

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.

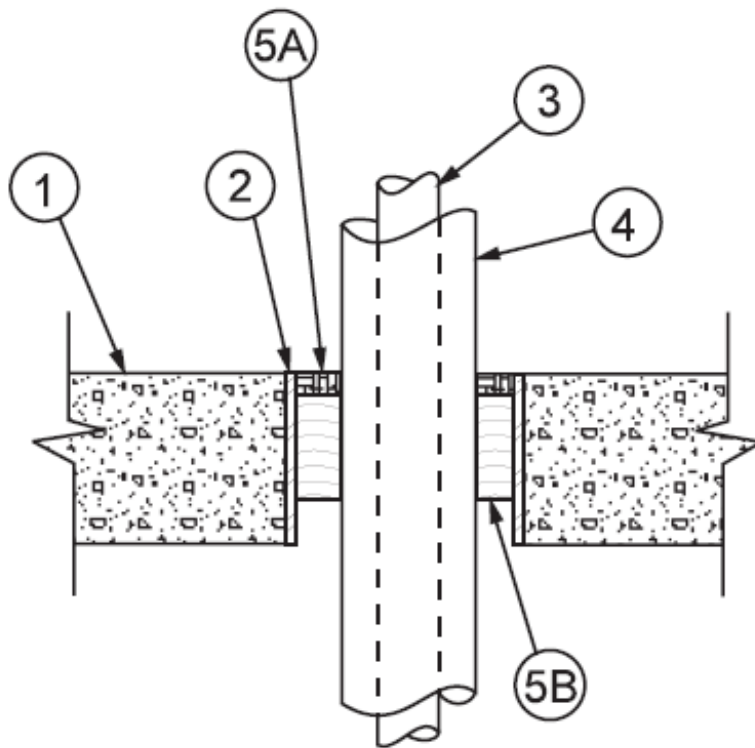
All joint systems shall be subjected to a cycling test conducted in accordance with ASTM E1966 prior to the fire resistance and hose stream test. Three (3) movement ratings are available – Type 1, Type 2 and Type 3.

Fire Stop Design 209

F-Rating = 1 and 1 ½ HR

T-Rating = 0 HR

T_{FM} -Rating = 1 and 1 ½ HR



1. FLOOR OR WALL. Min 4 1/2 in. (114 mm) thick normal or lightweight concrete floor or wall, or min nominal 8 in. (203 mm) thick concrete block wall.
2. PIPE SLEEVE (optional). Max 30 in. (762 mm) dia. opening.
3. PIPES. Max nominal 20 in. (508 mm) Schedule 10 steel pipe (min). Max one pipe per opening.
4. PIPE INSULATION. Mineral wool insulation, min 3 in. (76 mm) thick of 8 pcf (128 kg/m³) density. Wrapped around pipe and extends 6 in. (152 mm) above and below slab.
5. FIRE STOP COMPONENTS.
 - a. Fill Material. Sealant is installed within the opening to a min depth of 3/4 in. (19 mm). Surface is troweled smooth. For walls, sealant shall be applied symmetrically to a min depth of 3/4 in. (19 mm) on each side.
 - b. Backing Material. Mineral fiber of nominal 4 pcf (64 kg/m³) density. Tightly packed by hand (50±10% compression) between pipe insulation and perimeter of opening to a min depth of 3 in. (76 mm) and recessed a min of 3/4 in. (19 mm) from each concrete surface.
6. RATING. When annular space between pipe insulation and edge of opening:
 - a. is ≤1 in. (25 mm), 1 hr. (F-Rating and T_{FM}-Rating)
 - b. is >1 in. (25 mm), 1 1/2 hr. (F-Rating and T_{FM}-Rating)

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

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| 5a | CFS-IS P High Performance Intumescent Firestop Sealant | Fill Material | Liechtenstein | FM Approved | 4990-Penetration Seal & Fire Stop |
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| Design Component | Product | Product Type | Listing Country | Certification Type | Class of Work |
|------------------|--|---------------|--------------------------|--------------------|-----------------------------------|
| 5a | FS-ONE MAX Intumescent Firestop Sealant | Fill Material | United States of America | FM Approved | 4990-Penetration Seal & Fire Stop |
| 5a | CFS-IS P High Performance Intumescent Firestop Sealant | Fill Material | United States of America | FM Approved | 4990-Penetration Seal & Fire Stop |

Fire Stop Design 209

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| Category: | Penetration Seal |
| Design Number: | 209 |
| Ratings: | 1, 1 1/2, 0, 1, 1 1/2 |
| Construction: | Floor, Wall |
| Penetrant: | 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 |