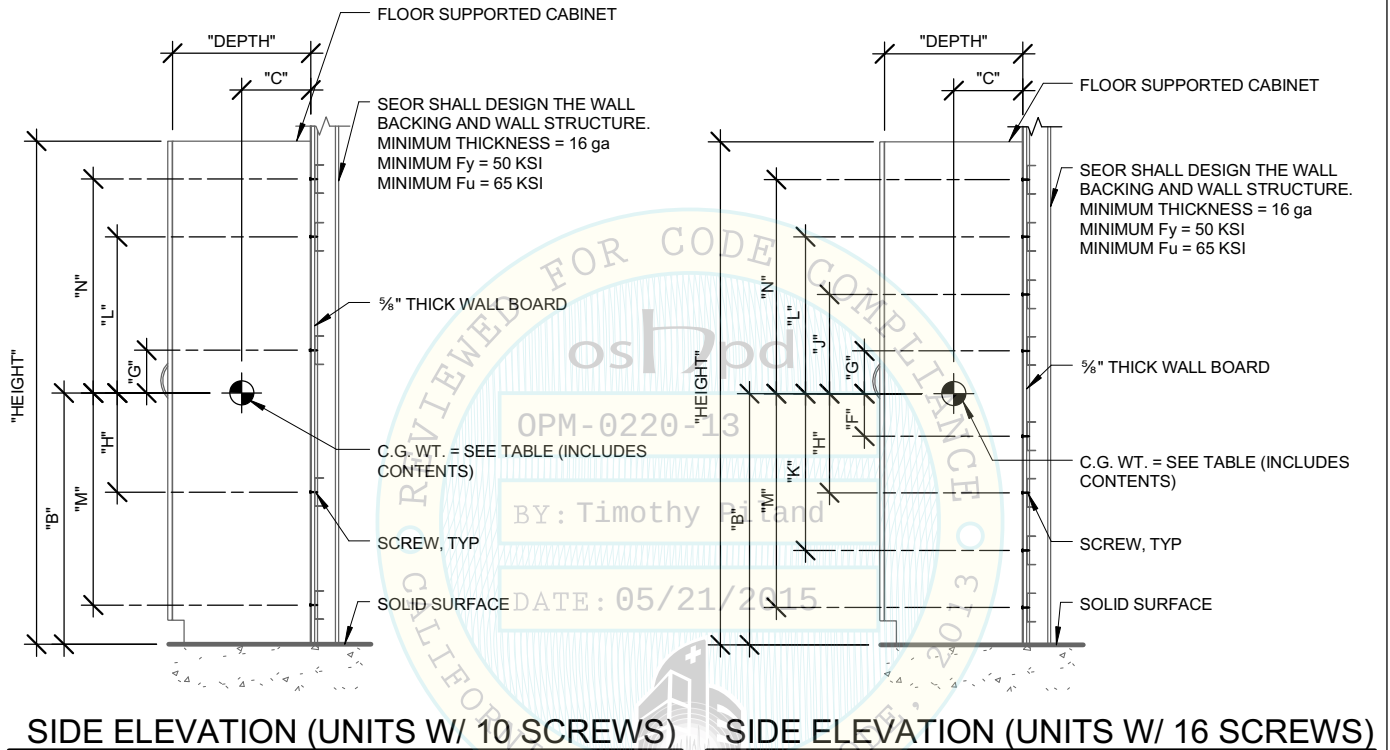


MIDMARK CORPORATION TALL CABINET
UNITS 027-1947-00 THROUGH 027-1947-35

ENG/CKR: ARF
JOB NO.: 15113.50
DATE: 05/19/15
SCALE: 3/8" = 1'-0"

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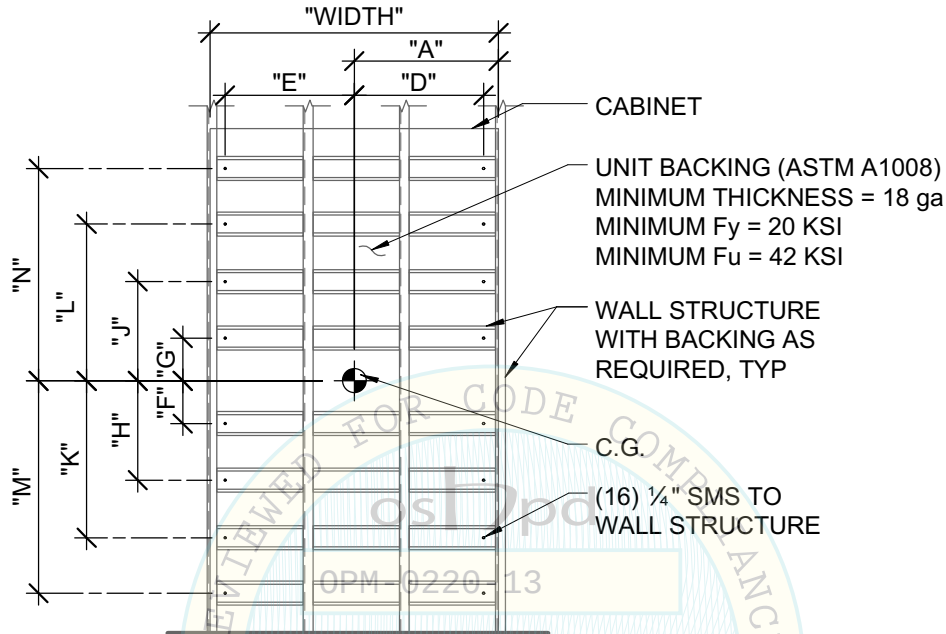
SHEET NO.:
2/5



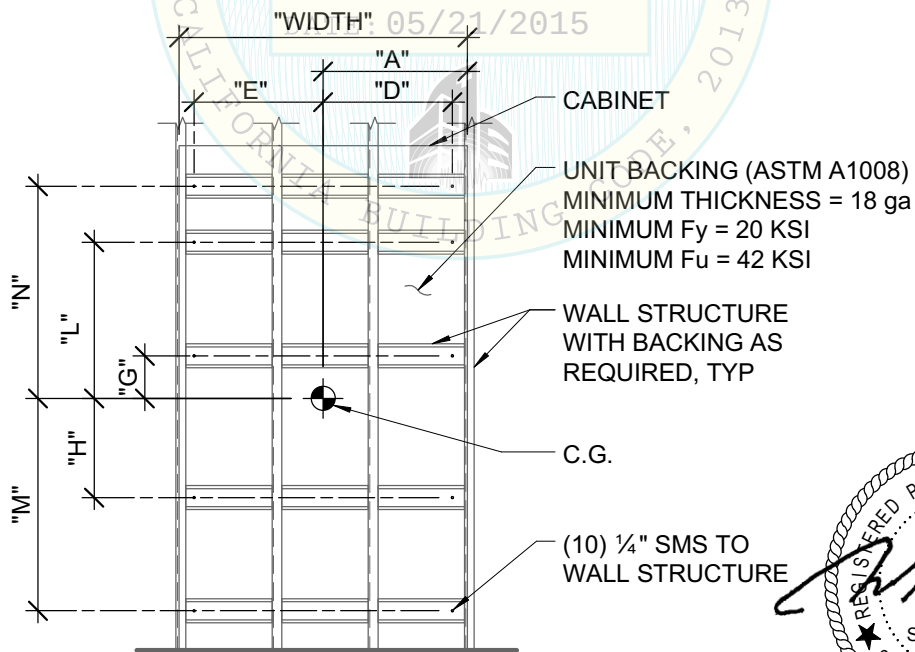
NOTES

1. CENTER OF GRAVITY (C.G.) WEIGHT IS A MAXIMUM. THIS PRE-APPROVAL ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
2. FOR GENERAL NOTES, SEE SHEET 1.
3. FOR GEOMETRY, WEIGHT, AND ANCHOR FORCES, SEE SHEETS 4 AND 5.
4. MINIMUM SCREW SPACING = 3/4"; MINIMUM EDGE DISTANCE FOR SCREWS = 3/8"





BACK ELEVATION (UNITS W/ 16 SCREWS)



BACK ELEVATION (UNITS W/ 10 SCREWS)



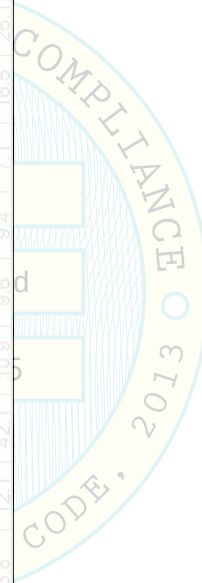
MIDMARK CORPORATION TALL CABINET
UNITS 027-1947-00 THROUGH 027-1947-35

ENG/CKR: ARF
JOB NO.: 15113.50
DATE: 05/19/15
SCALE:

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SHEET NO.:
4/5

Unit Name	Max Operating Weight (lbs)	WIDTH (in)	HEIGHT (in)	DEPTH (in)	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)	"G" (in)	"H" (in)	"L" (in)	"M" (in)	"N" (in)	T max (lbs/screw)	V max (lbs/screw)
027-1947-00	297	12.0	72.0	17.8	6.1	36.1	8.2	3.6	3.4	8.4	10.4	27.4	29.3	32.1	87	33
027-1947-01	359	15.0	72.0	17.8	7.6	36.0	8.1	5.1	4.9	8.4	10.4	27.4	29.3	32.1	77	40
027-1947-02	422	18.0	72.0	17.8	9.1	36.0	8.1	6.6	6.4	8.4	10.4	27.4	29.3	32.1	72	47
027-1947-03	483	21.0	72.0	17.8	10.7	36.0	8.0	8.1	7.9	8.4	10.4	27.4	29.3	32.1	70	54
027-1947-04	544	24.0	72.0	17.8	12.2	36.0	8.0	9.7	9.3	8.4	10.4	27.4	29.3	32.1	76	60
027-1947-05	674	30.0	72.0	17.8	15.0	36.0	8.1	12.5	12.5	8.4	10.4	27.4	29.3	32.1	89	75
027-1947-06	796	36.0	72.0	17.8	18.0	36.0	8.0	15.5	15.5	8.4	10.4	27.4	29.3	32.1	102	88
027-1947-07	918	42.0	72.0	17.8	21.0	36.0	8.0	18.5	18.5	8.4	10.4	27.4	29.3	32.1	115	102
027-1947-09	396	12.0	72.0	23.8	6.1	36.3	11.2	3.6	3.4	8.4	10.4	27.4	29.3	32.1	153	44
027-1947-10	479	15.0	72.0	23.8	7.6	36.2	11.0	5.1	4.9	8.4	10.4	27.4	29.3	32.1	133	53
027-1947-11	562	18.0	72.0	23.8	9.1	36.1	11.0	6.6	6.4	8.4	10.4	27.4	29.3	32.1	124	62
027-1947-12	644	21.0	72.0	23.8	10.6	36.1	10.9	8.1	7.9	8.4	10.4	27.4	29.3	32.1	119	71
027-1947-13	726	24.0	72.0	23.8	12.1	36.1	10.9	9.6	9.4	8.4	10.4	27.4	29.3	32.1	116	80
027-1947-14	898	30.0	72.0	23.8	15.0	36.2	11.0	12.5	12.5	8.4	10.4	27.4	29.3	32.1	126	100
027-1947-16	343	12.0	84.0	17.8	6.1	41.9	8.1	3.6	3.4	7.1	16.5	26.1	35.3	35.6	100	38
027-1947-19	416	15.0	84.0	17.8	7.6	41.9	8.1	5.1	4.9	7.1	16.5	26.1	35.3	35.6	88	46
027-1947-20	488	18.0	84.0	17.8	9.1	41.8	8.0	6.6	6.4	7.1	16.5	26.1	35.3	35.6	83	54
027-1947-21	559	21.0	84.0	17.8	10.6	41.8	8.0	8.1	7.9	7.1	16.5	26.1	35.3	35.6	81	62
027-1947-22	630	24.0	84.0	17.8	12.1	41.8	8.0	9.6	9.4	7.1	16.5	26.1	35.3	35.6	87	70
027-1947-23	779	30.0	84.0	17.8	15.0	41.9	8.0	12.5	12.5	7.1	16.5	26.1	35.3	35.6	103	86
027-1947-24	921	36.0	84.0	17.8	18.0	41.9	7.9	15.5	15.5	7.1	16.5	26.1	35.3	35.6	118	102
027-1947-27	459	12.0	84.0	23.8	6.1	42.2	11.1	3.6	3.4	7.1	16.5	26.1	35.3	35.6	177	51
027-1947-28	556	15.0	84.0	23.8	7.6	42.1	11.0	5.1	4.9	7.1	16.5	26.1	35.3	35.6	154	62
027-1947-29	653	18.0	84.0	23.8	9.1	42.0	11.0	6.6	6.4	7.1	16.5	26.1	35.3	35.6	144	72
027-1947-30	748	21.0	84.0	23.8	10.6	42.1	10.9	8.1	7.9	7.1	16.5	26.1	35.3	35.6	138	83
027-1947-31	844	24.0	84.0	23.8	12.1	42.1	10.9	9.6	9.4	7.1	16.5	26.1	35.3	35.6	135	94



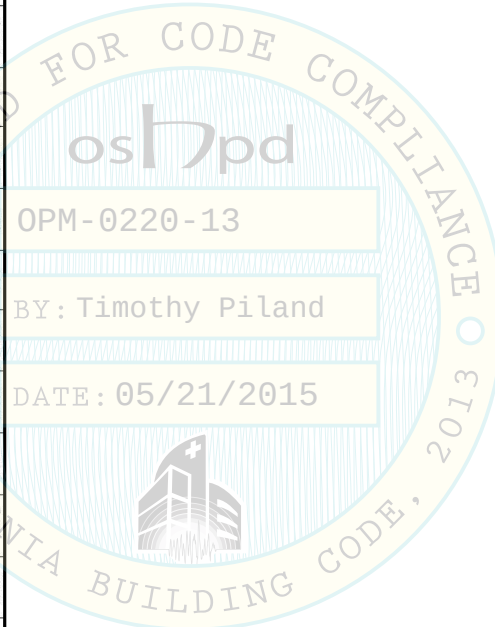
MIDMARK CORPORATION TALL CABINET
UNITS 027-1947-00 THROUGH 027-1947-35

ENG/CKR: ARF
JOB NO.: 15113.50
DATE: 05/19/15
SCALE:

ZFA STRUCTURAL ENGINEERS
100 bush street suite 1850 | san francisco ca 94104 | 415.243.4091 | www.zfa.com

SHEET NO.:
5/5

Unit Name	Max Operating Weight (lbs)	WIDTH (in)	HEIGHT (in)	DEPTH (in)	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)	"F" (in)	"G" (in)	"H" (in)	"J" (in)	"K" (in)	"L" (in)	"M" (in)	"N" (in)	T max (lbs/screw)	V max (lbs/screw)
027-1947-08	1040	48.0	72.0	17.8	24.0	36.0	7.9	21.5	21.5	1.0	8.4	10.4	17.9	20.0	27.4	29.3	32.1	80	72
027-1947-15	1062	36.0	72.0	23.8	18.0	36.2	10.9	15.5	15.5	1.1	8.4	10.4	17.7	20.1	27.4	29.3	32.1	89	74
027-1947-16	1223	42.0	72.0	23.8	21.0	36.3	10.9	18.5	18.5	1.2	8.4	10.4	17.6	20.2	27.4	29.3	32.1	100	85
027-1947-17	1386	48.0	72.0	23.8	24.0	36.3	10.8	21.5	21.5	1.2	8.4	10.4	17.6	20.2	27.4	29.3	32.1	111	96
027-1947-25	1062	42.0	84.0	17.8	21.0	41.9	7.9	18.5	18.5	6.9	7.1	16.5	16.7	25.9	26.1	35.3	35.6	83	74
027-1947-26	1204	48.0	84.0	17.8	24.0	41.9	7.9	21.5	21.5	6.9	7.1	16.5	16.7	25.9	26.1	35.3	35.6	93	83
027-1947-32	1043	30.0	84.0	23.8	15.0	42.1	10.9	12.5	12.5	7.1	7.1	16.5	16.5	26.1	26.1	35.3	35.6	91	72
027-1947-33	1234	36.0	84.0	23.8	18.0	42.1	10.9	15.5	15.5	7.1	7.1	16.5	16.5	26.1	26.1	35.3	35.6	103	86
027-1947-34	1425	42.0	84.0	23.8	21.0	42.1	10.8	18.5	18.5	7.1	7.1	16.5	16.5	26.1	26.1	35.3	35.6	116	99
027-1947-35	1617	48.0	84.0	23.8	24.0	42.1	10.8	21.5	21.5	7.1	7.1	16.5	16.5	26.1	26.1	35.3	35.6	129	112





OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION

APPLICATION FOR OSHPD PREAPPROVAL
OF MANUFACTURER'S CERTIFICATION (OPM)

OFFICE USE ONLY

APPLICATION #: OPM-0224-13

OSHPD Preapproval of Manufacturer's Certification (OPM)

Type: ☒ New ☐ Renewal ☐ Update to Pre-CBC 2013 OPA Number: _____

Manufacturer Information

Manufacturer: MIDMARK CORPORATION

Manufacturer's Technical Representative: Joe Martin

Mailing Address: 60 Vista Drive, Versailles, OH 45380

Telephone: 1-800-MIDMARK, ext. 8446 Email: JMartin@midmark.com

Product Information

Product Name: Midmark Corporation Overhead Cabinet

Product Type: Cabinet OPM-0224-13

Product Model Number: 027-1941-00; 027-1941-01; 027-1941-02; 027-1941-03; 027-1941-04; 027-1941-05; 027-1941-06; 027-1941-07; 027-1941-08; 027-1941-09; 027-1941-10; 027-1941-11; 027-1941-12; 027-1941-13; 027-1941-14; 027-1941-15; 027-1941-16; 027-1941-17; 027-1941-18; 027-1941-19; 027-1941-20; 027-1941-21; 027-1941-22; 027-1941-23; 027-1941-24; 027-1941-25; 027-1941-26; 027-1941-27; 027-1941-28; 027-1941-29; 027-1941-30; 027-1941-31; 027-1941-32; 027-1941-33; 027-1941-34; 027-1941-35; 027-1941-36; 027-1941-37; 027-1941-38; 027-1941-39

General Description: Wall supported cabinet

Applicant Information

Applicant Company Name: ZFA Structural Engineers

Contact Person: Mark Moore

Mailing Address: 100 Bush Street, Suite 1850, San Francisco, CA, 94104

Telephone: 415-243-4091 Email: markm@zfa.com

I hereby agree to reimburse the Office of Statewide Health Planning and Development review fees in accordance with the California Administrative Code, 2013.

Signature of Applicant:  Date: 4/06/2015

Title: Executive Principal Company Name: ZFA Structural Engineers

"Access to Safe, Quality Healthcare Environments that Meet California's Diverse and Dynamic Needs"





OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION

Registered Design Professional Preparing Engineering Recommendations

Company Name: ZFA Structural Engineers
Name: Mark Moore California License Number: 4443
Mailing Address: 100 Bush Street, Suite 1850, San Francisco, 94104
Telephone: 415-243-4091 Email: markm@zfa.com

OSHPD Special Seismic Certification Preapproval (OSP)

- ☐ Special Seismic Certification is preapproved under OSP-
(Separate application for OSP is required)
☒ Special Seismic Certification is not preapproved

Certification Method(s)

- ☐ Testing in accordance with: ☐ ICC-ES AC156 ☐ FM 1950-10
☐ Other* (Please Specify): _____

*Use of criteria other than those adopted by the California Building Standards Code, 2013 (CBSC 2013) for component supports and attachments are not permitted. For distribution system, interior partition wall, and suspended ceiling seismic bracings, test criteria other than those adopted in the CBSC 2013 may be used when approved by OSHPD prior to testing.

- ☒ Analysis
☐ Experience Data
☐ Combination of Testing, Analysis, and/or Experience Data (Please Specify): _____

List of Attachments Supporting the Manufacturer's Certification

- ☐ Test Report ☒ Drawings ☒ Calculations ☐ Manufacturer's Catalog
☐ Other(s) (Please Specify): _____

OFFICE USE ONLY - OSHPD APPROVAL VALID FOR CBC 2013 ONLY

Signature:  Date: 06/17/2015
Print Name: Timothy Piland
Title: SSE
Condition of Approval (if applicable): _____

"Access to Safe, Quality Healthcare Environments that Meet California's Diverse and Dynamic Needs"



MIDMARK CORPORATION OVERHEAD CABINET
UNITS 027-1941-00 THROUGH 027-1941-39

ENG/CKR: ARF

DATE: 06/11/15

JOB NO.: 15113.10

SCALE:

ZFA STRUCTURAL ENGINEERS

100 bush street suite 1850 | san francisco ca 94104 | 415.243.4091 | www.zfa.com

SHEET NO.:

1/5

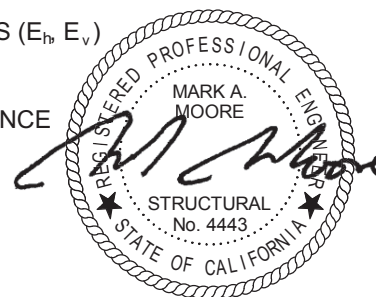
OPM-0224-13: EQUIPMENT MANUFACTURER: MIDMARK CORPORATION
EQUIPMENT TYPE: OVERHEAD CABINETS

GENERAL NOTES

1. THIS OSHPD PREAPPROVAL OF MANUFACTURER'S CERTIFICATION (OPM) IS BASED ON THE CBC 2013. THE DEMAND (DESIGN FORCES) FOR USE WITH THIS OPM SHALL BE BASED ON THE CBC 2013.
2. FORCES PER ASCE 7-10 SECTION 13.3.1, EQUATIONS 13.3-1, 13.3-2, 13.3-3, WHERE $S_{DS} = 2.20$, $a_p = 1.0$, $I_p = 1.5$ & $R_p = 2.5$, $z/h \leq 1.0$. A FACTOR OF 0.7 IS APPLIED TO CALCULATE ASD LOADS.
HORIZONTAL FORCE (E_h) = $1.109 W_p$
VERTICAL FORCE (E_v) = $0.308 W_p$
3. THE DETAILS IN THIS PRE-APPROVAL MAY BE USED AT ANY LOCATION WITH AN S_{DS} OF 2.20g OR LESS.
4. ALL SEISMIC AND ANCHOR FORCES SHOWN ON THE DRAWINGS ARE BASED ON ALLOWABLE STRESS DESIGN.
5. SHEET METAL SCREWS (SMS) SHALL CONFORM TO ICC-ES ESR-1976 OR ICC-ES ESR-2196.
6. SEE SHEET 2 FOR LIGHT GAGE STEEL MINIMUM SPECIFICATIONS.

RESPONSIBILITIES OF THE STRUCTURAL ENGINEER OF RECORD (SEOR)

7. DESIGN BACKING PLATES, STUDS, ETC. WHICH THE UNITS ARE ATTACHED TO AS NOTED ON THE DRAWINGS. THE SEOR SHALL ALSO VERIFY THE ADEQUACY OF THE STRUCTURES (SUCH AS WALLS AND FLOORS) WHICH SUPPORT THE UNITS FOR ALL LOADS.
8. PROVIDE ANY SUPPORTING STRUCTURE REQUIRED TO SUPPORT WEIGHTS AND FORCES SHOWN, IN ADDITION TO ALL OTHER LOADS.
9. VERIFY THAT THE INSTALLATION IS IN CONFORMANCE WITH THE 2013 CBC AND WITH THE DETAILS SHOWN IN THIS DOCUMENT. VERIFY THAT THE ACTUAL EQUIPMENT'S WEIGHT, CG LOCATION, ANCHOR LOCATIONS, ANCHOR DETAILS AND THE MATERIAL AND GAGE OF THE UNIT WHERE ATTACHMENTS ARE MADE AGREE WITH THE INFORMATION SHOWN ON THE PRE-APPROVAL DOCUMENTS.
10. VERIFY THAT THE COMBINATION OF S_{DS} & z/h RESULT IN SEISMIC FORCES (E_h , E_v) THAT ARE NOT GREATER THAN THE VALUES IN THE GENERAL NOTES.
11. VERIFY THAT THE ATTACHMENTS ARE LOCATED AT AN ADEQUATE DISTANCE FROM ANY END OR EDGE OF METAL STUD.

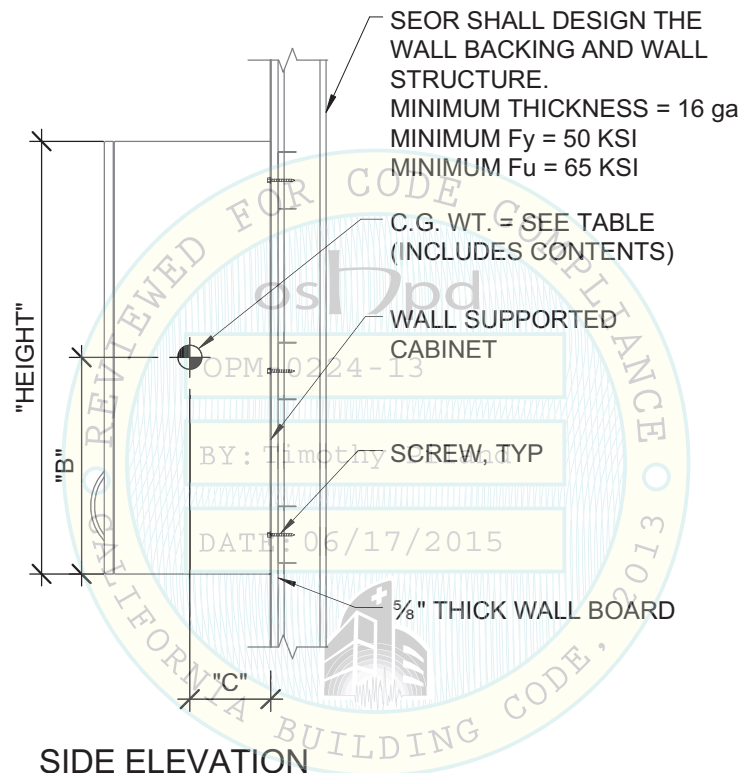


MIDMARK CORPORATION OVERHEAD CABINET
UNITS 027-1941-00 THROUGH 027-1941-39

ENG/CKR:	ARF	DATE:	06/11/15
JOB NO.:	15113.10	SCALE:	3/4" = 1'-0"

ZFA STRUCTURAL ENGINEERS
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SHEET NO.:
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NOTES

1. CENTER OF GRAVITY (C.G.) WEIGHT IS A MAXIMUM. THIS PRE-APPROVAL ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
2. FOR GENERAL NOTES, SEE SHEET 1.
3. FOR GEOMETRY, WEIGHT, AND ANCHOR FORCES, SEE SHEETS 4 AND 5.
4. MINIMUM SCREW SPACING = 3/4"; MINIMUM EDGE DISTANCE FOR SCREWS = 3/8"



MIDMARK CORPORATION OVERHEAD CABINET
UNITS 027-1941-00 THROUGH 027-1941-39

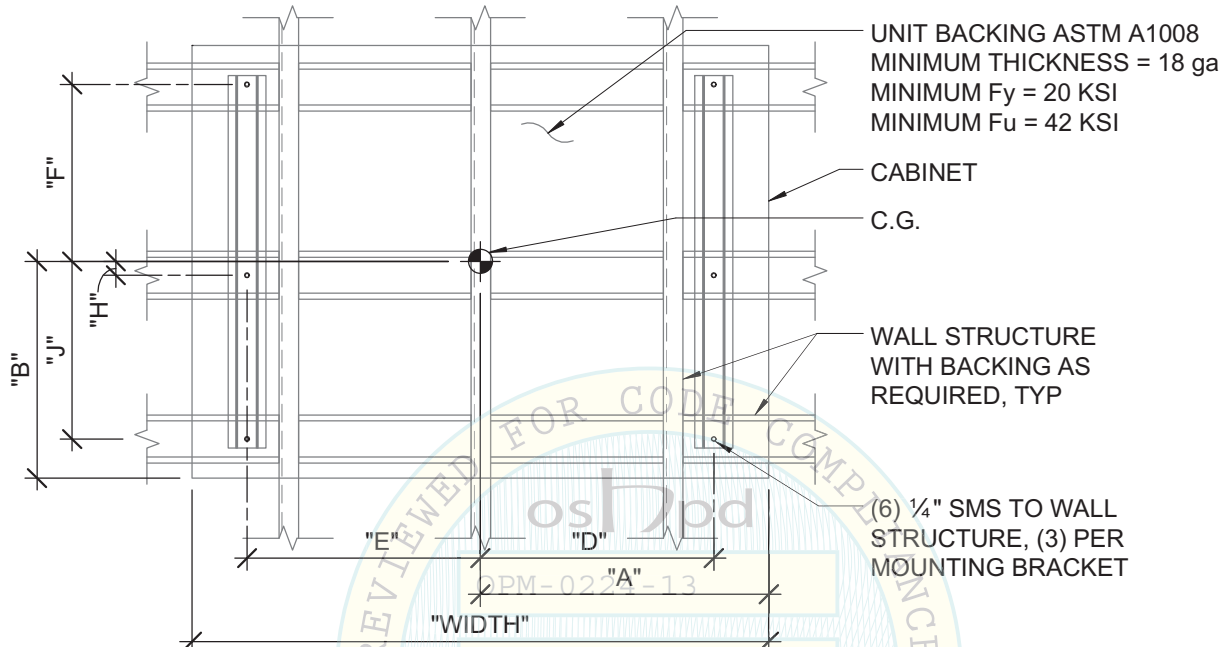
ENG/CKR:	ARF	DATE:	06/11/15
JOB NO.:	15113.10	SCALE:	3/4" = 1'-0"

ZFA STRUCTURAL ENGINEERS

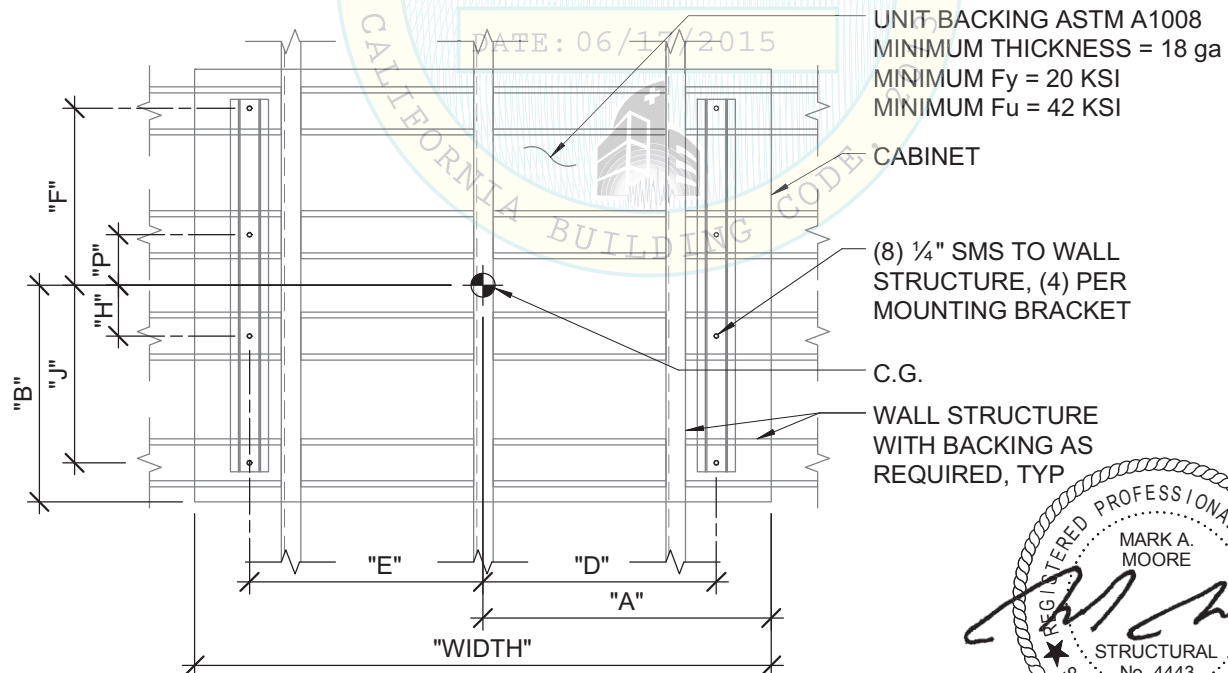
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SHEET NO.:

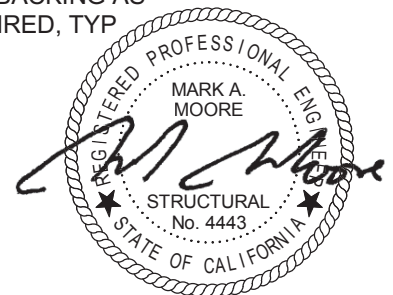
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BACK ELEVATION (UNITS W/ 6 SCREWS)



BACK ELEVATION (UNITS W/ 8 SCREWS)



MIDMARK CORPORATION OVERHEAD CABINET
UNITS 027-1941-00 THROUGH 027-1941-39

ENG/CKR: ARF DATE: 06/11/15
JOB NO.: 15113.10 SCALE:

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SHEET NO.:
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Part No.	Max Operating Weight	Width (in)	Height (in)	Depth (in)	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)	"F" (in)	"H" (in)	"J" (in)	T max (lbs/screw)	V max (lbs/screw)
027-1941-00	73	12	18	13.8	5.8	9.0	6.8	12	1.7	5.7	1.1	5.8	97	24
027-1941-01	89	15	18	13.8	7.2	9.0	6.8	2.7	3.2	5.7	1.2	5.8	77	28
027-1941-02	103	18	18	13.8	8.7	9.0	6.8	4.1	4.7	5.7	1.2	5.8	74	32
027-1941-03	118	21	18	13.8	10.2	9.0	6.8	5.6	6.2	5.7	1.2	5.8	76	36
027-1941-04	137	24	18	13.8	12.0	9.0	6.9	7.4	7.4	5.7	1.2	5.8	84	41
027-1941-05	166	30	18	13.8	15.0	9.1	6.9	10.4	10.4	5.7	1.2	5.8	93	50
027-1941-06	196	36	18	13.8	18.0	9.1	6.8	13.4	13.4	5.7	1.2	5.8	104	59
027-1941-07	225	42	18	13.8	21.0	9.1	6.8	16.4	16.4	5.7	1.2	5.8	116	67
027-1941-08	254	48	18	13.8	24.0	9.1	6.8	19.4	19.4	5.7	1.2	5.8	128	76
027-1941-09	95	12	24	13.8	5.8	12.0	6.7	1.2	1.6	8.7	1.1	8.8	113	30
027-1941-10	115	15	24	13.8	7.3	12.0	6.7	2.7	3.1	8.7	1.2	8.8	84	35
027-1941-11	134	18	24	13.8	8.8	12.0	6.7	4.2	4.6	8.7	1.2	8.8	70	41
027-1941-12	154	21	24	13.8	10.3	12.1	6.7	5.7	6.1	8.7	1.2	8.8	79	46
027-1941-13	177	24	24	13.8	12.0	12.0	6.8	7.4	7.4	8.7	1.2	8.8	85	52
027-1941-14	216	30	24	13.8	15.0	12.0	6.8	10.4	10.4	8.7	1.2	8.8	92	64
027-1941-15	254	36	24	13.8	18.0	12.1	6.8	13.4	13.4	8.7	1.2	8.8	102	75
027-1941-16	293	42	24	13.8	21.0	12.1	6.8	16.4	16.4	8.7	1.2	8.8	112	86
027-1941-17	331	48	24	13.8	24.0	12.1	6.7	19.4	19.4	8.7	1.2	8.8	151	75
027-1941-18	116	12	30	13.8	5.8	15.0	6.7	1.3	1.6	11.7	1.2	11.8	129	36
027-1941-19	141	15	30	13.8	7.3	15.1	6.7	2.8	3.1	11.7	1.2	11.8	94	42
027-1941-20	165	18	30	13.8	8.8	15.1	6.7	4.2	4.6	11.7	1.2	11.8	86	49
027-1941-21	188	21	30	13.8	10.3	15.1	6.7	5.7	6.1	11.7	1.2	11.8	85	56
027-1941-22	216	24	30	13.8	12.0	15.1	6.8	7.4	7.4	11.7	1.2	11.8	89	63
027-1941-23	254	30	30	13.8	15.0	15.1	6.8	10.4	10.4	11.7	1.2	11.8	96	77
027-1941-24	311	36	30	13.8	18.0	15.1	6.7	13.4	13.4	11.7	1.2	11.8	105	91
027-1941-25	359	42	30	13.8	21.0	15.1	6.7	16.4	16.4	11.7	1.2	11.8	114	105
027-1941-27	138	12	36	13.8	5.9	18.0	6.7	1.3	1.6	14.7	1.1	14.8	148	42
027-1941-28	167	15	36	13.8	7.4	18.0	6.7	2.8	3.1	14.7	1.2	14.8	104	50
027-1941-29	196	18	36	13.8	8.9	18.0	6.7	4.3	4.6	14.7	1.2	14.8	94	58
027-1941-30	224	21	36	13.8	10.3	18.0	6.7	5.8	6.1	14.7	1.2	14.8	92	66
027-1941-31	256	24	36	13.8	12.0	18.0	6.7	7.4	7.4	14.7	1.2	14.8	96	75
027-1941-32	313	30	36	13.8	15.0	18.0	6.7	10.4	10.4	14.7	1.2	14.8	101	91
027-1941-33	370	36	36	13.8	18.0	18.0	6.7	13.4	13.4	14.7	1.2	14.8	110	108
027-1941-36	151	27	18	13.8	13.5	9.0	6.9	8.9	8.9	5.7	1.2	5.8	89	45
027-1941-37	196	27	24	13.8	13.5	12.0	6.8	8.9	8.9	8.7	1.2	8.8	88	59
027-1941-38	240	27	30	13.8	13.5	15.1	6.8	8.9	8.9	11.7	1.2	11.8	92	70
027-1941-39	285	27	36	13.8	16.5	18.0	6.7	8.9	8.9	14.7	1.2	14.8	98	83



MIDMARK CORPORATION OVERHEAD CABINET
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SHEET NO.:
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Part No.	Max Operating Weight (lbs)	Width (in)	Height (in)	Depth (in)	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)	"F" (in)	"H" (in)	"J" (in)	"P" (in)	T max (lbs/screw)	V max (lbs/screw)
027-1941-26	407	48	30	13.8	24.0	15.1	6.7	19.4	19.4	11.7	4.2	11.8	4.8	129	88
027-1941-34	426	42	36	13.8	21.0	18.1	6.7	16.4	16.4	14.7	4.2	14.8	4.8	124	92
027-1941-35	483	48	36	13.8	24.0	18.1	6.7	19.4	19.4	14.7	4.2	14.8	4.8	140	104

