

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.

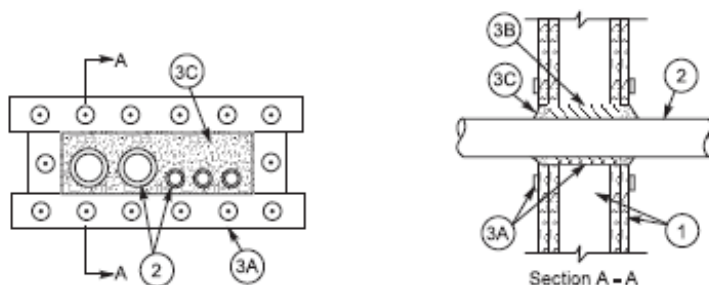
All joint systems shall be subjected to a cycling test conducted in accordance with ASTM E1966 prior to the fire resistance and hose stream test. Three (3) movement ratings are available – Type 1, Type 2 and Type 3.

Fire Stop Design 678

F-Rating = 1/2 and 1 HR

T-Rating = 0 HR

TFM-Rating = 1/2 and 1 HR



1. **WALL ASSEMBLY.** Min 5 in. (127 mm) thick drywall partition, min 2 hour fire rated. Steel or wood stud framing with two layers of 5/8 in. (16 mm) thick, Type X gypsum wallboard at each side of wall, vertically applied with all joints staggered and secured to

studs with fasteners.

2. **METAL PIPES OR CONDUITS.** Nominal 2 in. (51 mm) dia. (or smaller) Schedule 5 steel pipe, rigid steel conduit or electrical metallic tubing.

Max wall opening 11 in. (279 mm) wide by 3 1/4 in. (83 mm) high with max of five penetrations. Only two of the penetrations may have a greater dia. than 1 in. (25 mm). The space between the penetrating item and the opening shall be 1/4 in. (6 mm) to 3/4 in. (19 mm) and 1/2 in. (12 mm) min between items.

Both F-Rating and TFM-Rating are 1/2 hour or 1 hour if the nominal dia. of each pipe or conduit is 1 in. (25 mm) or less.

3. **FIRE STOP COMPONENTS.**

- a. **Steel Sleeve.** Rectangular-shaped sleeve, 5 in. (127 mm) deep with 2 in. wide flanges fabricated of 0.019 in. (0.48 mm, No. 28 GSG) thick galvanized steel. Friction fitted into opening and secured at each side of wall with 1 1/2 in. (38 mm) long, Type G drywall screws and fender washers spaced 2 3/4 in. (70 mm) o.c.
- b. **Forming Material.** Min 4 in. (102 mm) thick ceramic fiber insulation of min 6 pcf (96 kg/m³) density. Tightly packed within opening and recessed 1/2 in. (13 mm) from surface at each side of wall.
- c. **Fill Material.** Sealant applied within opening to a min depth of 1/2 in. (13 mm) at each side of wall. Additional sealant applied around the penetrating items to a min depth of 1/4 in. (6 mm). Prior to the installation of the steel sleeve, a 1/2 in. (13 mm) dia. bead shall be applied at the perimeter of the opening.

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

Design Component	Product	Product Type	Listing Country	Certification Type	Class of Work
3c	CFS-S Sil GG	Misc Firestopping Devices	United States of America	FM Approved	4990-Penetration Seal & Fire Stop
3c	CFS-S Sil SL	Misc Firestopping Devices	United States of America	FM Approved	4990-Penetration Seal & Fire Stop

Fire Stop Design 678

Category: Penetration Seal
Design Number: 678
Ratings: 1/2, 1, 0, 1/2, 1
Construction: Wall
Penetrant: Conduit, Steel Pipe
Floor/Wall Material Type: Gypsum Drywall
Joint Type: na
Min. Wall Thickness (in.): 5
Min. Wall Thickness (mm): 127
Product Type: Fill Material
Class of Work: 4990-Penetration Seal & Fire Stop