

## 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.

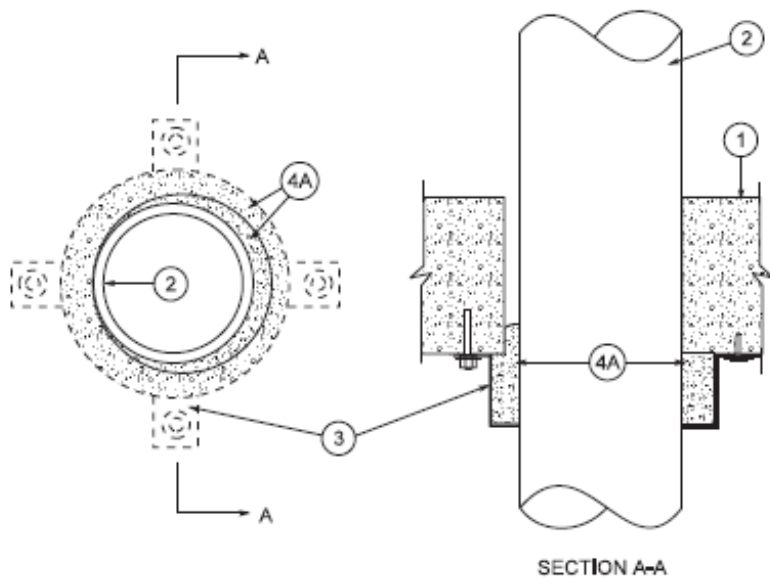
All joint systems shall be subjected to a cycling test conducted in accordance with ASTM E1966 prior to the fire resistance and hose stream test. Three (3) movement ratings are available – Type 1, Type 2 and Type 3.

## Fire Stop Design 211

**F-Rating = ½ and 1 ½ HR**

**T-Rating = 0 HR**

**$T_{FM}$ -Rating = ½ and 1 ½ HR**



1. FLOOR OR WALL. Min 4 1/2 in. (114 mm) thick lightweight or normal weight concrete, or min. 8 in. (203 mm) thick concrete block wall.
2. NONMETALLIC PIPE. Various dia. Schedule 40 (or heavier) solid-core polyvinyl chloride (PVC) pipe in openings (see table below for sizes and ratings). One penetrating item per opening. Penetrating item may be centered in opening or may be firmly butted against the concrete.
3. STEEL COLLAR. Nominal 2 in. (51 mm) deep collar fabricated from coils of precut 0.017 in. (0.43 mm [28 ga.]) galvanized steel incorporating four 1 1/4 in. (32 mm) wide by 2 1/8 in. (54 mm) long anchor bolt tabs on the outside of the collar for securement to the concrete. The anchor bolt tabs shall be bent 90° outward for securement. The inside of the collar incorporates retainer tabs 5/8 in. (16 mm) wide tapering down to 1/4 in. (6 mm) after 3/4 in. (19 mm) of length. The retainer tabs are bent 90° inward to retain the annular space around the pipe and to retain the sealant (Item 4A). A nominal 1/2 in. (12 mm) wide stainless steel hose clamp shall be secured to the collar at its mid height. The collar is secured to the concrete using either 1/4 in. (6 mm) dia. Hilti Qwik Bolt II expansion anchors or 0.0145 in. (0.37 mm) dia. by 1 1/4 in. (32 mm) long Hilti Powder Actuated Fasteners with steel washers 1 7/16 (37 mm) dia. by 1/16 in. (1.6 mm) thick. In floors, the collar is installed on the bottom surface of the concrete slab. In walls, the collars are installed on each surface.
4. FIRE STOP COMPONENTS.
  - a. Fill Material. Acrylic based intumescent sealant is installed to completely fill the collar and all annular spaces to the min depth as shown below.

Max Nominal Pipe Dia. in. (mm)	Max Nominal Opening Dia. in. (mm)	Depth of fill in. (mm)	F-Rating (hr)	T-Rating (hr)	T <sub>FM</sub> -Rating (hr)
4 (102)	5 (127)	2 (51)	1 1/2	0	1 1/2
6 (152)	7 (170)	1 (25)	1/2	0	1/2

For wall systems, the system described above shall be installed symmetrically on both sides of the wall.

**Hilti AG**  
Feldkircherstrasse 100, Box 333 , 9494 Schaan , Liechtenstein

Design Component	Product	Product Type	Listing Country	Certification Type	Class of Work
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4a	CP 611A High Performance Intumescent Firestop Sealant	Fill Material	Liechtenstein	FM Approved	4990-Penetration Seal & Fire Stop
4a	FS-ONE MAX Intumescent Firestop Sealant	Fill Material	Liechtenstein	FM Approved	4990-Penetration Seal & Fire Stop
4a	CFS-IS P High Performance Intumescent Firestop Sealant	Fill Material	Liechtenstein	FM Approved	4990-Penetration Seal & Fire Stop

**Hilti Inc.**  
**7250 Dallas Pkwy, Legacy Tower, Suite 1000, Plano, Texas 75024, USA**

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**Fire Stop Design 211**

<b>Category:</b>	Penetration Seal
<b>Design Number:</b>	211
<b>Ratings:</b>	1/2, 1 1/2, 0, 1/2, 1 1/2
<b>Construction:</b>	Floor, Wall
<b>Penetrant:</b>	Plastic Pipe
<b>Floor/Wall Material Type:</b>	Concrete
<b>Joint Type:</b>	na
<b>Min. Wall Thickness (in.):</b>	4 1/2
<b>Min. Wall Thickness (mm):</b>	114
<b>Min. Floor Thickness (in.):</b>	4 1/2
<b>Min. Floor Thickness (mm):</b>	114
<b>Class of Work:</b>	4990-Penetration Seal & Fire Stop