# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 and 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.
   3. Penetrations in smoke barriers.

B. Related Requirements:
   1. Section 018113 “Sustainable Design Requirements.”
   2. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

## 1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

## 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals: Credit EQc4.1. Refer to Division 01 Section “Sustainable Design Requirements” for additional submittal requirements.

C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
   1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

## 1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

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

1.7 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 its "Qualified Firestop Contractor Program Requirements."

B. Firestop Manufacturer: Do not use firestop material produced by any manufacturer who will not agree to send a direct employee as a qualified technical representative to the project site, during the initial installation and when requested, for the purpose of training appropriate installer personnel in proper selection and installation procedures and for rendering advice concerning the proper installation of materials. Manufacturer shall employ a professional Fire Protection Engineer with qualifications acceptable to the Society of Fire Protection Engineers (SFPE).

C. Compatibility: Provide only the firestop materials which are explicitly recommended by the manufacturer for the application, and which have been determined to be compatible with the adjoining construction and each other, as stated in the manufacturer’s published data or certified for each application.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Fungal Resistance: Source Firestop products with manufacturer's standard antimicrobial formulation to result in no (zero or one) mold growth on specimens per ASTM G 21. Reference - ASTM G21, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

C. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems. Consult with Structural Engineer on

Record before core-drilling holes through rebar. To avoid damage, Cast-in-Place Firestop Devices are recommended to uniformly distribute sleeves around rebar.

C. Building Movement: Provide systems rated to withstand building movements, including shrinkage and seismic performance when tested in accordance with the specified standards. FEMA 461 where applicable.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."
3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Hilti, Inc. (Basis-of-Design)
b. 3M Fire Protection Products.
c. Specified Technologies Inc.
d. A/D Fire Protection Systems Inc.
e. Or Equal.

B. LEED Material Credit EQc4.1 (inside the weatherproofing system and applied on-site): Refer to Division 01 Section “Sustainable Design Requirements” for additional product requirements.

C. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

D. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
   2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
   3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479. Provide firestop systems resistant to degradation from moisture during normal service before exposure to heat and fire. Firestop systems used in the following locations shall also function as a watertight seal preventing passage of water.
      a. Floor penetrations in mechanical and electrical equipment rooms, janitorial rooms or closets, toilet and shower rooms, garage and loading dock areas, and rooms or spaces having a floor drain. Wall penetrations in such spaces where any portion of the firestop is 3 in. or less above the floor. Provide systems having a W-Rating of Class 1.

E. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening; or no more than 50-cfm cumulative total for any 100 sq. ft. of wall area or floor area at both ambient and elevated temperatures.

F. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
   1. Sealant shall have a VOC content complying with LEED and CalGreen requirements.

G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
   1. Permanent forming/damming/backing materials.
   2. Substrate primers.
   3. Collars.
   4. Steel sleeves.

## 2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket. Pre-formed device should be fitted with an OSHA approved toe guard (cap) to temporarily protect open holes after concrete is cured.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent mesh material sized to form a tight seal around penetrants. Re-penetrable round sleeve pathways with smooth identifiable flanges to accommodate 0 to 100% cable fill through rated floors and walls.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Firestop Blocks: Flexible Intumescent preformed block, used for large openings to accommodate cable trays, single or multiple penetrating items, and electrical busways. Material can be cut to fit within irregular complex openings without voiding warranty or fire rating.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

K. Plugs: Non-curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles.

L. Putty Pads: Moldable non-conductive wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
   1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fastened, self-adhering-type labels with adhesives capable of bonding labels to surfaces on which labels are placed. Include the following information on labels:
   1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Manufacturer's name.
   6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping 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 that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Refer to Drawings for penetration firestopping details and as noted:

**Penetrations – Concrete Floors**

| TYPE OF PENETRANT | F-RATING (HR) | UL-CLASSIFIED SYSTEM |
|---|---|---|
| CIRCULAR BLANK OPENINGS | 1 | FA 0006,CAJ 0055,CAJ 0090 |
| | 2 | FA 0006,CAJ 0055,CAJ 0090 |
| | 3 | FA 0006, CAJ 0055, CAJ 0086, FA 0014 |
| SINGLE METAL PIPES OR CONDUIT | 1 | CAJ 1226, FA 1028 |
| | 2 | CAJ 1226, FA 1028, FA 1016 |
| | 3 | CAJ 1226, FA 1017 |
| | 4 | CBJ 1037, CBJ 1034 |
| SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, FRP, ENT) | 1 | FA 2053, FA 2025, CAJ 2109, CAJ 2098, CAJ 2271, CAJ 2167, CBJ 2021, CAJ 2342 |
| | 2 | FA 2053, FA 2025, CAJ 2109, CAJ 2098, CAJ 2271, CAJ 2167, CBJ-2021, CAJ 2371, CAJ 2342 |
| | 3 | FA 2054, CAJ 2109, CAJ 2098, CAJ 2371, CAJ 2342 |
| | 4 | CBJ 2016, CAJ 2017 |
| SINGLE OR BUNDLED CABLES | 1 | FA 3007,CAJ 3095,CAJ 3180 |
| | 2 | FA 3007,CAJ 3095,CAJ 3180 |
| | 3 | FA 3007,CAJ 3095,CAJ 3180 |
| CABLE TRAY | 1 | CAJ 4034, CAJ 4035 |
| | 2 | CAJ 4034, CAJ 4035 |
| | 3 | CAJ 4034, CAJ 4035 |
| SINGLE INSULATED PIPES | 1 | FA 5015, FA 5017, CAJ 5090, CAJ 5091, CAJ 5098 |
| | 2 | FA 5015, FA 5017, CAJ 5090, CAJ 5091, CAJ 5090 |
| | 3 | FA 5016, CAJ 5090, FA 5018 |
| | 4 | CBJ 5006 |
| ELECTRICAL BUSWAY | 1 | CAJ 6006, CAJ 6017, FA 6002, CAJ 6036 |
| | 2 | CAJ 6006, CAJ 6017, FA 6002, CAJ 6036 |
| | 3 | CAJ 6006, CAJ 6017 |
| NON-INSULATED MECHANICAL DUCTWORK | 1 | CAJ 7046, CAJ 7051, CAJ 7084 |
| | 2 | CAJ 7046, CAJ 7051, CAJ 7084 |

| | | |
|---|---|---|
| WITHOUT DAMPERS | 3 | CAJ 7046, CAJ 7051 |
| INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS | N/A** | N/A** |
| MIXED PENETRANTS | 1 | CAJ 8099, CAJ 8056, CAJ 8143 |
| | 2 | CAJ 8099, CAJ 8056, CAJ 8143 |
| | 3 | CAJ 8099, CAJ 8056 |
| | 4 | CAJ 8095 |
| FLOOR DRAIN/FLOOR SINK | 2 Hr. F<br>2 Hr. T | FA 1135, FA 1137 |

**Penetrations – Concrete or Block Walls**

| TYPE OF PENETRANT | F-RATING | UL-CLASSIFIED SYSTEM |
|---|---|---|
| CIRCULAR BLANK OPENINGS | 1 | CAJ 0055, CAJ 0090 |
| | 2 | CAJ 0055, CAJ 0090 |
| | 3 | CAJ 0055, CAJ 0086 |
| SINGLE METAL PIPES OR CONDUIT | 1 | CAJ 1226, WJ 1067 |
| | 2 | CAJ 1226, WJ 1067 |
| | 3 | CAJ 1226, WJ 1041, WJ 1068 |
| | 4 | CBJ 1034, CBJ 1037, WJ 1041, WJ 1042, WJ 1068 |
| SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, FRP, ENT) | 1 | CAJ 2109, CAJ 2098, CAJ 2167, CAJ 2371, CAJ 2342 |
| | 2 | CAJ 2109, CAJ 2098, CAJ 2167, CAJ 2371, CAJ 2342 |
| | 3 | CAJ 2109, CAJ 2098, CAJ 2371, CAJ 2342 |
| | 4 | WJ 2057, WJ 2091 |
| SINGLE OR BUNDLED CABLES | 1 | WJ 3036, CAJ 3095, CAJ 3180, WJ 3060 |
| | 2 | WJ 3036, CAJ 3095, CAJ 3180, WJ 3060 |
| | 3 | CAJ 3095, CAJ 3180 |
| | 4 | WJ 3050 |
| CABLE TRAY | 1 | WJ 4027, CAJ 4034, CAJ 4035 |

| | | |
|---|---|---|
| | | |
| | 2 | WJ 4027, CAJ 4034, CAJ 4035 |
| | 3 | CAJ 4034, CAJ 4035 |
| | 4 | WJ 8007 |
| SINGLE INSULATED PIPES | 1 | CAJ 5090, CAJ 5091, CAJ 5061, WJ 5042 |
| | 2 | CAJ 5090, CAJ 5091, CAJ 5061, WJ 5042 |
| | 3 | CAJ 5090, CAJ 5061 |
| | 4 | CBJ 5006, WJ 5028 |
| ELECTRICAL BUSWAY | 1 | CAJ 6006, CAJ 6017, CAJ 6036 |
| | 2 | CAJ 6006, CAJ 6017, CAJ 6036 |
| | 3 | CAJ 6006, CAJ 6017 |
| NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS | 1 | CAJ 7046, CAJ 7051, WJ 7021, WJ 7022 |
| | 2 | CAJ 7046, CAJ 7051, WJ 7021, WJ 7022 |
| | 3 | CAJ 7046, CAJ 7051 |
| INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS | 1 | WJ 7029 |
| | 2 | WJ 7029 |
| MIXED PENETRANTS | 1 | CAJ 8099, CAJ 8056, WJ 8007, CAJ 8143 |
| | 2 | CAJ 8099, CAJ 8056, WJ 8007, CAJ 8143 |
| | 3 | CAJ 8041, CAJ 8056, WJ 8007, CAJ 8099 |
| | 4 | CAJ 8095, WJ 8007 |

| **Penetrations – Gypsum Wall Assemblies** | | |
|---|---|---|
| **TYPE OF PENETRANT** | **F-RATING** | **UL-CLASSIFIED SYSTEM** |
| METAL PIPES OR CONDUIT | 1 | WL 1054, WL 1058, WL 1164 |
| | 2 | WL 1054, WL 1058, WL 1164 |
| | 4 | WL 1110, WL 1111, WL 1165 |
| NON-METALLIC PIPE OR | 1 | WL 2078, WL 2075, WL 2128 |

| | | |
|---|---|---|
| CONDUIT | | |
| | 2 | WL 2078, WL 2075, WL 2128 |
| | 4 | WL 2184, WL 2245 |
| SINGLE OR BUNDLED CABLES | 1 | WL 3065, WL 3111, WL 3112, WL 3395 |
| | 2 | WL 3065, WL 3111, WL 3112, WL 3395 |
| | 4 | WL 3139 |
| CABLE TRAY | 1 | WL 4011, WL 4019 |
| | 2 | WL 4011, WL 4019 |
| | 4 | WL 8014 |
| INSULATED PIPES | 1 | WL 5028, WL 5029, WL 5047 |
| | 2 | WL 5028, WL 5029, WL 5047 |
| | 4 | WL 5073 |
| NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS | 1 | WL 7017, WL 7040, WL 7042, WL 7155 |
| | 2 | WL 7040, WL 7042, WL 7155 |
| INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS | 1 | WL 7059, WL 7153, WL 7156, WL 7151 |
| | 2 | WL 7059, WL 7153, WL 7156, WL 7151 |
| ELECTRICAL BOXES | 2 | CLIV (HILTI CP617, CFS-P PA) |
| MIXED PENETRANTS | 1 | WL 1095, WL 8013 |
| | 2 | WL 1095, WL 8013 |
| | 4 | WL 8014 |

END OF SECTION