

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.

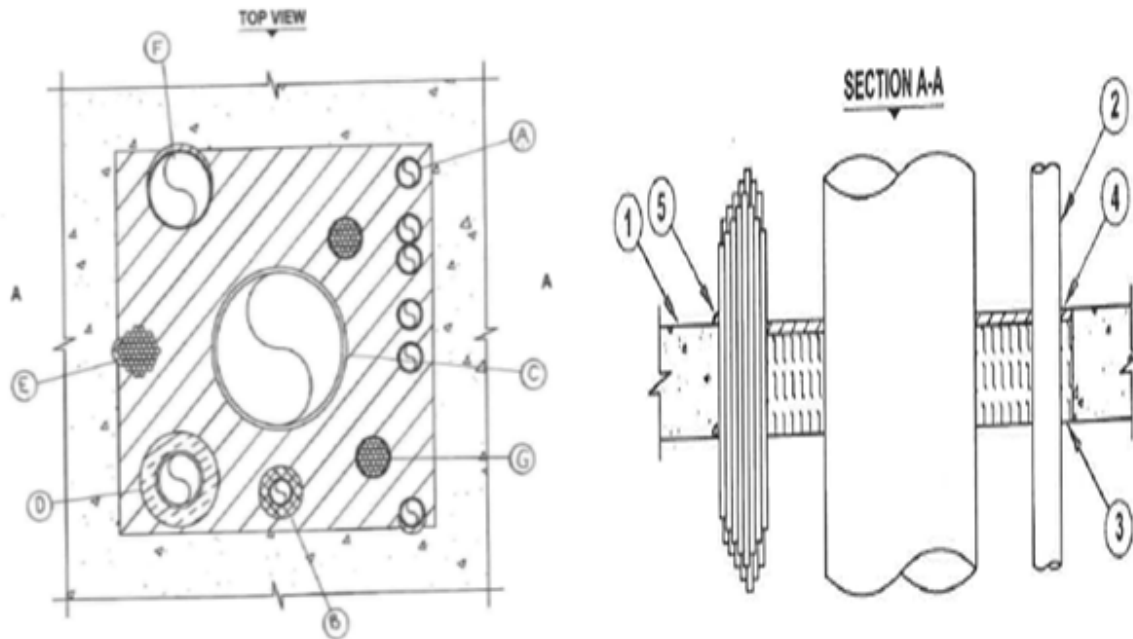
All joint systems shall be subjected to a cycling test conducted in accordance with ASTM E1966 prior to the fire resistance and hose stream test. Three (3) movement ratings are available – Type 1, Type 2 and Type 3.

Fire Stop Design 701

F Rating - 2 HR

T Rating - 0, 1/2, 3/4, and 2 HR

T_{FM} Rating - 1 and 2 HR



1. **FLOOR OR WALL ASSEMBLY.** Min 4-1/2 in. (114 mm) thick lightweight or normal weight concrete floor or concrete wall. Wall may also be constructed of concrete blocks. Max size of opening is 900 in² (0.58 m²) with no dimension greater than 30 in (762 mm). Max annular space is 12 in (305 mm).
2. **PENETRANTS.** One or more pipes, tubes or cable bundles may be installed within the opening. The total number of through penetrants is dependent on the size of the opening, type and size of the penetrants. Any combination of penetrants described below may be used provided that the following parameters relative to annular spaces are maintained. The annular space between individual cable bundles shall be a min. 1/2 in (13 mm). The annular space between individual cable bundles and other penetrants shall be a min of 1/2 in (13 mm) except that a min 2 in (51 mm) space shall be maintained between any cable bundle and any copper pipe or tube greater than 3 in (76 mm) in diameter and any steel pipe greater than 4 in (102 mm) in diameter. The annular space between any metallic pipe, tube or conduit (insulated or not insulated) shall be a min 1/2 in (13 mm). The annular space between all penetrants and the periphery of the opening shall be a min 0 in (point contact). Max annular space within the system shall be 12 in (305 mm). Penetrants to be rigidly supported on both sides of the floor or wall. Rating of the opening defaults to the lowest rating of any penetrant that is present. The following following types and sizes shall be permitted. **All items have F, T and TFM ratings = 2 hrs unless shown otherwise.**
 - A). Max nominal 2 in (51 mm) diameter electric metallic tubing (EMT) or conduit [**T rating = 3/4 hr**].
 - B). Max 2 in (51 mm) diameter regular (or heavier) copper tubing with 1 in (25 mm) thick AB/PVC pipe insulation.
 - C). Max 12 in (305 mm) diameter schedule 40 (or heavier) steel pipe [**T rating = 1/2 hr**].
 - D). Max 4 in (102 mm) diameter schedule 40 (or heavier) steel pipe with 1-1/2 in (38 mm) thick glass fiber pipe insulation.
 - E). 4/C No. 750 kcmil aluminum or copper conductor with aluminum or steel clad teck cable. Max cable bundle diameter shall be 3 in (76 mm) [**T rating = 1/2 hr**].
 - F). Max 6 in (152 mm) diameter copper tubing [**T rating = 0 hr and TFM rating = 1 hr**].

G). Max 4 in (102 mm) nominal cable bundles or individual cable consisting of any of the following [**T rating = 0 hr**].

- 1) 500 kcmil single copper or aluminum conductor power cable with PVC jacket.
- 2) 300 pair No. 24 AWG telephone cable with PVC jacket.
- 3) 7/C No. 12 AWG power cable with PVC jacket.
- 4) ½ in (13 mm) diameter fiber optic cable with PVC jacket.
- 5) 3/C No. 12 AWG steel clad cable.

4. **PACKING MATERIAL** - Min 4 in. (102 mm) thickness of min 4 pcf (64 kg/m³) density mineral wool batt insulation firmly packed into the opening between the annular space and the penetrant to act as a permanent form.

5. **FILL MATERIAL**. Min. 1/2 in. (13 mm) sealant installed within the recessed area of the annular space. Minimum ½ in. (13 mm) bead of sealant applied at the penetrant/periphery interface when in point contact. Sealant required on both sides of a wall.

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Design Component	Product	Product Type	Listing Country	Certification Type	Class of Work
5	FS-ONE MAX Intumescent Firestop Sealant	Fill Material	Liechtenstein	FM Approved	4990-Penetration Seal & Fire Stop

Hilti Inc.

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5	FS-ONE MAX Intumescent Firestop Sealant	Fill Material	United States of America	FM Approved	4990-Penetration Seal & Fire Stop

Fire Stop Design 701

Category:	Penetration Seal
Design Number:	701
Ratings:	2, 0, 1/2, 3/4, 2, 1, 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
Product Type:	Fill Material
Class of Work:	4990-Penetration Seal & Fire Stop