Carnegie Mellon University Environmental Health & Safety FIRE | LAB | WORK	**Environmental Health and Safety** **Firestop System Guidelines**
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1. Purpose

The Environmental Health and Safety (EHS) Department supports the mission and values of Carnegie Mellon University (CMU) by sustaining and enhancing a safe and healthy environment within the CMU community. As part of this mission, all faculty, staff, students, and visitors must be protected from the potential hazards of uncontained fire and smoke travel in campus buildings. The most basic component of fire protection in buildings is the inclusion of fire-rated barriers that are designed to compartmentalize a building to limit the travel of fire and smoke. This design also allows other fire protection measures, such as fire sprinkler systems, to be more effective in controlling a fire and provides time to allow building occupants to safely escape. These barriers often have open joints or must be penetrated with various building infrastructure elements such as pipes, wiring, and HVAC components during the construction phase and throughout the life of a building. Care must be taken to ensure that an appropriate firestop system is installed anytime there is an open joint or a penetration made to a fire-rated barrier. The purpose of this program is to establish fire-rated barrier management practices that ensure joints and penetrations are properly firestopped throughout the life of a building.

2. Scope

This document sets forth the requirements for sealing penetrations and joints in fire-rated barriers at all CMU owned or operated facilities[1] throughout the Greater Pittsburgh area. This document contains the information needed for campus partners to successfully identify fire-rated barriers, recognize scenarios where the fire-resistance rating of a barrier is compromised, select an appropriate firestop system to maintain or restore required fire-resistance ratings, and ensure that individuals installing firestop systems are qualified to do so.

3. Definitions

To effectively utilize this document, users are encouraged to review the definitions in this section. These definitions have been developed to meet the specific needs of this program

[1]While landlords of facilities leased by CMU must comply with all applicable local, state and federal laws with respect to improvements and repairs made by them to such buildings, unless agreed to by landlords in a lease or agreement, landlords are not required to follow provisions of these guidelines not otherwise required by law.

and may deviate from other published sources.

a. **Design Team** – A team of individuals contracted by the university to provide design services for a project. Members of the design team may include, but not be limited to, architects, engineers and/or code consultants.
b. **Engineering Judgement**- A document issued by a professional engineer or firestop system manufacturer's technical staff that provides an assessment or criteria for a firestop system that has not been tested. This assessment is based on the interpolation or extension of previously tested firestop systems.
c. **Fire-Rated Barrier-** Any floor, ceiling, or wall in a building containing a fire-resistance rating and designed to restrict the spread of fire and smoke.
d. **Firestop System-** A combination of products, procedures and conditions utilized to seal an opening in a fire-rated barrier that have been tested in accordance with the applicable ASTM or UL standard and listed in a directory published by a nationally recognized testing laboratory. Applicable standards include:
e. **ASTM E 814 (UL 1479) –** Standard Test Method for Fire Tests of Through-Penetration Firestops
f. **ASTM E 1966 (UL 2079) –** Standard Test Method for Fire-Resistive Joint Systems
g. **ASTM E 2307 –** Standard Test Method for Determining the Fire Resistance of Perimeter Barrier Systems using the Intermediate Scale, Multi-Story Test Apparatus
h. **Firestop System Rating** – The performance characteristics of a firestop system, expressed as:
    i. **F-Rating** – The time in hours that a firestop system will prevent the passage of flames.
    ii. **L-Rating** – The amount of air leakage through a firestop system, expressed in cubic feet per minute, per square foot of opening.
    iii. **Movement Capabilities** – The range of movement that a firestop system is designed to accommodate without diminishing its fire-resistive performance, expressed as a percentage of compression, extension, and/or vertical shear.
    iv. **T-Rating** – The time in hours that a firestop system limits the maximum temperature rise to 325 degrees Fahrenheit above ambient on the non-fire side of the barrier.
    v. **W-Rating** – The ability of a firestop system to resist water leakage.
i. **High-Rise** – A building with an occupied floor located more than 75 feet above the lowest level of fire department vehicle access.
j. **High Risk Area** – Any area within a building where the probability and/or severity of a fire is high. High risk areas include, but are not limited to, areas without automatic fire sprinkler protection, areas containing high value or mission critical equipment, and high hazard areas such as chemical storage rooms.
k. **Joint** – The area where two fire-rated barriers meet or where one fire-rated barrier meets a non-rated barrier.
l. **Penetration** – An item passing through one or more sides of a fire-rated barrier.

m. **Qualified Personnel-** A person or company who has obtained training or an industry designation in firestop system installation and practices, as outlined in Section 8 of this document.

4. Roles and Responsibilities

a. *Environmental Health and Safety (EHS)*

i. Oversee the university's firestop system guidelines and provide guidance to campus partners on issues related to unsealed openings in fire-rated barriers.
ii. Assist campus partners in identifying the location and rating of fire-rated barriers in existing buildings when new openings need to be made, upon request.
iii. Identify and document issues in fire-rated barriers in existing buildings during Fire and Life Safety Assessments (FLSAs).
iv. Review selected firestop systems that will be used to restore the fire-resistance ratings of fire-rated barriers, upon request.
v. Establish a list of acceptable trainings and industry qualifications needed for individuals or contractors installing firestop systems.
vi. Assist campus partners in coordinating third-party firestop training classes.
vii. Assist campus partners in obtaining Engineering Judgements when a listed firestop system is unable to be identified.

b. *Campus Partners*

Campus partners play a critical role in ensuring proper fire-rated barrier management at Carnegie Mellon University. These partners include, but are not limited to, Facilities Management Services (FMS), Campus Design and Facility Development (CDFD), Computing Services Communications Cabling, and Housing Services.

Campus partners have the following general responsibilities under this program, as applicable to their job responsibilities:

i. Review and comply with the standards set forth in this document.
ii. Ensure that any assigned fire-rated barrier issues identified in the Fire and Life Safety Assessment (FLSA) program are sealed with an appropriate firestop system.
iii. Ensure that any new penetrations in fire-rated barriers as part of ongoing building maintenance or repairs are sealed with an appropriate firestop system.
iv. Ensure that design specifications for renovation and construction projects align with the standards contained within this document and the applicable provisions of the 2018 International Building Code, as currently adopted by the City of Pittsburgh.
v. Ensure that any personnel or contractors performing firestop work involving fire-rated barriers are trained in accordance with Section 8 of this program.
vi. As needed, coordinate with EHS for assistance in identifying the location and rating of fire-rated barriers and selecting a firestop system.

5. General Requirements

Each of the following requirements applies to new construction and when renovating existing buildings on campus.

a. All penetrations and joints in fire-rated barriers must be sealed with an appropriate firestop system. The presence of automatic fire sprinklers or other fire protection systems is not a substitute for maintaining required fire-rated barriers.
b. The F-Rating of the firestop system used must meet or exceed the required fire-resistance rating of the barrier it is installed in.
c. Where the fire-rated barrier is also designated as a smoke barrier, the firestop system must contain an L-Rating not exceeding 5 cfm per square foot. Where multiple penetrations are made through a smoke barrier, the total cumulative leakage per any 100 square feet of floor or wall area may not exceed 50 cfm.
d. For penetrations through a floor/ceiling assembly, the firestop system must include a T-Rating that is equal to the F-Rating, but not less than 1 hour.
e. Exceptions:
    i. Floor penetrations contained and located within the cavity of a wall.
    ii. Floor penetrations by floor drains, tub drains, or shower drains contained of located within a concealed space.
    iii. Floor penetrations of maximum 4-inch diameter metal conduit or tubing penetrating directly into a metal-enclosed electrical power switchgear.
f. All conditions of the firestop system and all requirements of the manufacturer must be adhered to.
g. Products from different firestop manufacturers cannot be mixed or combined. Products from different manufacturers have not been tested together and may fail to perform as intended.

6. Requirements for the Maintenance of Existing Buildings

Existing buildings present the greatest challenges for fire-rated barrier management. Ongoing maintenance, repair and renovation work frequently affects fire-rated barriers. Sometimes, due to the age of the building and availability of construction documents, it is difficult to obtain information needed to make decisions on the application of firestop systems. It is important for campus partners to work together to ensure that the best possible solution is reached to mitigate these issues.

a. It is highly recommended that anyone making a new penetration through a wall or floor is familiar with the common locations of fire-rated barriers in buildings.
b. Resources for determining the need for a firestop system include, but are not limited to, reviewing existing building construction documentation, looking for markings and labels or other adjacent penetrations that have been firestopped, referencing the list of common fire-rated barriers in Appendix A, and reaching out to EHS for review of the proposed scope of work.
c. Where a barrier has been determined to contain a fire-rating, a firestop system shall be

used to restore the rating of the barrier.

d. Refer to Appendix B for resources that can be used to select a firestop system.
e. Where penetrations are made through fire-rated barriers that protect high risk areas, an EHS review of the proposed firestop system is required prior to installation.

7. Requirements for the Construction of New Buildings

The construction of a new building presents the best opportunity to ensure that firestopping is done correctly. This requires proper planning, selection of qualified personnel, and quality assurance through third-party inspection (when required).

a. *Design and Construction*

i. All fire-rated barriers in a project area must be specified during the design process and identifiable on the construction documents.
ii. Types and locations of potential penetrations and joints should be identified during the design process and coordinated to ensure that all required fire-resistance ratings can be maintained.
iii. A schedule of firestop systems should be included on the construction documents for reference in the field by the installing contractor and/or inspector.
iv. Where firestop system selection will be delegated to individual contracted trades at the time of construction, the installing contractor should submit copies of the selected firestop systems to the design team for review, prior to installation.
v. Upon completion, fire-rated barriers in building maintenance areas such as mechanical rooms, electrical rooms, attics, and concealed areas above drop ceilings or below raised floors, must be permanently identified with a sign or painted stencil that includes the hourly rating of the fire barrier and the words “protect all openings”.

   Example: “2 HOUR FIRE BARRIER – PROTECT ALL OPENINGS”.

b. Third-Party Inspection

i. Per the 2018 International Building Code (IBC), firestop systems for projects involving a high-rise building or building that is a Risk Category III or IV must be inspected by an approved third-party inspection agency. Refer to Appendix D for additional information on building risk categories.
ii. Inspection of penetration firestop systems must be completed in accordance with ASTM E 2174 and inspection of fire-resistive joint systems must be completed in accordance with ASTM E 2392.

8. Training Requirements

Failure to properly install a firestop system can result in the spread of smoke and fire throughout a building, potentially resulting in injury, loss of life, or property damage. Firestop systems must be installed by qualified personnel who have completed a firestop manufacturers training program and maintain a current certification. As an alternative to this requirement, any contractor (company) with an FM 4991 Approval or designated as a UL

Qualified Firestop Contractor may perform firestopping services. Other training programs and qualifications may be approved by EHS upon request.

Qualified Personnel shall be able to do the following:

a. Collect information necessary to select a firestop system that is appropriate for the penetration or open joint condition.
b. Properly install or oversee the installation of the selected firestop system.
c. Identify conditions that do not align with the criteria in a selected firestop system and utilize available resources to overcome these challenges.
d. Stay current with firestop code requirements ~~and new technologies.~~

9. EHS Review

Campus partners will find that many of the unsealed openings in fire-rated barriers can be repaired without issue. However, the age of some buildings on campus and/or unique construction methods or field conditions found in existing buildings can make the remediation process challenging. EHS is available to assist with these more challenging situations. Contact EHS at safety@andrew.cmu.edu where it is unclear whether the unsealed opening involves a fire-rated barrier, the required rating of the fire-rated barrier cannot be easily determined, or when unique field conditions are encountered that do not align with readily available firestop systems. These conditions may necessitate obtaining an Engineering Judgement or implementing other best practices to minimize risk.

Appendix A: Identification of Fire-Rated Barriers

Understanding the location of fire-rated barriers is a critical first step in identifying whether a firestop system is needed. Fire-rated barriers generally include the locations listed below; however, this list is not all inclusive and may fluctuate from building to building. Additional areas such as chemical storage rooms or certain electrical installations may contain a fire-rated barrier and will need to be evaluated on a case-by-case basis. When in doubt, reach out to EHS for review.

Location	Common Fire-Resistance Ratings
Enclosed stairways (interior exit stairways)	Two hours when the stairway connects four stories or more. One hour when the stairway connects less than four stories. (IBC 1023.2)
Atrium walls	One hour (IBC 404.6)
Vertical shafts such as elevator shafts and utility shafts	Two hours when the shaft connects four stories or more. One hour when the shaft connects less than four stories. (IBC 713.4)
Floors with structural support components that contain spray-applied fireproofing	Dependent on building construction type. (IBC 602.1)
Walls at the interface of two separate buildings serving as a horizontal exit	Two hours (IBC 1026.2)
Non-sprinklered corridor walls in academic/administrative buildings	One hour (IBC 1020.1)
Most corridor walls in housing buildings	Thirty minutes (IBC 1020.1)
Emergency generator rooms	Two hours (IBC 2702.1.3)
Fire command centers	One hour (IBC 911.1.2)
Fire pump rooms	One hour in non-high-rise buildings that are equipped throughout with fire sprinklers. Two hours in all other buildings. (IBC 913.2.1)

Table is based on the 2018 International Building Code (IBC).

Appendix B: Firestop System Selection and Resources

When an opening in a fire-rated barrier is identified, information about the penetration or joint must be obtained to select an appropriate firestop system. To aid in the selection process, Qualified Personnel should use the firestop system selection tools available from firestop product manufacturers that they are utilizing such as:

Specified Technologies Incorporated (STI): System Search and Submittal Builder
Hilti: Firestop Selector
3M: System Selector and Submittal Wizard

These selection tools will generate firestop systems that can be used and the conditions for their use. An example of firestop system documentation can be found in Appendix D. When selecting a firestop system, the following information about the opening will need to be collected to begin the process of selecting a firestop system.

General Info
Type of firestop system needed (penetration firestop system, joint firestop system, curtain wall firestop system)
Barrier construction (concrete floor, gypsum wall, etc)
Required ratings (F-Rating, T-Rating, L-Rating, W-Rating)
Info for Penetrations
Type of penetrating item (insulated metallic pipe, cable bundle, etc)
Size of penetrating item
Annular space around the penetrating item and between other penetrating items
Info for Joints
Type of joint (head of wall, floor to wall, etc)
Width of the joint
Required movement capabilities (% compression, % extension, % vertical shear)

For additional information on firestopping principles and practices, the International Firestop Council (IFC) and the Firestop Contractors International Association (FCIA) are reputable resources that can be referenced.

Appendix C: Planning Info

When planning for the installation of a firestop system, the following items should be considered to set up for success.

a. The firestop application area must be clean, dry, and within the temperature limitations for the products used in the firestop system.
b. Firestop products and materials need to be stored in accordance with the manufacturer's recommendations to ensure a high level of quality and performance.
c. Most firestop systems for penetrations require that the penetrating item is rigidly supported. Additionally, most firestop systems for multiple cables require tight "bundling".
d. Firestop systems for cables inside of a sleeve have a limitation on the maximum percentage of cable fill permitted. There must be adequate "free space" to apply the firestop materials, especially when using sealants such as caulk and putty. Pay close attention to the maximum cable fill permitted in each firestop system.
e. Areas where data communications cabling passes through a fire-rated barrier should be sealed with a re-penetrable firestop system. For example, sealing the end of a cable sleeve with caulking will not allow cables to be easily removed or added without difficulty or the risk of causing damage. Alternatively, a firestop system utilizing products such as pillows, collars, or pass-through devices will provide the recurring access that is needed.
f. Firestop systems that use a backing material such as mineral wool may have specific requirements for the brand, density, orientation and compression of the material. Where joints require a specific "percent compression", the following equation can be used to determine the thickness of the mineral wool needed to achieve the specified compression.

$$\text{Thickness} = \frac{(\text{Width of joint}) \times 100}{100 - (\text{Compression \%})}$$

g. Proper application and "tooling" of sealants is a requirement of many firestop systems. This helps to create a proper seal and is an integral part of the firestop system that ensures adherence of the sealant. Where sealants will be painted, plan to let the sealant cure for a minimum of 72 hours before painting.
h. Firestop systems for larger HVAC ducts may require the installation of steel retaining angles to prevent the duct from collapsing/distorting when exposed to fire. This can compromise the firestop system.
i. Specific fastener types may be required for an installation to maintain the integrity of the system during a fire.
j. It is highly recommended that firestop systems used for penetrations in floors/ceilings of electrical rooms or areas containing high value equipment contain a W-Rating to ensure a water-tight seal.

Appendix D: Risk Categories for Third-Party Inspections

2018 International Building Code Table 1604.5 – Risk Category of Buildings and Other Structures	
Risk Category	**Nature of Occupancy**
I	Buildings and other structurers that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings or other structures except those listed in Risk Categories I, III, and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. • Buildings and other structures containing Group E occupancies with an occupant load greater than 250. • Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. • Group I-2, Condition 1 occupancies with 50 or more care recipients. • Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities. • Group I-3 occupancies. • Any other occupancy with an occupant load greater than 5,000 [a]. • Power-generating stations, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. • Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the International Fire Code; and are sufficient to pose a threat to the public if released [b].
IV	• Buildings and other structures designated as essential facilities, including but not limited to: • Group I-2, Condition 2 occupancies having emergency surgery or emergency treatment facilities. • Ambulatory care facilities having emergency surgery or emergency treatment facilities. • Fire, rescue, ambulance and police stations and emergency vehicle garages. • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. • Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures. • Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the International Fire Code; and are sufficient to pose a threat to the public if released [b]. • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

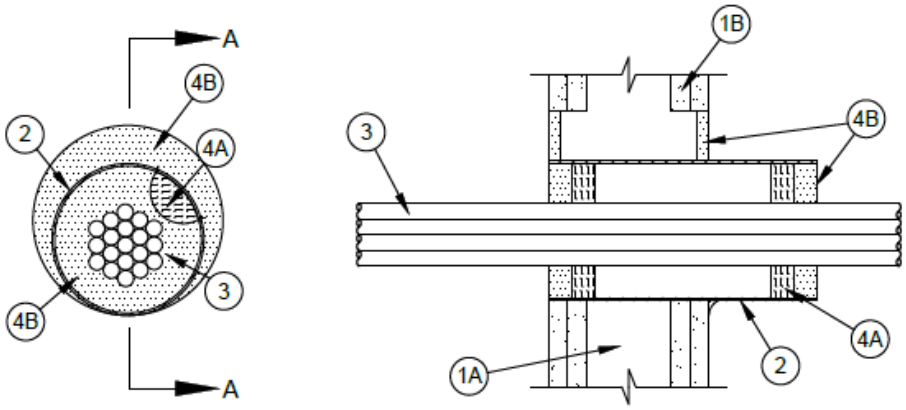
b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities or toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Appendix E: Example Firestop System

Classified by
Underwriters Laboratories, Inc.
to ANSI/UL 1479 (ASTM E814) and CAN/ULC S115

System No. W-L-3210

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 - 3/4 Hr	FT Rating - 3/4 Hr
L Rating at Ambient - Less Than 1 CFM/sq ft (See Items 3 and 4B)	FH Ratings - 1 and 2 Hr (See Item 1)
L Rating at 400°F - Less Than 1 CFM/sq ft (See Items 3 and 4B)	FTH Rating - 3/4 Hr
	L Rating at Ambient - Less Than 5.1 L/S/m² (See Items 3 and 4B)
	L Rating at 204°F - Less Than 5.1 L/S/m² (See Items 3 and 4B)



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, V300, 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, number of layers, fastener type and sheet orientation shall be as specified in the individual U300, V300, U400 , V400 or W400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 6-1/2 in. (165 mm) when sleeve (Item 2) is installed. Max diam of opening is 4 in. (102 mm) when sleeve is not used.

   The hourly F and FH rating of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.
2. **Steel Sleeve -- (Optional)** -- Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing (EMT), steel conduit, Schedule 5 (or heavier) steel pipe sleeve or min 0.016 in. thick (0.41 mm, No. 28 ga) galv steel sleeve installed flush with wall surfaces. The annular space between the steel sleeve and periphery of opening shall be min 0 in. (continuous point contact) to max 2 in. (51 mm). When Schedule 5 steel pipe or EMT is used, sleeve may be installed flush with or extend up to 18 in. (46 cm) beyond one or both wall surfaces. Steel sleeve may be installed at an angle not greater than 45 degrees from perpendicular. Schedule 5 steel pipe or EMT sleeves may extend continuously beyond one wall surface. Sleeve to be

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PAGE 1 OF 2

rigidly supported when extending from the wall surfaces.

3. **Cables** -- Aggregate cross-sectional area of cables in opening when a steel sleeve (Item 2) is not used, or within steel sleeve to be max 48 percent of the aggregate cross-sectional area of the opening or sleeve. Cables to be bundled and rigidly supported on both sides of wall assembly. When the sleeve is installed, the annular space between the cables and the sleeve shall be min 0 in. (point contact) to max 1-1/2 in. (38 mm). When the sleeve (Item 2) is not used, the annular space between the cables and the opening shall be a min 0 in. (point contact) to a max 1/2 in. (13 mm). When L Ratings for penetrants are required, min separation between cables and between cables and periphery of opening or the sleeve os 1/8 in. (3 mm). Cable bundle, using cables described below, may penetrate the wall at an angle not greater than 45 degrees. Any combination of the following types and sizes of copper conductor cable may be used:
   - A. Max 200 pair No. AWG (or smaller) copper conductor cable with polyvinyl chloride (PVC) or plenum-rated jacketing and insulation.
   - B. Max 3/C No. 2/0 AWG (or smaller) aluminum or copper conductor service entrance cable with PVC insulation and jacket.
   - C. Max 3/C No. 8 AWG (or smaller) nonmetallic sheathed (Romex) cable with copper conductors, PVC insulation and jacket.
   - D. Max 7/C No. 2/0 AWG (or smaller) multiconductor power and control cables with XLPE or PVC insulation and XLPE or PVC jacket.
   - E. Max RG/U (or smaller) coaxial cable with fluorinated ethylene or plenum-rated insulation and jacketing.
   - F. Max 62.5/48 fiber optic cable with PVC or plenum-rated insulation and jacketing.
   - G. Max 4 pair No. 24 AWG (or smaller) copper conductor data cable with PVC or plenum-rated insulation and jacket.
   - H. Max 4/C No. 2/0 aluminum or copper conductor aluminum or steel Metal-Clad# or Armored-Clad# cable.
   - I. Max 3/4-in. (19 mm) diam copper ground cable with or without a PVC jacket.
4. **Firestop System** -- The firestop system shall consist of the following:
   - **A. Packing Material** -- When required (See table in Item 4B), min 1 in. (25 mm) thickness of min 4.0 pcf (64 kg/m^3) mineral wool batt insulation firmly packed into each end of sleeve (Item 2) as a permanent form. Packing material to be recessed from each end of sleeve as required to accommodate the required thickness of fill material. When the sleeve is not used, the packing material is not required.
   - **B. Fill, Void or Cavity Material* - Sealant or Putty** -- When sleeve (Item 2) is used, fill material applied to appropriate thickness within steel sleeve as shown in the table below, flush with edges of steel sleeve on both surfaces of wall. Min 1/2 in. (13 mm) thickness of fill material installed into annular space between sleeve and wall flush with both surfaces of the wall. Min 1/2 in. (13 mm) diam bead of sealant or "rope" of putty shall be applied around the perimeter of the sleeve on each side of the wall when sleeve extends beyond surface of wall and is installed at continuous point contact. When sleeve is not used, a min 5/8 in. (16 mm) thickness of fill material shall be applied within the annulus, flush with both surfaces of the wall. At point contact location, apply min 1/4 in. (6 mm) diam bead of fill material at cable/gypsum board interface on both sides of the wall.

Sealant or Putty Type	Thickness, In. (mm)	Packing Material Required
SpecSeal Series SSS Sealant or LCI Sealant	1/2 in. (13)	Yes
SpecSeal Series SSS Sealant or LCI Sealant	1 in. (25)	No
SpecSeal Putty	1 in. (25)	No

SPECIFIED TECHNOLOGIES INC -- SpecSeal Series SSS Sealant, SpecSeal LCI Sealant or SpecSeal Putty

L Ratings apply only when SpecSeal Series SSS or SpecSeal LCI Sealants are used.

*** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**