

Wall & Floor Penetration Fire Stops (FM Approval Class Number 4990)

An important technique in property loss control is the subdivision of a building into compartments and sub-compartments. This subdivision is usually accomplished by erecting physical barriers that will limit the damage caused by an event to the room of origin. The loss caused by the spread of fire damage can be minimized when effective compartmentation is incorporated into a building's design.

One method of combating the spread of fire through openings in or around barriers is to properly design and install firestopping. Firestopping is intended for use in openings in or between fire resistant walls, floor/ceiling assemblies at head of walls and at construction joints between floors and walls.

Through penetrations submitted for Approval shall be evaluated for their ability to prevent the passage of flame through or around openings in fire rated walls and floor/ ceiling assemblies and their ability to limit the transmission of heat through the assembly. In addition, no openings shall develop that permit a projection of water beyond the unexposed surface during the hose stream test.

All through penetrations shall be subjected to a fire resistance test conducted in accordance with ASTM E814 (08) "Standard Method for Fire Tests of Through-Penetrations Fire Stops" followed by a hose stream test conducted in accordance with ASTM E2226 (07), "Practice for Application of Hose Stream". An hourly rating will be assigned based on the time period for which it successfully met the performance criteria.

Through penetrations that meet the fire resistance and hose stream test criteria shall be assigned three (3) separate ratings. They are called the F rating, the T rating and the T_{FM} rating.

The F rating denotes the period of time which the firestop:

- Withstood the fire resistance test without developing any through openings through which flames can pass;
- Withstood the fire resistance test without the occurrence of flaming on the unexposed side of the assembly;
- During the hose stream test, did not develop any opening that allows the projection of water during the hose stream test from the stream to the unexposed side.

The T rating shall denote the period of time which the firestop:

- Met all the criteria of the F rating;
- Limited the transmission of heat through the assembly, as measured by thermocouples located on the unexposed side of the test assembly, as specified in ASTM E814, from exceeding a 325°F (181°C) rise above ambient temperature.

The T_{FM} rating shall denote the period of time which the firestop:

- Met all the criteria of the F rating;
- Limited the transmission of heat through the assembly as measured by an individual thermocouple placed on the unexposed side of the fire stop material positioned 1 in. (25 mm) from the penetrating item from exceeding a 325°F (181°C) rise above ambient temperature.

FM Approvals does not consider the performance of the thermocouples placed directly on the penetrating item for purposes of determining the T_{FM} rating as it is not viewed as part of the firestopping materials provided in trying to protect the opening.

All joint systems between adjacent floor, wall or top of wall sections shall be subjected to a fire resistance and hose stream test conducted in accordance with ASTM E1966, "Standard Test method for Fire Resistance Joint Systems". If successful, the assembly will be assigned an Assembly Rating based on the time period in which it has successfully met the performance criteria. Floor-to-floor and floor-to-wall joint systems shall also be subjected to the same fire test but are not required to be subjected to a hose stream test.

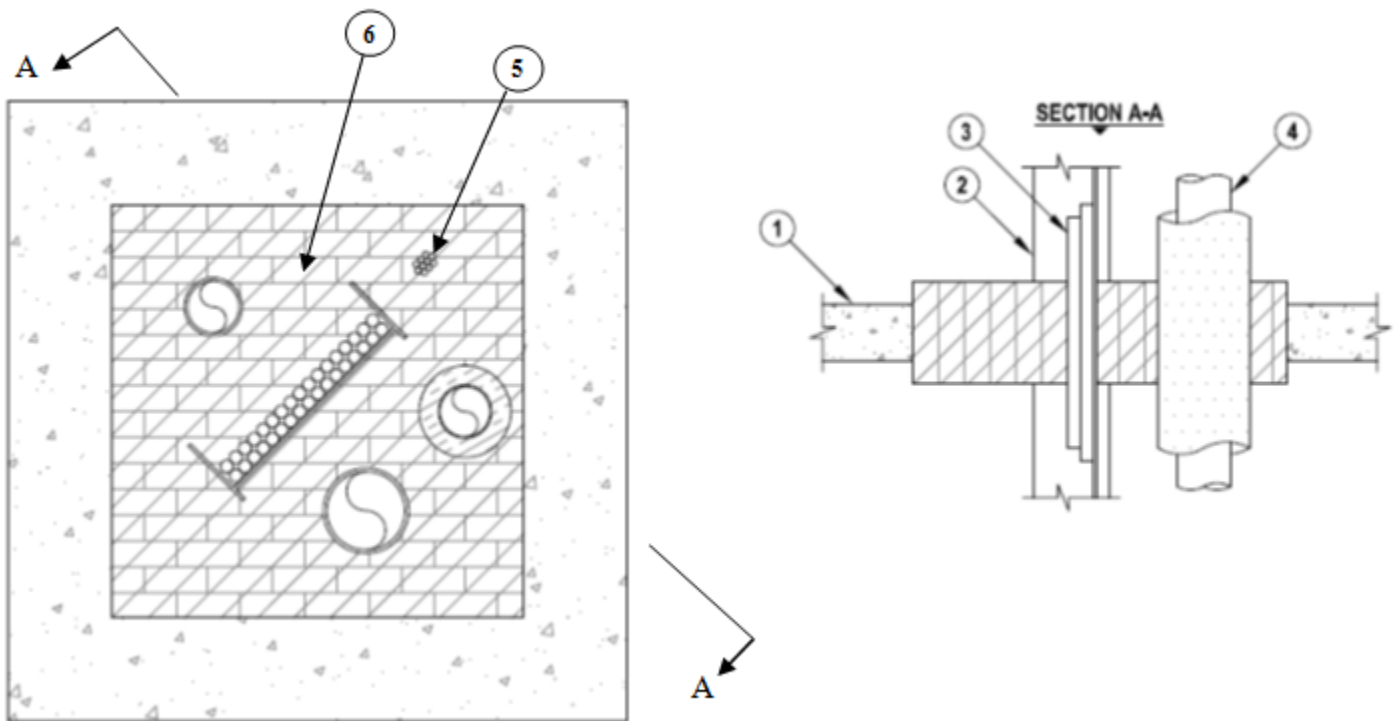
All joint systems shall be subjected to a cycling test conducted in accordance with ASTM E1966 prior to the fire resistance and hose stream test. Three (3) movement ratings are available – Type 1, Type 2 and Type 3.

Fire Stop Design 663

F-Rating = 3 HR

T-Rating = 1, 1.5, 2 and 3 HRS (see Table)

T_{FM} -Rating = 1, 1.5, 2 and 3 HRS (see Table)



1. **FLOOR OR WALL ASSEMBLY.** Minimum 4-1/2 in. (114 mm) thick lightweight or normal weight concrete floor or concrete wall. Wall may also be constructed of concrete blocks. Maximum size of the opening is 32 x 32 in. (0.8 m x 0.8 m).
2. **CABLE TRAY.** Maximum 18 in. (457 mm) wide x 6 in. (152 mm) deep steel open ladder cable tray. One cable tray to be installed in the opening. Minimum 3 in. (76 mm) clearance between cable tray and any other penetrant. Minimum 8 in. (200 mm) distance from edge of cable tray to periphery of the opening. Cable tray to be rigidly supported on both sides of the wall assembly.
3. **CABLES.** Aggregate cross-sectional area of the cables in the cable tray to be a max 30% 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 can be used:
 - a. Max 7/C No.12 AWG copper conductor cable
 - b. Max 500 KCMIL. Single conductor cable
 - c. Max 300 pair No. 24 AWG telephone cable
 - d. 24 fiber-optic cable
4. **METALLIC PIPES.** One or more metallic pipes or tubing to be installed within the opening. Minimum 4 in. (102 mm) clearance between any penetrants and periphery of the opening is 1.5 in. (38 mm). Penetrants rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes or tubing may be used:
 - a. 4 in. (102 mm) nominal diameter (or smaller) copper tubing with 1.5 in. (38.1 mm) thick glass-fiber pipe insulation
 - b. 4 in. (102 mm) nominal diameter (or smaller) schedule 40 (or thicker) steel pipe
 - c. 6 in. (152 mm) nominal diameter (or smaller) schedule 40 (or thicker) steel pipe

5. **CABLE BUNDLE.** One or more 2 in. (51 mm) nominal diameter (or smaller) tight bundle of cables. The annular space between cable bundles is minimum 4 in. (102 mm). The annular space between cable bundle and all other penetrants is minimum 3 in. (76 mm). The annular space between cable bundle and periphery of opening is minimum 2 in. (51 mm). Cables shall be tightly bundled together and rigidly supported on both sides of the floor or wall assembly. Any combination of the following types and sizes of cables may be used:

- a. Max 7/C No.12 AWG cable
- b. Max 25 PR. No. 24 AWG telephone cable
- c. Max 2/C No.12 AWG Romex
- d. Max 3/C No. 12 AWG metal clad cable
- e. RG-6/U coaxial cable
- f. 24 fiber-optic cable

Item No.	Penetrating Item	F-Rating (Hrs)	T-Rating (Hrs)	TFM -Rating (Hrs)
2	18 in. (457 mm) wide x 6 in. (152 mm) deep steel open ladder cable tray	3	1	1
4.a)	4 in. (102 mm) nominal diameter (or smaller) copper tubing with 1.5 in. (38 mm) thick glass-fiber pipe insulation	3	2	3
4.b)	4 in. (102 mm) nominal diameter (or smaller) schedule 40 (or thicker) steel pipe	3	1	3
4.c)	6 in. (152 mm) nominal diameter (or smaller) schedule 40 (or thicker) steel pipe	3	1.5	1.5
5	2 in. (51 mm) nominal diameter cable bundle	3	3	2

6. **FIRESTOP SYSTEM.** Fire blocks installed with the 8 in. (203 mm) dimension projecting through the opening, centered within the thickness of the wall assembly. Blocks to be firmly packed and completely fill the entire opening. Blocks can be cut to smaller thicknesses where needed to assist in tight packing and filling any gaps or voids within the opening.

(Optional – not shown). Fill material (FS-ONE FireStop Sealant, CFS-IS P High Performance Intumescent FireStop Sealant, CP618 or CFS-P ST FireStop Putty Stick) shall be permitted to be applied to fill any voids that may exist within the opening.

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Design Component	Product	Product Type	Listing Country	Certification Type	Class of Work
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6	CFS-BL Firestop Block	Fill Material	Liechtenstein	FM Approved	4990-Penetration Seal & Fire Stop
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6	CFS-BL Firestop Block	Fill Material	United States of America	FM Approved	4990-Penetration Seal & Fire Stop

Fire Stop Design 663

Category: Penetration Seal
Design Number: 663
Ratings: 3, 1, 1 1/2, 2
Construction: Floor, Wall
Penetrant: Cable or Cable Tray, Copper Pipe, Steel Pipe
Floor/Wall Material Type: Concrete
Joint Type: na
Min. Wall Thickness (in.): 4 1/2
Min. Wall Thickness (mm): 114
Min. Floor Thickness (in.): 4 1/2
Min. Floor Thickness (mm): 114
Class of Work: 4990-Penetration Seal & Fire Stop