**SECTION 26 00 00**

**PENETRATION FIRESTOPPING FOR ELECTRICAL**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.03 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

1. Only tested firestop systems shall be used in specific locations as follows: Penetrations for the passage of cables, conduit, and other electrical equipment through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
2. Only tested smoke and acoustic systems shall be used in specific locations as follow: penetration for the passage of cables, conduits, and other electrical equipment through non fire-rated vertical and horizontal partitions.

* 1. RELATED WORK OF OTHER SECTIONS
1. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:
2. Section 03 30 00 - Cast-In-Place Concrete
3. Section 04 20 00 – Masonry Work
4. Section 07 84 00 – Firestopping
5. Section 09 20 00 – Plaster and Gypsum Board
6. Section 13 48 00 - Sound, Vibration and Seismic Control
7. Section 21 00 00 - Fire Suppression
8. Section 26 00 00 - Electrical

1.05 REFERENCES

1. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"
2. Test Requirements: UL 1479, “Fire Tests of Through-Penetration Firestops”
3. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

 1. UL Fire Resistance Directory:

a. Firestop Devices (XHJI)

b. Fire Resistance Ratings (BXRH)

c. Through-Penetration Firestop Systems (XHEZ)

d. Fill, Voids, or Cavity Material (XHHW)

e. Forming Materials (XHKU)

1. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments
2. Inspection Requirements: ASTM E 2174, “Standard Practice for On-site Inspection of Installed Fire Stops.”
3. ASTM E 84, “Standard Test Method for Surface Burning Characteristics of Building Materials.”
4. All major building codes: ICBO, SBCCI, BOCA, and International Building Code (IBC).

Note to specifier: Retain or delete building codes listed above as applicable

1. NFPA 101 - Life Safety Code
2. NFPA 70 - National Electric Code

1.06 QUALITY ASSURANCE

1. Contractor to ensure a manufacturer’s direct representative is on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. Training will be done per manufacturer’s written recommendations published in their literature and drawing details. Contact Hilti for support at 800.879.8000.
2. Fire-Test-Response Characteristics: Provide through-penetration firestop systems and fire-resistive joint systems that comply with specified requirements of tested systems.
3. Firestop System installation must meet requirements of ASTM E 814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.
4. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
5. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.
6. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.07 SUBMITTALS

A. Submit Product Data: Manufacturer’s specifications and technical data for each material including the composition and limitations, documentation of qualified tested firestop systems to be used and manufacturer's installation instructions to comply with Section 01 30 00.

B. Manufacturer's engineering judgment identification number and document details when no qualified tested system is available for an application. Engineering judgment must include both project name and contractor’s name who will install firestop system as described in document.

C. Submit material safety data sheets provided with product delivered to jobsite.

1.08 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A manufacturer’s willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

B. Installation Responsibility: assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.

C. The work is to be installed by a contractor with at least one of the following qualifications:

 1. FM 4991 Approved Contractor

 2. UL Approved Contractor

 3. Hilti Accredited Fire Stop Specialty Contractor

D. The installer must have no less than 3 years of experience with firestop installation.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at jobsite.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature limitations.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Scheduling

1. Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

2. Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

**PART 2 - PRODUCTS**

2.01 FIRESTOPPING, GENERAL

1. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
2. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
3. Penetrations in Fire Resistance Rated Walls: Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E 814 which is equal to the time rating of construction being penetrated.
4. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
	1. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
	2. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
	3. T-ratings can be achieved by utilizing a Low Bio Persistent Endothermic Mat incorporating foil scrim on both sides.

NOTE TO SPECIFIER: Retain or delete W-rating listed below if horizontal assemblies require water resistance.

* 1. W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.
1. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
	1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.
2. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of 0 as determined by ASTM G21.
3. Provide a fire-rated cable pathway device whenever single and/or bundled low-voltage cables penetrate fire rated concrete, masonry and drywall walls and floors, where frequent cable additions and changes may occur. The fire-rated cable management device shall contain integrated intumescent firestop wrap strip materials sufficient to maintain the hourly rating of the barrier being penetrated. The device shall be capable of being easily ganged together with any combination of compatible sleeves using gang plate systems. The fire-rated cable management device shall consist of a bare metal housing and frame(s) to enable grounding for electrical continuity. The device shall provide airflow containment sufficient to achieve the L-Rating requirements of the barrier type.
	1. Round fire-rated cable management device: The device shall consist of a corrugated steel tube with zinc coating, contain and inner plastic housing, intumescent material rings, and inner fabric smoke seal membrane. The device shall contain a smoke seal fabric membrane or intumescent firestop plugs sufficient to achieve the L-Rating. Install device per the manufacturer’s published installation instructions.
	2. Rectangular fire-rated cable management device: The device shall consist of a rectangular galvanized steel sleeve with a symmetrical half-shell design for retrofit capabilities. The device shall consist of an inner and outer layer of brushes on both ends of the device sufficient to achieve the L-Rating. The device shall be capable of being easily ganged together using gang plate or floor grid systems with ganging clips. Install device per the manufacturer’s published installation instructions.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory or other qualified tested firestop systems, provide products of the following manufacturers as identified below:

1. **Basis of Design:**

 Hilti Inc., Plano, TX

 800-879-8000

 www.us.hilti.com

1. Substitution requests shall be considered in accordance with the performance requirements outlined in this document.

2.03 MATERIALS

A. Use only firestop products that have been UL 1479 or ASTM E 814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Preformed firestop devices for use with noncombustible and combustible pipes (closed and open systems), conduit, and/or cable bundles penetrating concrete floors and/or gypsum walls, the following products are acceptable:

1. Hilti Cast-In Place Firestop Device (CFS-CID U) including all components as described by manufacturer for proper installation.
2. Hilti Cast-In Place Firestop Device For Metal Deck (CFS-CID MD P/M) including all components as described by manufacturer for proper installation.
3. Hilti Firestop Speed Sleeve (CP 653 BA) for use with cable penetrations.
4. Hilti Firestop Extended Speed Sleeve (CFS-SL GA L) for use with cable penetrations.
5. Hilti Modular Firestop Sleeve System (CFS-MSL) for use with new and existing cable penetrations in walls and floors.

6. Hilti Firestop Drop-In Device (CFS-DID) for use with pipes when cored or sleeved holes exist in floor.

7. Hilti Firestop Block (CFS-BL)

C. Sealants, foams, or caulking materials for use with non-combustible items including rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)
2. Hilti Fire Foam (CP 620/CP 660)
3. Hilti Flexible Firestop Sealant (CP 606)

D. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including PVC jacketed, flexible cable or cable bundles, and plastic pipe, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)

 E. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)
2. Hilti Fire Foam (CP 620/CP 660)
3. Hilti Flexible Firestop Sealant (CP 606)

 F. Non curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti Firestop Putty Stick (CP 618)
2. Hilti Firestop Plug (CFS-PL)
3. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
4. Hilti Firestop Putty Pad (CP 617)
5. Hilti Firestop Box Insert

H. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Mortar (CP 637)
2. Hilti Firestop Block (CFS-BL)
3. Hilti Fire Foam (CP 620/CP 660)
4. Hilti Composite Sheet (CFS-COS)

I. Non curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL)

J. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL)
2. Hilti Firestop Plug (CFS-PL)

K. Re-penetrable, cable management devices for use with new or existing cable bundles penetrating gypsum, concrete, or masonry walls, the following products are acceptable:

1. Hilti Firestop Speed Sleeve (CP 653 BA) with integrated smoke seal fabric membrane.
2. Hilti Firestop Extended Speed Sleeve (CFS-SL GA L) for use with cable penetrations
3. Hilti Modular Firestop Sleeve System (CFS-MSL) for use with new and existing cable penetrations in walls and floors.

4. Hilti Firestop Cable Collar (CFS-CC)

5. Hilti Firestop Sleeve (CFS-SL SK)

6. Hilti Retrofit Sleeve (CFS-SL RK) for use with existing cable bundles.

L. Large wall opening protective materials for the use with metallic electrical panel, the following product is acceptable:

1. Hilti CFP-ES Endo-Shield Low Bio Persistent Endothermic Mat (CFP-ES)
2. For T-Ratings for penetrations in horizontal assemblies, the following product is acceptable:
3. Hilti Endo-Shield Low Bio Persistent Endothermic Mat (CFP-ES)
4. Sealants for penetrations in non-rated fire separations, the following products are acceptable:
5. Hilti Light Smoke and Acoustic Sealant (CS-S SA)
6. Hilti Smoke and Acoustic Sealant (CP 506)

**PART 3 - EXECUTION**

3.01 PREPARATION

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. Verify penetrations are properly sized and in suitable condition for application of materials.

2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate construction of openings, penetrations, and construction joints to ensure that the fire stop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

1. Coordinate firestopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.
2. Do not cover up through-penetration firestop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector.

3.03 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory and/or qualified tested firestop systems documentation.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

1. Seal all holes or voids made by penetrations to ensure an air and water-resistant seal.

2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

3. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

1. Keep areas of work accessible until inspection by applicable code authorities.
2. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops” or other recognized standard.
3. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
4. Manufacturer’s Field Services: Contractor to ensure a manufacturer’s direct representative is on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. Training will be done per manufacturer’s written recommendations published in their literature and drawing details. Contact Hilti for support at 800.879.8000.

3.05 IDENTIFICATION & DOCUMENTATION

1. The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration location on the entire project.

A.1 The Documentation Form for through penetrations is to include:

* 1. A Sequential Location Number
	2. The Project Name
	3. Date of Installation
	4. Detailed description of the penetrations location
	5. Tested System or Engineered Judgment Number
	6. Type of assembly penetrated
	7. A detailed description of the size and type of penetrating item
	8. Size of opening
	9. Number of sides of assemblies addressed
	10. Hourly rating to be achieved
	11. Installers Name

1. Copies of these documents are to be provided to the general contractor at the completion of the project.
2. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."

2. Contractor's Name, address, and phone number.

3. Through-Penetration firestop system designation of applicable testing and inspecting agency.

4. Date of Installation.

5. Through-Penetration firestop system manufacturer's name.

6. Installer's Name.

1. A firestop documentation manager software shall be used to document, track, and

maintain the passive firestop systems throughout the construction and maintenance phase of the facility. The software solution shall be used to track and document every firestop system installed on the project and each subsequent addition, change, or removal of the firestop system.  The firestop documentation shall be managed with a cloud-based software which allows the installer to use a standard smartphone or tablet device (either iOS, Android, or Windows capable) to capture the relevant information for the installation.  The following data shall be tracked for each penetration within the facility:  product installed, system installed, date of installation, location of the penetration including a notation on the 2D plan image, F-rating, name of installer, photo (pre-installation and post-installation), and inspection status.  The Owner and/ or Construction Manager may designate additional items to be tracked.  The firestop documentation manager software must perform the following basic functions:

1. Create multiple projects/ facilities, add/create/ remove users for each project, upload documents including UL systems, 2D floor plans, product data, engineering judgments, etc.
2. Define data to track using pre-defined input fields or creating custom input fields as desired.
3. Capture multiple photos for each penetration, including a pre-installation and post-installation photo.
4. Scan QR Code on Hilti identification label to link the program data to a specific penetration location.
5. Annotate (mark) location of penetration on 2D floor plan.
6. Create reports by filtering data and utilizing report templates.
7. Online/ offline (for use in areas where data service is unavailable) synchronization of data between mobile device, online application and cloud-based system.
8. Ability to transfer ownership of projects from one customer to another from construction phase to facility maintenance.

Permanently attach Hilti identification labels to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove or change penetrating items or firestopping. Labels shall have a unique QR code for each penetration which can be scanned by the firestop documentation software to quickly identify the penetration attributes.

Acceptable Software:  Hilti CFS-DM, from Hilti Inc., Plano, Texas Tel (800) 879-8000 or Hilti (Canada) Corporation, Mississauga, Ontario (800) 363-4458 website:  [www.us.hilti.com](http://www.us.hilti.com) or [www.hilti.ca.com](http://www.hilti.ca.com)

1. Substitutions: Not permitted.
2. Single Source: Obtain firestop documentation manager software and firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

3.06 ADJUSTING AND CLEANING

1. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.
2. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.07 LABOR USE TO INSTALL FIRESTOP SYSTEMS

1. To ensure complete harmony on the project site, the installation of each scope of work is to be performed jurisdictionally correct per existing trade agreements.

**END OF SECTION**