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Introduction

When people think of Hilti, they think of industry-leading drilling and fastening technology. Firestop has become a key focus within the company and has helped us become the Number 1 manufacturer and supplier in both North America and the World. With a clear commitment to this industry through extensive product development, testing, market analysis and understanding customer needs, Hilti has become the leading manufacturer in firestop technology and product offering in the world.

Hilti’s involvement in fire protection products is a core aspect of our contribution to the construction industry. Hilti develops products to create openings in wall and floor assemblies (drilling or core rigs), and products to secure the penetrating items through these assemblies (installation systems, anchors). Providing a product to “seal-up” these openings is a natural fit. The type of product used to seal these openings will depend on the assembly penetrated. If fire-rated, then a firestop product must be used. If a non-rated assembly is penetrated, then foam may be utilized. Hilti can offer a variety of solutions for all of our customer’s penetrating needs.

In order to maintain market leadership in North America, there are specific areas that must be understood by Hilti employees and our partners installing firestop; the Professional Firestop Installer.

These areas include:

- Fire protection
- Fundamentals in firestopping (definitions)
- How to use the UL Directory effectively
- Choosing the correct firestop product
- Hilti Engineering Judgment process
- Test laboratories, organizations and associations
- Specifications
- Building Codes and Test Standards
- Key markets for firestop opportunity
- Hilti firestop products
- Frequently asked questions

All of these topics are found in this Firestop Resource Guide. By familiarizing yourself with the topics presented in this guide areas and understanding the competition, you will position yourself and your company as the expert.
Introduction to Fire Protection

Even though it is important to us, firestop is a small portion of the overall concept known as “Fire Protection”. It is essential to understand how and where firestop fits inside the large picture when discussing the importance of firestop to anyone within the building construction industry.

What is fire protection?

Fire protection is a combination of three primary strategies used to mitigate damages and save lives when a fire occurs. Once a fire has started, the first opportunity to reduce or limit the impact comes in the selection of burnable items (i.e. the choice of materials contained in a structure and the type of structure constructed). Both the growth of the fire and its spread along vertical and horizontal surfaces may be slowed through such design.

Active fire protection systems provide the next opportunity. Active fire protection systems may be defined as a system that provides a service or activates when a fire is detected. Automatic detection systems will tend to activate first, followed by automatic water sprinklers or other automatic suppression systems. The design and effect of these systems will vary based upon the type of structure built, local building code enforced at the time of construction and use of the building (occupancy type).

Passive fire protection provides the final opportunity to impede fire and smoke, and plays an essential role in providing automatic suppression systems with a manageable fire to act on. Passive fire protection is designed to contain fire and smoke in zones or compartments. Passive fire protection system may be defined as “working” or performing their role of protection whether a fire has occurred or not.

It is important to remember that fire protection requires the development of an integrated system involving all of the previously mentioned systems. No one system should be considered disposable or better than the other. It is important that all systems work together to provide the needed protection of both people and property.

Why does fire protection exist?

There are several reasons why fire protection exists. First, to protect the lives of individuals located in various occupancies. Whether they work, play or live in these buildings, if a fire breaks out, they must be offered the proper protection to escape unharmed.
A second reason for fire protection is to contain a fire in its area of origin. By containing the fire, several things can be accomplished. First it will minimize the loss of property due to fire. The fire will only consume and/or damage items found in the area of origin only. This savings could be substantial when considering a high-rise building or plant facility with high-dollar equipment used for production. Containing a fire is also the best scenario for firefighters. The ability to extinguish a fire that has spread to two or more floors is reduced dramatically versus one that is contained to one zone on a single floor. This also means that fewer fire fighting personnel are needed and the degree of risk decreased.

Insurance costs for owners/occupants are another reason for fire protection. An occupancy without the proper fire protection may have a policy written with higher premiums. These premiums over time may add up to three times the amount than it would take to outfit the occupancy with the correct fire protection systems. Even worse, an owner/occupant may not find an insurance company willing to write them a policy, thus risking their entire business on the hopes that a fire will not occur.

Building owners have three basic interests in relation to building performance:

1. Preservation of safety
2. Preservation of capital
3. Preservation of function

**What types of fire protection exist?**

There are three areas of fire protection that exist in construction today:

- Detection and Alarm
- Automatic Suppression
- Compartmentalization

**Detection and Alarm (active protection)** – Fire detection systems are needed so that automatic or manual fire suppression will be initiated; any other fire protection systems will be activated (i.e. automatic fire doors, notification of local fire department, internal alarm system); and occupants will have time to move to safe locations, typically outside of the building.

**Automatic Suppression (active protection)** – For nearly a half century, automatic fire sprinklers have been an important single system for automatic control of hostile fires in buildings. Some advantages of automatic fire sprinklers include: operation directly over the fire itself; not affected by smoke or toxic gases; visibility is not an issue for these...
systems. Other automatic extinguishing systems (i.e. carbon dioxide, dry chemical, clean system agents (halon replacement), and high expansion foam), may be used to provide protection for specific portions of a building where they are particularly suited.

Compartmentalization (passive protection) – Barriers, such as walls, partitions, and floors, that separate building spaces. These barriers also delay or prevent fire from propagating from one space to another. The effectiveness of a barrier is dependent upon its inherent fire resistance, the details of construction, and the penetrations – such as doors, windows, ducts, pipe chases, and electrical raceways. Although the hourly ratings of fire endurance do not always represent the actual time the barrier can withstand a building fire, un-penetrated fire-rated barriers seem to perform rather well. On the other hand, it is quite common for fire-rated barriers to fail because of non or incorrectly firestopped penetrations.

What is the leading killer in fires?

Smoke and toxic gases are the leading killers of fires victims. Roughly 70% of all building-related fire deaths are directly related to by products of combustion. Death often results from oxygen deprivation in the bloodstream, caused by the replacement of oxygen in the blood hemoglobin by carbon monoxide. Smoke, besides oxygen deprivation, indirectly contributes to the number of deaths. Dense smoke can obscure the visibility, irritate the eyes, and cause fear in individuals caught in a fire.
### Terms & Definitions

**Active Fire Protection**
A system or device that is designed to alert occupants, aid in extinguishment, or limit the spread of fire (e.g. sprinkler system or alarm system).

**Annular Space (Annulus)**
The distance between a penetrating item and the surrounding opening.  
*Example:* a pipe with an outside diameter of 4.5" centered in a 6" diameter hole has an annular space of $(6-4.5) \div 2 = 3/4"$.

**Annular Space Requirements Per NFPA Std. #13**
In section 4-5.4.3.4, it requires that sprinkler pipes in seismic areas, have a minimum annular space of 1-inch for pipes 1" through 3-1/2" and 2-inches for pipes 4" and larger. Exceptions to this standard do exist. Please consult NFPA Standard #13 for details.

**Assembly Rating**
The combination of the T and F rating in a joint assembly. T equals F.

**ASTM E 814**
“Standard Method of Fire Tests of Through-Penetration Firestops”

**Authority Having Jurisdiction**
The organization, office, or individual responsible for approving equipment, an installation, or procedure.

**Backing Material (Forming Material, Packing Material)**
Material used in firestop systems (e.g. mineral wool, backer rod, CF 128 foam) to set the depth and provide support for the fill, void cavity material.

**Building Officials and Code Administrators (BOCA)**
Publishes National Building Code (NBC). It is principally used in the Midwest and Northeastern portions of the United States.

**Closed Piping System**
Piping system which is completely enclosed, usually carrying fluids under pressure. Examples: hot/cold water distribution, sprinkler piping, chilled water supply and return.

**Combustible**
Capable of undergoing combustion.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>cULus Mark</td>
<td>An Underwriters’ Laboratories certification mark that indicates compliance with both Canadian and U.S. requirements.</td>
</tr>
<tr>
<td>Draftstopping</td>
<td>Building materials installed to prevent the movement of air, smoke, gases and flame to other areas of the building through large concealed passages, such as attic spaces and floor assemblies with suspended ceilings or open web trusses.</td>
</tr>
<tr>
<td>Endothermic Reaction</td>
<td>Absorption of energy during a chemical reaction. Thus feeling cool to the touch.</td>
</tr>
<tr>
<td>Exothermic Reaction</td>
<td>The production of energy during a chemical reaction. Thus feeling warm to the touch.</td>
</tr>
<tr>
<td>F Rating</td>
<td>The time a firestop system prevents the passage of flame through an opening and successfully passes the hose stream test as determined by ASTM E-814 and UL 1479.</td>
</tr>
<tr>
<td>Fill, Void or Cavity Material</td>
<td>A firestop material (e.g. sealant, putty, mastic, etc.)</td>
</tr>
<tr>
<td>Fire Barrier</td>
<td>A continuous membrane, either vertical or horizontal, such as a wall or floor assembly that is designed and constructed with a specified fire resistance rating to limit the spread of fire and restrict the movement of smoke.</td>
</tr>
<tr>
<td>Fire Blocking</td>
<td>Building materials installed to resist the free passage of flame to other areas of the building through concealed spaces.</td>
</tr>
<tr>
<td>Fire Compartment</td>
<td>A space, within a building that is enclosed by fire barriers on all sides including the top and bottom.</td>
</tr>
<tr>
<td>Fire Damper</td>
<td>A damper arranged to seal off airflow automatically through part of an air duct system, so as to restrict the passage of heat.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Fire Partition</td>
<td>A vertical assembly of materials, having protected openings, designed to restrict the spread of fire.</td>
</tr>
<tr>
<td>Fire Resistance Rating</td>
<td>The period of time a building or buildings component maintains the ability to confine a fire or continues to perform a structural function or both. This is usually determined or measured by ASTM E-119 test standard.</td>
</tr>
<tr>
<td>Fire Resistive Joint System</td>
<td>A system consisting of specified materials designed and tested to resist the passage of flame and hot gases sufficient to ignite cotton waste for a prescribed period of time in accordance with UL 2079.</td>
</tr>
<tr>
<td>Fire Wall</td>
<td>A fire resistance rated wall, having protected openings, that restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall.</td>
</tr>
<tr>
<td>Firestop System</td>
<td>A specific construction consisting of a fire-rated wall or floor assembly, a penetrating item or items passing through an opening in the assembly, and the materials designed to help prevent the spread of fire through the openings.</td>
</tr>
<tr>
<td>Hose Stream Test</td>
<td>This portion of ASTM E-814 (UL 1479) is done to represent the structural integrity of the firestop system after it is exposed to heat.</td>
</tr>
<tr>
<td>International Conference of Building Officials (ICBO)</td>
<td>Publishes Uniform Building Code (UBC). It is principally used in the Western portions of the United States.</td>
</tr>
<tr>
<td>Intumescent</td>
<td>A term describing materials which is designed to expand significantly (typically 2 to 10 times original volume) when exposed to heat. Intumescent materials are often used as firestops, particularly around combustible penetrations.</td>
</tr>
</tbody>
</table>
### Joint System
A joint system is a specific construction consisting of adjacent wall and/or floor assemblies and the materials designed to help prevent the spread of fire through a linear opening between the wall and/or floor assemblies.

### L Rating
An optional measurement of the rate of air leakage through test samples resulting from a specified air pressure difference applied across the surface of the test samples.

### Membrane Penetration
An opening made through one side (wall, floor or ceiling membrane) of an assembly.

### Membrane Penetration Firestop
A material, device or construction installed to resist, for a prescribed time period, the passage of flame and heat through openings in a protective membrane in order to accommodate cables, cable trays, conduit, tubing, pipes or similar items.

### Noncombustible
A material that, in the form in which it is used and under the conditions anticipated, will not aid combustion or add appreciable heat to an ambient fire.

### Non-Rated System
An assembly that has not been tested, designed, or assigned an hourly rating in accordance with ASTM E-119.

### Passive Fire Protection
A device or system designed to confine fire and smoke in zones (e.g. compartmentalization).

### Penetrant (Penetrating Item)
Any item passing completely though a wall or floor, such as pipes, conduits, cables, etc.

### Percent Fill
The cross-sectional area of an opening that is occupied by a penetrating item(s). Typically found in UL Systems containing cables. Percent fill may be calculated with the following formulas:

\[
\text{Percent Fill} \% = \left( \frac{A_w}{A_o} \right) \times 100 \quad N = \text{number of wires}
\]

\[
\text{Area of Wire} (A_w) = [3.14 \times (r_c^2)] \times N \quad r_c = \text{radius of wire}
\]

\[
\text{Area of Opening} (A_o) = 3.14 \times (r_o^2) \quad r_o = \text{radius of opening}
\]
Point of Contact (Penetrating Item)  
When listed UL system drawing allows penetrating item to “touch” edge of opening.

Shop Drawings  
Construction drawings generated by contractors, sub-contractors, or suppliers to communicate what they plan to furnish on a project to meet the terms of their contract. They differ from the contract drawings in that contract drawings are generated by the design firm and provided to the contractors and suppliers. Shop drawings are often marked-up contract drawings, but the supplier or contractor can also generate them from scratch. Shop drawings are part of the submittals, which are prepared so that the contractor can gain approval to proceed. They are reviewed and approved by the appropriate design professional. Areas where shop drawings are used include structural steel, miscellaneous metals, pre-cast concrete, and in some cases firestop.

Smoke Barrier  
A continuous membrane, either vertical or horizontal, such as a wall, floor, or ceiling assembly, that is designed and constructed to restrict the movement of smoke. A smoke barrier might or might not have a fire resistance rating. Such barriers might have protected openings.

Smoke Compartment  
A space within a building enclosed by smoke barriers on all sides, including the top and bottom.

Smoke Damper  
A listed device installed in ducts and air transfer openings that is designed to resist the passage of air and smoke. The device is installed to operate automatically, controlled by a smoke detection system, and where required is capable of being positioned manually from a remote command station.

T Rating  
The time for the temperature of the unexposed surface of the firestop system or any penetrating item to rise 325°F above its initial temperature as determined by ASTM E-814 and UL 1479.
<table>
<thead>
<tr>
<th><strong>Through Penetration</strong></th>
<th>Penetrating items passing entirely through both protective membranes of bearing walls required to have a fire-resistance rating and wall requiring protected openings.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type I Construction</strong></td>
<td>Construction in which the structural members are noncombustible (formerly referred to as fire resistive).</td>
</tr>
<tr>
<td><strong>Type II Construction</strong></td>
<td>Construction in which the structural elements are entirely of noncombustible or limited combustible materials permitted by the code and protected to have some degree of fire resistance (formerly referred to as noncombustible).</td>
</tr>
<tr>
<td><strong>Type III Construction</strong></td>
<td>Construction which all or part of the interior structural elements may be of combustible materials or any other material permitted by the particular building code being applied (formerly referred to as exterior protected combustible or ordinary construction).</td>
</tr>
<tr>
<td><strong>Type IV Construction</strong></td>
<td>Construction in which structural members i.e. columns, beams, arches, floors, and roofs, are basically of unprotected wood (solid or laminated) with large cross-sectional areas (formerly referred to as heavy timber).</td>
</tr>
<tr>
<td><strong>Type V Construction</strong></td>
<td>Construction which the structural members are entirely of wood or any other material permitted by the code being applied (formerly referred to as wood frame).</td>
</tr>
</tbody>
</table>

**UL**
UL is an abbreviation for Underwriters Laboratories Inc., a not for profit independent organization testing for public safety.

**UL 1479**
“Fire Tests of Through-Penetration Firestops” (equivalent to ASTM E-814).

**UL 2079**

**UL Fire Resistance Directory**
UL publication which contains descriptions and ratings of firestop systems.
<table>
<thead>
<tr>
<th><strong>Vented (Open) Piping System</strong></th>
<th>Piping system which is atmospherically vented by design to prevent backflow or vacuum. Examples: DWV piping (drain, waste or vent).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>W Rating</strong></td>
<td>An optional rating for through penetration firestop systems. Determines the effectiveness of a firestop system to restrict the flow of water. Class 1-rated firestops have been shown to resist up to 3 feet of water column up to 72 hours.</td>
</tr>
</tbody>
</table>
Fundamentals in Firestopping

In order to truly understand the opportunities that firestop offers, it is important to understand how firestop fits into the fire protection equation.

Why is Firestopping so Important?

As mentioned in the Introduction to Fire Protection chapter, Smoke and Toxic Gases are the leading killers of fire victims. In order to reduce the number of deaths associated with fires, smoke and toxic gases along with fire must be contained (compartmentalization) in the area of origin.

In a study performed by The National Fire Protection Association, locations of fire victims were plotted as shown below:

<table>
<thead>
<tr>
<th>Victim Locations</th>
<th>Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intimate with ignition</td>
<td>16.3%</td>
</tr>
<tr>
<td>Not intimate, but in same room</td>
<td>24.6%</td>
</tr>
<tr>
<td>Same floor, but not same room of origin</td>
<td>30.7%</td>
</tr>
<tr>
<td>In building, but not same floor</td>
<td>26.4%</td>
</tr>
<tr>
<td>Outside building</td>
<td>1.0%</td>
</tr>
<tr>
<td>Unclassified</td>
<td>1.1%</td>
</tr>
</tbody>
</table>


More than half of all fatalities occurred outside the room of origin. These statistics verify the need for fire-rated walls, floors, and ceilings. When they are penetrated, they need to be properly sealed with a firestop material. During the time period of this study (1994-1998), there were a total of 18,719 civilian deaths and 18.7 billion dollars in direct property damage.

During a fire, smoke can travel a significant distance. In a developing fire, smoke will travel 50 -100 feet per minute. In a fire that has developed, smoke may travel as fast as 300 feet per minute. When survivors of fires were interviewed, 47% stated that they could not see more than 12 feet. When looking at the Life Safety Code (NFPA 101), the average recommend maximum travel distance to an exit is 200 feet. Traveling 200 feet during a fire, when you could only see 12 feet at a time would be an extremely difficult task.
**Benefits of Compartmentalization**

With the use of fire-rated walls/floors and firestop systems, we can achieve the goals of compartmentalization. By achieving this goal we can:

- Limit the spread of a fire once it begins
- Minimize (or reduce) the risk of loss of an occupant and property
- Protect others located in the same building as fire, but different area
- Aid in the attempt to extinguish fire
- Provide a protected means of access to fire department personnel
- “Protect in Place” where it is difficult or impossible to move occupants under fire conditions. (Hospitals, Jails, etc.)


“The protection of vertical openings is one of the most significant factors in the design of multi-story buildings, from the standpoint of life safety and exit design. Because of the natural tendency of fire to spread upward in a building, careful attention to details of design and construction are required to minimize this effect. One of the greatest hazards to life safety results from fires that start below the occupants and the means of egress. Similarly, fires in multistory buildings may result in smoke spread into enclosed exits before evacuation.”

**Large Fire Data:**

**Example #1: MGM Grand Hotel – Las Vegas, NV**

An example of the importance of firestop, one can examine the data from the MGM Grand Hotel fire which occurred in Las Vegas. This fire occurred on November 21, 1980. The fire was discovered by a hotel employee who entered an unoccupied deli/restaurant located on the casino level of the hotel. The fire quickly reached flash-over and spread through the casino area. The heat and smoke rapidly extended from the casino area through the seismic joints, elevator shafts, and plumbing chases throughout the 21 residential floors of the hotel. The heat was intense enough on the 26 floor, that the sprinkler heads were activated. The fire resulted in 85 deaths. Only 18 bodies recorded were on the casino level. The rest were located on the 16 floor or above. In this example, roughly 80% of the fatalities occurred outside the room of fire origin.
Example #2: One Meridian Plaza – Philadelphia, PA

On the night of February 23, 1991 a fire broke out in the 38-story Meridian Bank Building in downtown Philadelphia. The fire was reported to the fire department at 8:40 pm and burned for more than 19-hours. This fire is one of the largest high-rise office building fires in American history, completely consuming 8 floors of the building.

This fire claimed the lives of three Philadelphia firefighters and caused an estimated $100 million in direct property loss. The litigation that resulted from this fire topped $4 billion in civil damages.

The fire started in a vacant 22\textsuperscript{nd} floor office where a pile of linseed oil-soaked rags were left by a contractor. Due to incomplete fire detection, the fire was well advanced before any notification was given. Unprotected penetrations in fire-resistant rated assemblies and the absence of fire dampers in ventilation shafts permitted the fire and smoke to spread vertically and horizontally. Unprotected opening in the walls of the 22\textsuperscript{nd} floor electrical closet permitted the fire to impinge on the primary and secondary electrical system causing the building to completely lose power.

Due to many factors, loss of electrical power, water supply, lack of proper protection of openings, and lack of proper detection the fire burned for more than 19-hours and extended up to the 30\textsuperscript{th} floor before being extinguished.

What is Firestopping?

A process whereby certain materials, some of them specially manufactured, are used to resist (or stop) the spread of fire and its byproducts through openings made to accommodate penetrations in fire-rated walls, floors and floor/ceiling assemblies.

What is a Through-Penetration Firestop Systems?

A completely installed Through-Penetration Firestop System includes a fire-rated assembly (wall, floor, floor/ceiling), an opening in the assembly, penetrating item (or items), a firestop material, any required support or installation items (such as a sleeve, mineral wool, etc.) and consideration of annular space and hole size.
An Example of a Firestop System

SECTION A-A
WALL ASSEMBLY

SECTION A-A
THROUGH - PENETRATION (HOLE)

SECTION A-A
THROUGH PENETRATION

SECTION A-A
MEMBRANE PENETRATION
AN EXAMPLE OF A FIRESTOP SYSTEM

FRONT VIEW

SECTION A-A

2 LAYERS OF 5/8" UL CLASSIFIED GYPSUM WALLBOARD

FIRE STOPPING SEALANT
PENETRATING ITEM

MINERAL WOOL
BACKING MATERIAL

WIRE MESH/STEEL SLEEVE

THIS EXAMPLE IS OF A FIRE-RATED GYPSUM WALL PENETRATED WITH A PIPE. THIS SAME TYPE OF PENETRATION MAY OCCUR IN SEVERAL LOCATIONS, MANY OF WHICH ARE DISCUSSED LATER. NOTE THAT THIS DRAWING USES A SLEEVE AND A BACKER MATERIAL AS PART OF THE SYSTEM.
Common Penetrating Items

The following section is a list of common penetrating items found in the building construction industry. Typical UL test reports and systems may be found for the item listed below:

Metallic Pipe (Insulated and Non-Insulated)
- Steel
- Copper
- Conduit
- EMT
- Insulation types (Glass fiber, AB/PVC)

Plastic Pipe (Closed and Open)
- PVC (Polyvinyl Chloride)
- CPVC (Chlorinated Polyvinyl Chloride)
- ABS (Acrylonitrile Butadiene Styrene)
- FRPP (Fire Retardant Polypropylene)
- PEX (Cross-link Polyethylene)

Cables (Electrical and Telecommunication)
- Power (Romex, SER)
- Signaling and Control (Fire Alarm)
- Telephone
- Television (RG 59, 62A)
- Computer
- Fiber-optic

Ducts
- Round and Rectangle
- Non-Dampered
- Dampered (consult damper manufacturer for correct installation)

Electrical Busways and Cable Trays
- Open and closed “ladder” cable trays
- “Spine trays”
- Bus bars

Most common applications have single items penetrating the opening. These are some of the most basic applications, and several tested systems exist to solve these applications. However, there are instances where applications consist of multiple penetrating items contained in one
large opening. These applications are sometimes difficult to solve with a UL System, and custom drawings are needed (Engineered Judgments). These will be discussed in a later chapter.

Common Fire Rated Construction

Walls
- Solid Concrete - Precast or Poured in Place
- Concrete Masonry Unit (CMU) - Concrete Block
- Gypsum Wallboard over Steel or Wood Studs

Floors
- Solid Concrete
- Hollow-Core Concrete
- Concrete over Steel Deck (Fluted)
- Wood Frame Floor/Ceiling Assembly

The above mentioned are typical assemblies found in the UL Fire Resistance Directory with fire ratings ranging from 1/2-hour to 4-hours. There will be cases where penetrations are required to have firestop (by the local fire marshal/inspector), and they pass through a non-rated or non-tested assembly. In these cases, the best Hilti can provide is a drawing showing how our products will perform when installed with rated assemblies. A prime example of this situation is fire-rated gypsum wall intersects with a non-rated roof assembly. In this case, an engineering judgment may be supplied – based upon review of the application. This will demonstrate that 1/8" depth of CP 672 Speed Spray over 4 pcf. mineral wool will last 1 or 2-hours.

Firestop Market Influences
- Model/Local Building Codes
- Federal Regulations
- Local Building Inspectors
- Plan Examiners
- Fire Marshals and other Fire Officials
- Testing Laboratories (UL)
- Standard Organizations (ASTM, NFPA)
- Insurance Underwriters
- Specifying Architects
- Specifying Engineers
- Consultants and Inspection Services
- Contractors/Installers
• Building Owners
• Firestop manufacturers, Representatives and Distributors

All of the above have some influence whether firestop will or will not be used and to what degree the UL listings will be followed. One key to selling the firestop concept is to target these key decision makers in your area. By introducing yourself and explaining your function - you are a professional in the firestop arena. This will lead to the proper use of firestop and additional sales.
# Test Standards Associated with Firestop

When considering firestop products, there are multiple test standards that may be referenced. These include:

<table>
<thead>
<tr>
<th>Test Standard</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM E 814 or UL 1479</td>
<td>“Fire Tests of Through-penetration Firestops”</td>
</tr>
<tr>
<td>ASTM E 84, UL 723 or NFPA 255</td>
<td>“Surface Burning Characteristics of Building Materials”</td>
</tr>
<tr>
<td>ASTM E 90</td>
<td>“Standard Practice for Use of Sealants in Acoustical Applications”</td>
</tr>
<tr>
<td>ASTM E 119 or UL 263</td>
<td>“Fire Tests of Building Construction and Materials”</td>
</tr>
<tr>
<td>ASTM E 136</td>
<td>“Behavior of Materials in a Vertical Tube Furnace at 750 °C” (Combustibility)</td>
</tr>
<tr>
<td>ASTM E 1399</td>
<td>“Tests for Cyclic Movement of Joints”</td>
</tr>
<tr>
<td>ASTM E 595</td>
<td>“Tests for Outgassing in a Vacuum Environment”</td>
</tr>
<tr>
<td>ASTM G 21</td>
<td>“Determining Resistance of Synthetic Polymeric Materials to Fungi”</td>
</tr>
</tbody>
</table>

Many of these test standards are only utilized in specific applications / environments where firestop may be installed. As an example, ASTM E 814 is the basic test standard where a firestop is evaluated for its performance under fire conditions. This is the basis to determine if a product will achieve firestop status. In contrast, ASTM E 595 is a test standard where all types of building construction materials are evaluated for their ability to be used in a “clean environment”. The need for this is found in high technology environments where products are manufactured (i.e. computer chip plant).

The need for product testing to many of these standards, if applicable, will be found in the Specification book created for each jobsite by the Architect/Engineer.
ASTM E 814 (UL 1479)
Fire Tests of Through-Penetration Firestops

During this testing process, the firestop system (material) is evaluated using three specific sets of criteria. These include:

- Fire exposure
- Temperature data
- Hose stream test

**Fire Exposure** data is merely how long a firestop system can prevent fire from passing through the system to the non-fireside of the test assembly. Once a flame is discovered on the non-fireside, the test is stopped and then assigned an “F-rating” by rounding down to the last completed hour (as long as the system passes the hose stream part of the test – see below). Common ratings include 1, 2, 3 or 4-hours.

During the tests, a standard time/temperature curve is followed:

- 1000 °F at 5 minutes
- 1300 °F at 10 minutes
- 1550 °F at 30 minutes
- 1700 °F at 1 hour
- 1850 °F at 2 hours
- 2000 °F at 4 hours

To put this into perspective, a group of fire marshals studied a fire that burned for more than 19 hours at the One Meridian Plaza in Philadelphia, and the temperature never exceeded 1500 °F. This is an indication that the current standard is adequate.

**Temperature Data** is taken throughout the test by thermocouple readings on the non-fireside of the test assembly. These readings determine what the “T-rating” of the system will be. The T-rating is the time for the temperature of the unexposed surface of the firestop system or any penetrating item to rise 325 °F.
above its initial temperature as measured at the beginning of the test. As an example, at the start of the test the room temperature is 75 °F. The target temperature for the T-rating is 400 °F.

Readings are taken at the following locations:

Legend:

A – At a point on the surface of the firestop, 1” from one through-penetrating item for each type of penetrating item
B – At a point on the firestop surface at the periphery of the firestop.
C – At a minimum of three points on the firestop surface applied equi-distant from a penetrating item and the periphery.
D – At one point on any frame that is installed about the perimeter of the opening.
E – At one point on the unexposed surface of the wall or floor that is a minimum 12” from any opening.
F – At one point on each type of through-penetrating item – taken 1” over the surface of the firestop system.

The rating is intended to represent how long it will take before a combustible item on the non-fireside will catch on fire from heat transfer.

The **Hose Stream** section of the test is done after the fire exposure part of the test is completed. It is often mis-understood that this part of the test is done to represent what would happen if the fire department were to hit the firestop system while trying to extinguish the fire. However, this was not the intent of the
hose stream. The hose stream test is conducted to represent the structural integrity of the firestop system after its exposure to heat. Many things could happen during a fire including increased pressures in the room of origin, as well as items falling on the penetrating item or impacting the firestop system. The firestop system must continue to work even under these conditions.

Below is a pressure and duration chart for the hose stream.

<table>
<thead>
<tr>
<th>Hourly Fire Rating Time in Minutes</th>
<th>Water Pressure (psi)</th>
<th>Duration of Hose Stream (sec./sq. ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>240 ≤ time &lt; 480</td>
<td>45</td>
<td>3.00</td>
</tr>
<tr>
<td>120 ≤ time &lt; 240</td>
<td>30</td>
<td>1.50</td>
</tr>
<tr>
<td>90 ≤ time &lt; 120</td>
<td>30</td>
<td>0.90</td>
</tr>
<tr>
<td>time &lt; 90</td>
<td>30</td>
<td>0.60</td>
</tr>
</tbody>
</table>

In order for a system to be listed by UL, it must pass both the fire endurance (F-rating) and hose stream part of the test. The temperature data is only relevant where building codes require the T to equal the F-rating.

**Other UL Ratings:**

Two other ratings found in the UL 1479 Test Standard are the “L and W-rating”. Each of these ratings are optional and are designed to provide greater information about the product / system performance under fire conditions.

The “**L rating**” is short for the “Leakage Rating”, and represents a relative measure of air leakage through a firestop system prior to the fire testing. There is little comparative data to support the L-Rating’s implications as far as a firestop system is concerned. There is no pass/fail criteria, just a number assigned to the UL listing based upon test performance.

During this test, air movement is measured as it moves through the firestop system at normal, ambient temperature. The firestop system is then subjected to exposure of 400 °F for 30 minutes. A new reading takes place measuring air leakage. This data is provided in CFM/ft² for penetrations or CFM/lin ft for joints.

The “**W rating**” (Water Leakage Test) is designed to represent the water tightness of a firestop system. In order to evaluate this, a test sample is constructed and the firestop system is installed. A water tight cylinder (test chamber) is then installed around the firestop system and penetrating item(s). Water, with a permanent dye, is then placed in the test chamber until 3 feet of water column is created (1.3 psig). A white indicating medium is then placed below the firestop system and the test is run for 72-hours. A firestop system passes if the dyed water does not come in contact with the white medium or the underside of the test sample.
ASTM E 84 (UL 723 & NFPA 255)  
Surface Burning Characteristics of Building Materials

Surface burn tests establish relative flame spread and smoke development ratings of various products used in today’s construction. Items tested include building materials, as well as contents located within a building. The lower the rating classification, the better the products provide some form of fire protection.

The classifications for flame spread and smoke develop involve a broad range of values. These include:

<table>
<thead>
<tr>
<th>Classification</th>
<th>Flame Spread</th>
<th>Smoke Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0 – 25</td>
<td>0 – 450</td>
</tr>
<tr>
<td>B</td>
<td>26 – 75</td>
<td>0 – 450</td>
</tr>
<tr>
<td>C</td>
<td>76 – 200</td>
<td>0 – 450</td>
</tr>
</tbody>
</table>

As an example, a product with a flame spread rating of 20, and a smoke development rating of 25 would be ranked as a “Class A” building material and would be considered low in combustibility. When looking at Codes and Specifications, many require that only products with Flame Spread Ratings of 25 or under and Smoke Ratings of 50 and under are acceptable. ALL of the Hilti firestop products meet these requirements.
UL 2079
Tests for Fire Resistance of Building Joint Systems

This standard is designed for fire resistive building joint systems that do not contain other unprotected openings such as windows. The standard is used to evaluate floor to floor, floor to wall, wall to wall, and top-of-wall (head-of-wall) joints for fire-rated construction.

This standard is very similar to ASTM E 814 (UL 1479) in the way the systems are tested. The same time/temperature curve is used in both standards. There are three main differences for those joint assemblies tested to the 2079 standard:

- Assembly rating vs. F and T ratings
- Cycle requirements
- Hose stream requirements

Firestop joint systems are tested are assigned an Assembly Rating instead of F and T Ratings. An assembly rating combines both the F and T into one rating. The rating with the lowest time will be used for the assembly rating. The T-rating is the major factor in this case, because a failure due to flame passage to the non-fireside, will have caused the temperature to rise well above the 325 + mark. This differs from the through-penetrations in that a system may have a F-rating of 3-hours but a T-rating of 0 (i.e. steel pipe). This system is still listed, where a joint would not.

The second difference is the Cycle Requirements. All joint system are cycled through their intended range of movement prior to fire exposure. This is designed to demonstrate the firestop systems range of movement and the impact it may have on the system to perform under fire conditions. The cycle requirements are defined by ASTM Standard E 1399, Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems. The percentage of movement for the joint system is determined by the firestop manufacturer.

The following table illustrates the amount of cycles and timing based upon movement classifications.

<table>
<thead>
<tr>
<th>Movement classification</th>
<th>Minimum number of cycles</th>
<th>Minimum cycling rate (cycles per minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>500</td>
<td>1</td>
</tr>
<tr>
<td>Class II</td>
<td>500</td>
<td>10</td>
</tr>
<tr>
<td>Class III</td>
<td>100</td>
<td>30</td>
</tr>
</tbody>
</table>
The final difference for firestop joint systems is the requirement of the **Hose stream** test. The only two applications that require the hose stream test after the fire endurance is wall-to-wall and top-of-wall (head-of-wall) joints. The calculation of time and water pressure is the same as the requirements for ASTM E 814 / UL 1479.
ASTM E 2307

This standard is designed for the testing of perimeter fire barrier systems. A perimeter fire barrier system is the perimeter joint protection installed in the space between an exterior wall assembly (typically non-rated) and a rated floor assembly. A perimeter fire barrier system is designed to impede the vertical spread of fire from the floor of origin to the floor above through the perimeter joint. Spread of fire via the exterior of the wall (“leapfrog”) is not considered failure.

The test method utilizes the Intermediate-Scale, Multi-Story Test Apparatus which is a two story test structure consisting of a test room and an observation room. The perimeter joint and exterior wall assembly are exposed to an interior compartment fire as well as a flame plume emitted from an exterior burner.

The following ratings can be obtained through testing of ASTM E 2307:

- **F-rating (Integrity Rating)** – measures the time at which flames penetrates through the perimeter fire barrier system or around its boundaries

- **T-Rating (Insulation Rating)** – measures the time of any TC on the unexposed face of the perimeter fire barrier system or adjacent supporting construction to reach more than 325°F above its initial temperature.

In addition to the above perimeter fire barrier systems may be cycled prior to the fire test. Joints are typically cycled either by moving the floor up and down in relation to the wall (Shear) or left and right (horizontal). After the joint is cycled, the joint is stabilized and tested at its extended width.

Air Leakage (L-Rating) can also be measured through the perimeter fire barrier system. The L-rating is a measurement of the rate of air leakage through the test sample resulting from a specified air pressure difference applied across the surface of the test sample.
ASTM E 136
Behavior of Materials in a Vertical tube Furnace at 750 degree C

This standard is referenced in the building codes and in other documents to define what can or cannot be considered “non-combustible”.

This standard involves a small oven acting as an incinerator. The materials must not lose any weight (other than water weight) and must not exhibit any flaming. In other words, you should not be able to incinerate the material.

The pass/fail criteria relates to how much weight the specimen loses and whether its fuel content raises the air temperature in the oven.
ASTM E 90 – 04
Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

Sound transmission testing simulates the same difficult test parameters used to determine the performance of firestopping products.

Standard outlines the method and procedures for measuring sound loss through assemblies and calculating the overall STC rating. Much like a fire test, the standard evaluates the performance of the whole system (including the assembly itself, joints, gaps and penetrations within the assembly) to measure and determine the Sound Transmission Loss (STL) and the resulting Sound Transmission Classification (STC) rating.

The method defined by ASTM E90 utilizes two separate rooms that are divided by a partition. The assembly to be tested is installed within the dividing partition. One of the rooms is designated as the source room and the other room is designated as the terminating room. The test apparatus is designed so that sound is only transmitted through the test specimen.

Typical ASTM E-90 Configuration

In regards to firestop products, the results are given with an STC for the wall or floor assembly itself, the assembly with the particular penetration unprotected, and a result with the penetration sealed with the firestop material. The higher the STC number the better acoustical properties the material has.
ASTM G 21
Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

ASTM G-21 “Determining Resistance of Synthetic Polymeric Materials to Fungi” is the test method used to determine the effect of fungi on materials. The test is conducted by placing a sample of material on a surface of agar and sprayed with fungi spore. The sample is then covered and incubated at 82 to 86°F (28 to 30°C) and not less then 85% relative humidity for minimum 28 days. The only potential nutrient is the sample itself. If the sample is not attacked by fungi then the material is considered mold and mildew resistant. The material is then given a rating of 0, 1, 2, 3 or 4 with 0 being the best rating (See Table Below).

<table>
<thead>
<tr>
<th>Rating</th>
<th>Observed Growth on Specimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>0*</td>
<td>No Growth – Material does not serve as nutrient for micro organism, it’s fungi static</td>
</tr>
<tr>
<td>1*</td>
<td>Traces of Growth (less than 10%) Material contains nutrients or is only easily dirty, so that only light growth is possible</td>
</tr>
<tr>
<td>2</td>
<td>Light Growth (10 to 30%) Material is not resistant against fungal attack</td>
</tr>
<tr>
<td>3</td>
<td>Medium Growth (30 to 60%) Material is not resistant against fungal attack</td>
</tr>
<tr>
<td>4</td>
<td>Heavy Growth (60 % to complete coverage) Material is not resistant against fungal attack</td>
</tr>
</tbody>
</table>

* A Rating of 1 or less must be confirmed with microscopic observation
ASTM E 119
Fire Tests of Building Construction and Materials

This test standard is used to measure the performance of assemblies such as walls, floors, columns and other building members under fire conditions. The test standard evaluates the ability of the assembly to prevent the passage of fire and hot gasses from one side of the assembly to the other. For load-bearing assemblies and elements, the test also evaluates load-bearing ability under fire conditions. Upon successful completion of the requirements below an assembly is given a 1, 2, 3, or 4-hour assembly rating.

Fire Endurance Test
Fire tests are carried out with furnace temperatures following the standard time-temperature curve. During the fire test the assembly must resist the passage of flame for the desired time period. Time and temperature points within the test furnace are as follows:

- 1000°F (538°C) at 5 min
- 1300°F (704°C) at 10 min
- 1550°F (843°C) at 30 min
- 1700°F (927°C) at 1 hour
- 1850°F (1010°C) at 2 hours
- 2000°F (1093°C) at 4 hours

Temperatures of Unexposed Surfaces
The assembly is not only required to resist fire it must also resist the transfer of heat. Temperature data is recorded during the test by thermocouples placed on the non-fireside of the assembly. The assembly must resist the transfer of heat such that the temperature on the non-fireside does not rise 250°F (139°C) above ambient temperature.
Hose Stream
A hose stream test is also conducted to ensure that the assembly retains sufficient mechanical integrity after being exposed to fire conditions. The assembly must be able to withstand the impact, erosion and cooling effects of the hose stream. The duration and pressure of the hose stream test are as follows:

<table>
<thead>
<tr>
<th>Resistance Period</th>
<th>Water Pressure (psi)</th>
<th>Duration of Application (Sec. /sq. ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 hour and over if less than 8 hour</td>
<td>45</td>
<td>3.00</td>
</tr>
<tr>
<td>2 hour and over if less than 4 hour</td>
<td>30</td>
<td>1.50</td>
</tr>
<tr>
<td>1-1/2 hour and over is less than 2 hour</td>
<td>30</td>
<td>0.90</td>
</tr>
<tr>
<td>1 hour and over is less than 1-1/2 hour</td>
<td>30</td>
<td>0.60</td>
</tr>
</tbody>
</table>
Using the UL Fire Resistance Directory and Omega Point (Intertek) Directory

When would you use the UL Fire Resistance Directory?

- When specifications reference specific UL system numbers for wall and floor assemblies
- When a contractor needs third party documentation on a firestop system
- To view listed systems from all manufacturers
- To help compare the requirements of one firestop system versus another
- To locate a UL system for a particular application located on a jobsite
- Demonstrate your knowledge of firestop systems to a customer, inspector or specified and establish a problem solving status.

When would you use the Omega Point (Intertek) Directory?

- When specifications reference specific curtain wall (perimeter wall) system numbers tested at Omega Point
- When a contractor needs third party documentation on a curtain wall (perimeter wall) firestop system
- To view listed systems from all manufacturers
- To help compare the requirements of one firestop system versus another
- Demonstrate your knowledge of firestop systems to a customer, inspector or specified and establish a problem solving status.

UL Fire Resistance Directory Overview

With the advancement of technology, using the UL Fire Resistance Directory has become easier. The introduction of UL’s website now allows users to enter specific UL Systems in order to view a detailed firestop, wall or floor systems.

Where computers are not available, using the printed UL Fire Resistance Directory is critical. The Fire Resistance Directory consists of the following three volumes:

**Volume I:**
Contains listings for fire rated beams, columns, floors, roofs, walls and partitions. You will use this volume when determining specifics about what hourly rated assemblies are being penetrated on-site. Details about the assembly design may drive the need for a custom drawing (engineering judgment) if changes take place.
Volume IIA and IIB:
Contains tested systems for joint systems, through-penetration firestop systems and electrical circuit protective systems and duct assemblies. This is where you will find all of the listed firestop systems from all manufacturers. Located in the back of Volume IIB is an alphabetical listing of all the manufacturers and their firestop systems.

Volume III:
Contains tested systems for dampers, fire doors, glazing materials and related equipment. This volume is rarely – if ever used in our business.

Omega Point (OPL) Directory of Listed Building Products, Materials and Assemblies Overview

To view the curtain wall assemblies that have been tested and listed, you will utilize Volume II of the Omega Point Directory. These systems are located under the Fire-Resistive Joint Systems section of the book.

Here you will find all design aspects of the firestop system including exterior wall, floor assembly and perimeter joint protection.
Using the UL Fire Resistive Directory: Actual Systems

Shown below is UL System Number CAJ 1226 taken from the UL Fire Resistive Directory. When reading through the text, you will gain an understanding of how UL describes each individual component of the systems. All of the listings are created with the same format (i.e. floor/wall assembly first, sleeve options if applicable, penetrating item, etc.).

It is worth noting that any deviation from the below system would fall outside the means of this particular system. In that case, a different UL system would be required or if nothing is found, an Engineering Judgment request should be submitted to the Hilti Fire Protection Engineers.

Through-penetration Firestop Systems

System No. C-AJ-1226

August 26, 2005

F Rating — 3 Hr

T Rating — 0 Hr

L Rating At Ambient — Less Than 1 CFM/Sq Ft

L Rating At 400 F — 4 CFM/Sq Ft
1. **Floor or Wall Assembly** — Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified *Concrete Blocks*. Max diam of opening is 32 in.

2. **Metallic Sleeve** — (Optional) Nom 32 in. diam (or smaller) Schedule 40 (or heavier) steel sleeve cast or grouted into floor or wall assembly, flush with floor or wall surfaces or extending a max of 3 in. above floor or beyond both surfaces of wall.

   2A. **Sheet Metal Sleeve** — (Optional) Max 6 in. diam, min 26 ga galv steel provided with a 26 ga galv steel square flange spot welded to the sleeve at approx mid-height and sized to be a min of 2 in. larger than the sleeve diam. The sleeve is to be cast in place and may extend a max of 4 in. below the bottom of the deck and a max of 1 in. above the top surface of the concrete floor.

   2B. **Sheet Metal Sleeve** — (Optional) - Max 12 in. diam, min 24 ga galv steel provided with a 24 ga galv steel square flange spot welded to the sleeve at approx mid-height and sized to be a min of 2 in. larger than the sleeve diam. The sleeve is to be cast in place and may extend a max of 4 in. below the bottom of the deck and a max of 1 in. above the top surface of the concrete floor.

3. **Through-Penetrant** — One metallic pipe, tube or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space between penetrant and periphery of opening shall be min 0 in. (point contact) to max 1-7/8 in. Penetrant may be installed with continuous point contact. Penetrant to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic penetrants may be used:

   A. **Steel Pipe** — Nom 30 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. **Iron Pipe** — Nom 30 in. diam (or smaller) cast or ductile iron pipe.
   C. **Copper Pipe** — Nom 6 in. diam (or smaller) Regular (or heavier) copper pipe.
   D. **Copper Tubing** — Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing.
   E. **Conduit** — Nom 6 in. diam (or smaller) steel conduit.
   F. **Conduit** — Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT).

4. **Firestop System** — The firestop system shall consist of the following:

   A. **Packing Material** — Min 4 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or sleeve or from both surfaces of wall or sleeve as required to accommodate the required thickness of fill material.

   B. **Fill, Void or Cavity Material*** — **Sealant** — Min 1/4 in. thickness of fill material applied within the annulus, flush with top surface of floor or sleeve or with both surfaces of wall or sleeve. At the point or continuous contact locations between penetrant and concrete or sleeve, a min 1/4 in. diam bead of fill material shall be applied at the concrete or sleeve/pipe penetrant interface on the top surface of floor and on both surfaces of wall.

**HILTI CONSTRUCTION CHEMICALS, DIV OF**

**HILTI INC** — FS-One Sealant

*Bearing the UL Classification Mark*
Using the UL Fire Resistive Directory: Numbering and Nomenclature

UL Numbering System Through-Penetrations

When looking through the Fire Resistance Directory, you will find thousands of systems designed for specific applications. These systems are categorized using an Alpha-Alpha-Numeric system. It is important for involved to understand the system and how to quickly identify the difference between a CAJ and WL system

The first part of the system designation is the Alpha-Alpha section. This represents the type of assembly that the firestop system was designed and tested with.

<table>
<thead>
<tr>
<th>First Letter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Floor</td>
</tr>
<tr>
<td>W</td>
<td>Wall</td>
</tr>
<tr>
<td>C</td>
<td>Floor and/or Wall (combined)</td>
</tr>
</tbody>
</table>

The second (or third) letter(s) provides more information about the assembly.

<table>
<thead>
<tr>
<th>Second Letter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Concrete floors 5-inches thick or less</td>
</tr>
<tr>
<td>B</td>
<td>Concrete floors greater than 5-inches thick</td>
</tr>
<tr>
<td>C</td>
<td>Framed floors - floor/ceiling assemblies</td>
</tr>
<tr>
<td>D</td>
<td>Deck construction</td>
</tr>
<tr>
<td>E through I</td>
<td>Not used</td>
</tr>
<tr>
<td>J</td>
<td>Concrete or masonry walls 8-inches thick or less</td>
</tr>
<tr>
<td>K</td>
<td>Concrete walls greater than 8-inches thick</td>
</tr>
<tr>
<td>L</td>
<td>Framed walls - gypsum wallboard assemblies</td>
</tr>
<tr>
<td>M</td>
<td>Bulkheads</td>
</tr>
<tr>
<td>N through Z</td>
<td>Not used</td>
</tr>
</tbody>
</table>

The second part of the system designation is the Numeric section. This represents the type of penetration that the firestop system was designed and tested with.
The four digit number describes the type of penetrating item.

| 0000 - 0999 | Blank openings |
| 1000 - 1999 | Metal pipe, conduit or tubing |
| 2000 - 2999 | Plastic pipe |
| 3000 - 3999 | Cables |
| 4000 - 4999 | Cable tray |
| 5000 - 5999 | Insulated pipe |
| 6000 - 6999 | Miscellaneous electrical |
| 7000 - 7999 | Miscellaneous mechanical |
| 8000 - 8999 | Mixed penetrating items |
| 9000 - 9999 | Reserved |

As an example, let’s look at UL System CAJ 1150:

**EXAMPLE:** CAJ 1150

- C - Floor or Wall penetration
- A - Concrete Floor 5-inch or less
- J - Concrete or Masonry Walls
- 1150 - Metal pipe, conduit or tubing

**UL Numbering System Joint Systems**

These systems are categorized similarly using an Alpha-Alpha-Numeric system.

The first two letters represents what type of joint is listed.

- FF – Floor to floor
- FW – Floor to wall
- WW – Wall to wall
- HW – Head of wall (Top of wall)
- CG – Wall to wall intended as corner guards
- BW – Bottom of wall
The third letter signifies the movement capabilities of the joint system.
- S – No movement (static)
- D – Dynamic

The second part of the system designation is the Numeric section. This represents the size of joint that the firestop system was designed and tested with.

The four digit number describes the nominal joint width.
- 0000 - 0999 Less than or equal to 2”
- 1000 - 1999 Greater than 2” and less than or equal to 6”
- 2000 - 2999 Greater than 6” and less than or equal to 12”
- 3000 - 3999 Greater than 12” and less than or equal to 24”
- 4000 - 4999 Greater than 24”

As an example, let’s look at UL System HWD 0042:

**EXAMPLE:**

HWD 0042

HW – Head of wall joint

D – Dynamic (movement)

0042 – Joint width less than or equal to 2”
Omega Point Numbering System Joint Systems

These systems are categorized utilizing a systematic number system. As an example, CEJ 307P is a typical Hilti edge of slab listing. In the case of all OPL listings, the CEJ stands for Construction Expansion Joint. The numbers represent the number of the system listed. This is just an order established by OPL. The P stands for Perimeter. The key to their listing system is the letter used at the end of every system. This will designate what type of firestop joint system is listed. The chart below explains their nomenclature:

<table>
<thead>
<tr>
<th>Omega Point Laboratory Joint Nomenclature</th>
</tr>
</thead>
<tbody>
<tr>
<td>• F – Floor to floor</td>
</tr>
<tr>
<td>• FW – Floor to wall</td>
</tr>
<tr>
<td>• W – Wall to wall</td>
</tr>
<tr>
<td>• H – Head of wall (Top of wall)</td>
</tr>
<tr>
<td>• P – Perimeter (curtain wall)</td>
</tr>
</tbody>
</table>
Construction Project – Specifications

An Overview

Specifications are generated for virtually every construction project. They may be very simple and brief, or very long and complex. Please note that the numbers for a given spec section sometimes vary slightly, some specs are out of date or just plain wrong. Most specifications for projects containing firestop are written in the AIA “Masterformat.” The AIA “Masterformat” outlines where specific information should be contained in the specification book for each project.

It is important to review the specification book and read the relevant specification sections EARLY in the project. The specification book is a legally binding part of the contract between a contractor and an owner, or a sub-contractor and a contractor. Anytime you can help our customer meet the terms of the contract, painlessly and accurately, you are providing a value-added service. The following pages provide an outline of “Masterformat” section numbers.

Before looking for the specification section which calls for FIRESTOP, read the sections that explain the requirements for submittals and substitutions. This explains WHAT needs to be submitted to gain project-specific approvals and WHEN these submittals need to be made. Most contractors dislike the submittal process and are often late filing the submittals. This is where you can add value to your services by helping your customer make an accurate and timely submittal.

The actual product specifications can be found in several different locations, most commonly in Section 07840, 07841, or 07842. If the mechanical and/or electrical engineer is specifying firestop materials, it will be found in Division 15 or 16, unfortunately there is no specific section within these divisions that is designated for firestop. The specification generator may assign a section number which makes sense for his or her project. Many times, the firestopping verbiage in Division 15 and 16 refers back to section 07840, 07841, or 07842. The different spec sections often contain conflicting information. The information found in section 07840, 07841 or 07842 often overrides information found in the specific divisions because it is more complete. However, if the mechanical and electrical trades are contracted to firestop the penetrations they create, they may stick with the specs in Div. 15 and Div. 16 as these sections are the basis of their contract. If you only review the Division 7 spec (Thermal and Moisture Protection) you may be unpleasantly surprised when the decision concerning firestop is finalized. If you’re not sure, ask your customer!

Finally, firestop may be specified via the drawings instead of the spec book. Architectural drawings usually begin with the letter “A” while Mechanical drawings begin with “M” and Electrical with “E.” Review the Architectural Detail sheets for firestop details; this is where the project architect will place the details that they
pull from the Hilti website or CD. A Hilti-specific detail is a GREAT opportunity! Additionally, you may find reference to firestop on the project plans under Architectural General Notes, as well as the Firestopping Schedule. Schedules are generally in tabular form, and show which UL system(s) are to be used for combinations of penetrating items, and floor/ wall construction.

The key to success is to review the construction documents EARLY in the process and read all relevant sections—this is how you provide expertise and added value to your customers!

**MASTERSPEC Key Specification Sections related to Firestop**

**MASTER FORMAT AND TITLES**

**DIVISION 1 : GENERAL REQUIREMENTS**
- 01100 SUMMARY
- 01200 PRICE AND PAYMENT PROCEDURES
- 01300 ADMINISTRATIVE REQUIREMENTS
- 01400 QUALITY REQUIREMENTS
- 01500 TEMPORARY FACILITIES AND CONTROLS
- 01600 PRODUCT REQUIREMENTS
- 01700 EXECUTION REQUIREMENTS
- 01800 FACILITY OPERATION
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**DIVISION 2 : SITE CONSTRUCTION**
- 02050 BASIC SITE MATERIALS AND METHODS
- 02100 SITE REMEDIATION
- 02200 SITE PREPARATION
- 02300 EARTHWORK
- 02400 TUNNELING, BORING, AND JACKING
- 02450 FOUNDATION AND LOAD-BEARING ELEMENTS
- 02500 UTILITY SERVICES
- 02600 DRAINAGE NAD CONTAINMENT
- 02700 BASES, BALLASTS, PAVEMENTS, AND APPURtenANCES
- 02800 SITE IMPROVEMENTS AND AMENITIES
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- 02950 SITE RESTORATION AND REHABILITATION

**DIVISION 3 : CONCRETE**
- 03050 BASIC CONCRETE MATERIALS AND METHODS
- 03100 CONCRETE FORMS AND ACCESSORIES
- 03200 CONCRETE REINFORCEMENT
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- 03500 CEMENTITIOUS DECKS AND UNDERLAYMENT
- **03600 GROUTS**
- 03700 MASS CONCRETE
- 03900 CONCRETE RESTORATION AND CLEANING

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Sample Specifications - Table of Contents

Section 07840
A general Division 7 specification covering joints and through-penetrations.

Section 07841
A Division 7 specification covering through-penetrations only. Specification should generally be used in tandem with Section 07842.

Section 07842
A Division 7 specification covering joints only. Specification should generally be used in tandem with Section 07841.

Section 07843
A Division 7 specification covering cast-in-place firestop devices. Specification should be used in combination with Section 07841 and 07842.

Section 15084
A specification for through-penetrations to be used in Division 15, “Mechanical”

Section 16055
A specification for through-penetrations to be used in Division 16, “Electrical”

Through–Penetration Schedule
A schedule of UL systems for through-penetrations. May be used within a specification or placed on the construction drawings.

Joints Schedule
A schedule of UL systems for through-penetrations. May be used within a specification or placed on the construction drawings.

The project designers (architect, specifications writer, mechanical engineer, electrical engineer) will decide which specification or combination of these specifications will be used, based on the specific project requirements.
Section 07840 (07270) Format Outline

After locating this section in the specification book, you can then find the specific information related to firestop and the project.

Related sections will often be called out where firestop information can be found. Some examples of these related applications include:

- Top-of-wall joints
- Perimeter safing slots for curtain walls
- Expansion joints in fire-rated floors/walls

Submittals
Those products specified in Section 2 – Products, must have product data sheets, material safety data sheets, and shop drawings submitted 30-60 days prior to the start of work. All of this information is located in the Hilti Firestop Manual or on the Hilti website.

Quality Assurance
Most design firms require either an experienced specialty firestop contractor or a contractor that has received training from the manufacturer to perform the actual installation of the firestop. This is a great opportunity to promote the on-site training that is available from Hilti.

References to UL
There is a growing trend in specs to require a product that is listed in the UL Directory, but not call out a specific product manufacturer. In this case, Hilti can easily be submitted and used for these projects.
Sample Specifications: Firestopping

SECTION 07840
FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-Specification Section, apply to work specified in this section.

1.02 DEFINITIONS
   A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.03 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION
   Only tested firestop systems shall be used in specific locations as follows:
   A. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through
   B. fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service
   C. shaft walls and partitions.
   B. Safing slot gaps between edge of floor slabs and curtain walls.
   C. Openings between structurally separate sections of wall or floors.
   D. Gaps between the top of walls and ceilings or roof assemblies.
   E. Expansion joints in walls and floors.
   F. Openings and penetrations in fire-rated partitions or walls containing fire doors.
   G. Openings around structural members which penetrate floors or walls.

1.04 RELATED WORK OF OTHER SECTIONS
   A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

   1. Section 03300 - Cast-In-Place Concrete
   2. Section 07900 - Joint Sealers
   3. Section 04200 - Masonry Work
   4. Section 09200 - Lath and Plaster
   5. Section 09250 - Gypsum Drywall Systems
   6. Section 13080 - Sound, Vibration and Seismic Control
   7. Section 13900 - Fire Suppression and Supervisory Systems
   8. Section 15050 - Basic Mechanical Materials and Methods
9. Section 15250 - Mechanical Insulation
10. Section 15300 - Fire Protection
11. Section 15400 - Plumbing
12. Section 16050 - Basic Electrical Materials and Methods

1.05 REFERENCES
   B. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

   1. UL Fire Resistance Directory:
      a. Through-Penetration Firestop Devices (XHCR)
      b. Fire Resistance Ratings (BXUV)
      c. Through-Penetration Firestop Systems (XHEZ)
      d. Fill, Voids, or Cavity Material (XHHW)
      e. Forming Materials (XHKU)

   D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments
   F. All major building codes: ICBO, SBCCI, BOCA, and IBC. (Note to specifier: Retain or delete building codes listed above as applicable)
   H. NFPA 70 - National Electric Code

1.06 QUALITY ASSURANCE
   A. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.
   B. Firestop System installation must meet requirements of ASTM E-814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.
   C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
   D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.
   E. For those firestop applications that exist for which no UL tested system is available through a manufacturer, an engineering judgment derived from
similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council (September 7, 1994, as may be amended from time to time).

1.07 SUBMITTALS
A. Submit Product Data: Manufacturer’s specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions to comply with Section 1300.
B. Manufacturer’s engineering judgment identification number and drawing details when no UL system is available for an application. Engineer judgment must include both project name and contractor’s name who will install firestop system as described in drawing.
C. Submit material safety data sheets provided with product delivered to job-site.

1.08 INSTALLER QUALIFICATIONS
A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A supplier’s willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.09 DELIVERY, STORAGE, AND HANDLING
A. Deliver materials undamaged in manufacturer’s clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.
B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.
D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
E. Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS
A. Do not use materials that contain flammable solvents.
B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.
C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer’s recommended limitations for installation printed on product label and product data sheet.
E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.01 FIRESTOPPING, GENERAL
A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
C. Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post installed." Provide cast-in-place firestop devices prior to concrete placement.

2.02 ACCEPTABLE MANUFACTURERS
A. Subject to compliance with through penetration firestop systems (XHEZ) and joint systems (XHBN) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:
   1. Hilti, Inc., Tulsa, Oklahoma (800) 879-8000
   2. Other manufacturers listed in the U.L. Fire Resistance Directory – Volume 2

2.03 MATERIALS
A. Use only firestop products that have been UL 1479, ASTM E-814, or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.
B. Cast-in place firestop devices for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:
   1. Hilti CP 680 Cast-In Place Firestop Device
   2. Hilti CP 682 Cast-In Place Firestop Device
C. Sealants or caulking materials for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
1. Hilti FS-ONE Intumescent Firestop Sealant
2. Equivalent products listed in the U.L. Fire Resistance Directory – Volume 2

D. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti CP 601s Elastomeric Firestop Sealant
2. Hilti CP 606 Flexible Firestop Sealant
3. Hilti FS-ONE Intumescent Firestop Sealant

E. Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the following products are acceptable:

1. Hilti CP 672 Firestop Spray
2. Hilti CP 601s Elastomeric Firestop Sealant
3. Hilti CP 606 Flexible Firestop Sealant

F. Intumescent sealants or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. Equivalent products listed in the U.L. Fire Resistance Directory – Volume 2

G. Intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. Hilti CP 618 Firestop Putty Stick

H. Non curing, re-penetrable intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti CP 618 Firestop Putty Stick
2. Equivalent products listed in the U.L. Fire Resistance Directory – Volume 2
I. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:

1. Hilti CP 617 Firestop Putty Pad
2. Hilti Firestop Box Insert
3. Equivalent products listed in the U.L. Fire Resistance Directory – Volume 1

J. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti CP 642 Firestop Collar
2. Hilti CP 643N Firestop Collar
3. Hilti CP 644 Firestop Collar
4. Hilti CP 645 Firestop Wrap
5. Hilti CP 648-E Firestop Wrap
6. Hilti CP 648-S Firestop Wrap

K. Materials used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti FS 635 Trowelable Firestop Compound
2. Hilti FS 657 FIRE BLOCK

L. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti FS 657 FIRE BLOCK
2. Hilti CP 675T Firestop Board

M. Sealants or caulking materials used for openings between structurally separate sections of wall and floors, the following products are acceptable:

1. Hilti CP 672 Firestop Spray
2. Hilti CP 601s Elastomeric Firestop Sealant
3. Hilti CP 606 Flexible Firestop Sealant

N. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.

O. Provide a firestop system with an Assembly Rating as determined by UL 2079 which is equal to the time rating of construction being penetrated.

PART 3 - EXECUTION

3.01 PREPARATION
A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
   1. Verify penetrations are properly sized and in suitable condition for application of materials.
   2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
   3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
   4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
   5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION
A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.
   B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.03 INSTALLATION
B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.
   1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
   2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
3. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL
A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
B. Keep areas of work accessible until inspection by applicable code authorities.
C. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.05 ADJUSTING AND CLEANING
A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.
B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

END OF SECTION
Building Codes

The main driver of firestop and its installation in the building construction industry depends on the local and National Building Codes. These codes are written by National organizations and then adopted on the state and local level of government. Local building officials then enforce plan design and the actual building process based upon these codes.

Up until the late 1990’s, three major building codes were utilized throughout the United States. These included the Uniform Building Code, Standard Building Code and the National Building Code (BOCA). In 1996, these three organizations agreed to work together to develop one national building code forming the ICC (International Code Council).

All of the codes listed below have adopted the use of firestop for through-penetrations within specific sections of the code.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>IBC</td>
<td>International Building Code (sponsored by ICC)</td>
</tr>
<tr>
<td>UBC</td>
<td>Uniform Building Code (Sponsored by ICBO)</td>
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<tr>
<td>SBC</td>
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<tr>
<td>BOCA</td>
<td>National Building Code (Sponsored by BOCA)</td>
</tr>
<tr>
<td>NFPA 101</td>
<td>Life Safety Code (Sponsored by the NFPA)</td>
</tr>
<tr>
<td>NFPA 70</td>
<td>National Electrical Code (Sponsored by the NFPA)</td>
</tr>
</tbody>
</table>

Within each of these codes, there are specific sections that specifically relate to firestop and the installation requirements. These are included in the following table.
## Firestop Code Requirements

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<td>NFPA 70</td>
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</tr>
</tbody>
</table>
2000 International Building Code (IBC)

Penetrations (Sec. 711)

Section 711.3 Fire resistance rated walls

Section 711.3.1.2 Through-Penetration Firestop System. Through-penetrations shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E 814 with a minimum positive pressure differential of 0.01 inch of water and shall have an F rating of not less than the required fire resistance rating of the wall penetrated.

Hilti Interpretation

- Wall through-penetration firestop systems shall be tested in accordance to ASTM E 814.
- The fire-rating (F) of the firestop system shall equal to that of the wall being penetrated.

Section 711.4 Horizontal assemblies

Section 711.4.1.2 Through-penetrations shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E 814 with a minimum positive pressure differential of 0.01 inch of water. The system shall have an F rating and a T rating of not less than 1 hour but not less than the required rating of the floor penetrated.

Hilti Interpretation

- Floor through-penetration firestop systems shall be tested in accordance to ASTM E 814.
- The fire-rating (F) and temperature-rating (T) of the firestop system shall equal the greater of 1 hour or that of the floor being penetrated.

Fire Resistive Joint Systems (Sec. 712)

Section 712.1 General. Joints installed in or between fire resistance rated walls, floor or floor-ceiling assemblies and roofs or roof-ceiling assemblies shall be protected by an approved fire resistant joint system designed to resist the passage of fire for a time period not less than the required fire resistance rating of the wall, floor or roof in or between which it is installed.

Hilti Interpretation

- Joints between fire-rated assemblies shall be firestopped.
- The fire-rating (F) of the firestop system shall equal that of the wall, floor or roof being penetrated.
Section 712.3 Fire test criteria. Fire resistant joint systems shall be tested in accordance with the requirements of UL 2079.

_Hilti Interpretation_
- Joint systems shall be tested in accordance to UL 2079.

Section 712.4 Exterior curtain wall/floor intersection. Where fire resistance rated floor or floor-ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with an approved material.

_Hilti Interpretation_
- Exterior curtain wall joints shall be firestopped where they meet the floor/ceiling.

Construction and Compartmentation (Sec. 8.2)

Section 8.2.2.2* Fire compartments shall be formed with fire barriers that are continuous from outside wall to outside wall, from one fire barrier to another, or a combination thereof, including continuity through all concealed spaces, such as those found above a ceiling...

Hilti Interpretation
- Fire compartments shall be constructed of fire-rated materials.
- Fire compartments shall be continuous from one fire-rated assembly to another.
- Fire-rated compartment walls and floors shall be continuous though concealed spaces.

Section A.8.2.2.2 To ensure that a fire barrier is continuous, it is necessary to seal completely all openings where the fire barrier abuts other fire barriers, exterior walls, the floor below, and the floor ceiling above.

Hilti Interpretation
- All joints created by one fire barrier adjoining another shall be firestopped.

Section 8.2.5.2* Openings through floors, such as stairways, hoistways for elevators, dumbwaiters, inclined and vertical conveyors; shaftways used for light, ventilation, or building services; or expansion joints and seismic joints used to allow structural movements, shall be enclosed with fire barrier walls. Such enclosures shall be continuous from floor to floor or floor to roof. Openings shall be protected as appropriate for the fire resistance rating of the fire barrier.

Hilti Interpretation
- All shaft assemblies shall be constructed of fire-rated materials.
- Such shaft assemblies shall be continuous from floor to floor or floor to roof.
- Penetrations in the shaft wall should be firestopped with a fire-rated material equal to that of the shaft itself.

Section A.8.2.5.2 Penetrations through floor/ceiling and roof/ceiling assemblies should be protected using the methods specified in Tables A.8.2.5.2 (a) and (b). Protection methods for penetrations include:

(e) Method E Use of an approved, through-penetration protection system tested in accordance with ASTM E814, Methods for Fire Tests of Through-Penetration Fire Stops.
Hilti Interpretation
- ASTM E814 Methods for Fire Tests of Through-Penetration Fire Stops, is one method used to test through-penetration systems

Section A.8.2.5.2 Exception No. 3 One method of determining the fire resistance rating of expansion and seismic joints is by testing in accordance with UL 2079, Test for Fire Resistance of Building Joint Systems

Hilti Interpretation
- UL 2079, Test for Fire Resistance of Building Joint Systems, is one method used to test joint systems.

Section 8.3.2* Smoke barriers shall extend from an outside wall to an outside wall, from a floor to a floor, from a smoke barrier to a smoke barrier, or a combination thereof; this includes continuity through all concealed spaces such as those found above the ceiling, including interstitial spaces.

Hilti Interpretation
- Smoke barriers shall be continuous from wall to wall or floor to floor or floor to ceiling.
- Smoke barriers should be continuous through all concealed spaces.

Section A.8.3.2 To ensure that a smoke barrier is continuous, it is necessary to seal completely all openings where the smoke barrier abuts other smoke barriers, fire barriers, exterior walls, the floor below, and the ceiling above.

Hilti Interpretation
- Joints between two smoke barriers and between a smoke barrier and a fire-rated assembly shall be firestopped.

Opening Protectives (8.2.3.2.3)

Section 8.2.3.2.3.1 Every opening in a fire barrier shall be protected to limit the spread of fire and restrict the movement of smoke from one side of the fire barrier to the other.

Hilti Interpretation
- Every opening in a fire barrier shall be firestopped.

Penetrations and Miscellaneous Openings in Fire Barriers (8.2.3.2.4)

Section 8.2.3.2.4.1* Pipes, conduits, bus ducts, cables, wires, air ducts, pneumatic tubes and ducts, and similar building service equipment that pass through fire barriers shall be protected as follows:
1. The space between the penetrating item and the fire barrier shall meet one of the following conditions:
   a) It shall be filled with a material capable of maintaining the fire resistance of the fire barrier.
   b) It shall be protected by an approved device designed for the specific purpose.

2. Where the penetrating item uses a sleeve to penetrate the fire barrier, the sleeve shall be solidly set in the fire barrier, and the space between the item and the sleeve shall meet one of the following conditions:
   a) It shall be filled with a material capable of maintaining the fire resistance of the fire barrier.
   b) It shall be protected by an approved device designed for the specific purpose.

3. Insulation and coverings for pipes and ducts shall not pass through the fire barrier unless one of the following conditions are met:
   a) It shall be filled with a material capable of maintaining the fire resistance of the fire barrier.
   b) It shall be protected by an approved device designed for the specific purpose.

**Hilti Interpretation**
- All items that pass through a fire barrier shall be firestopped with a material or device capable of maintaining the same fire-rating (F) as the fire barrier.
1997 Uniform Building Code

Fire Resistive Joint Systems (Sec. 706)

Section 706.1 General. Joints installed in or between fire-resistive walls, fire-resistive floor or floor-ceiling assemblies and fire resistive roof or roof-ceiling assemblies shall be protected by an approved fire resistive joint system designed to resist the passage of fire for a time period not less than the required fire-resistance rating of the floor, roof, or wall in or between which it is installed.

Hilti Interpretation
- Joints between two fire-rated assemblies must be firestopped to a fire-rating of not less than that of the rated assembly.

Walls and Partitions (Sec. 709)

Section 709.6.3 Penetration Firestop System. Penetrations shall be protected by an approved penetration firestop system installed as tested in accordance with UBC Standard 7-5 (equivalent to ASTM E 814) and shall have an F Rating of not less than the required rating of the wall penetrated.

Hilti Interpretation
- Penetration made in fire-rated assemblies must be firestopped according to ASTM E 814.
- The firestop system shall have a fire-rating (F) of not less than that of the penetrated wall or partition assembly.

Floor Ceilings or Roof Ceilings (Sec. 710)

Section 710.2.3 Penetration Firestop System. Penetrations shall be protected by an approved penetration firestop system installed as tested in accordance with UBC Standard 7-5 (equivalent to ASTM E 814) and shall have an F rating and a T rating of not less than the required rating of the floor penetrated.

Hilti Interpretation
- Penetration made in fire-rated assemblies must be firestopped according to ASTM E 814.
- The firestop system shall have a fire-rating (F) and a temperature-rating (T) of not less than that of the penetrated floor/ceiling or roof/ceiling assembly.
1999 Standard Building Code (SBCCI)

Fire Resistive Joint Systems (Sec. 705.7)

Section 705.7.1 General. Joints installed in or between fire resistant walls, fire resistant floor or floor/ceiling assemblies shall be protected by an approved fire resistant joint system designed to resist the passage of fire for a time period not less than the required fire resistance rating of the wall, floor, or roof in or between which it is installed. Fire resistant joint systems shall be installed and tested in accordance with 705.7. The void created at the intersection of a floor or floor/ceiling assembly and an exterior curtain wall assembly shall be protected in accordance with 705.7.6.

Section 705.7.6 The void created at the intersection of a fire resistant floor or a floor/ceiling assembly and an exterior curtain wall shall be sealed using an approved material or assembly of materials designed and tested for this purpose. The material shall remain in place, sealing the opening for a time period at least equal to the required fire resistance rating of the floor deck.

Hilti Interpretation

- Joints between rated assemblies and exterior curtain walls shall be firestopped.
- Joints between two fire-rated assemblies must be firestopped to a fire-rating (F) of not less than that of the rated assembly.

Interior Wall and Partition Fire Separation Requirements (704.2)

Section 704.2.1.2 General. All partitions enclosing vertical openings such as stairways, utility shafts and elevator shafts which are required to have a fire resistance rating shall extend from floor to floor or floor to roof. These walls shall be continuous through all concealed spaces such as the space above a suspended ceiling. The supporting structure shall have a fire resistance rating equal to or greater than the fire resistance rating required for the vertical enclosure. Where the openings are offset at intermediate floors, the offset and floor construction shall be of construction having a fire resistance of not less than that required for the enclosing partitions.

Hilti Interpretation

- All vertical fire-rated shaft assemblies shall extend from floor to floor or floor to roof
- All vertical fire-rated shaft assemblies shall be continuous through all concealed spaces.
Section 704.2.1.3 General. All other partitions required to have a fire resistance rating shall extend from the top of the floor below to the ceiling above and shall be securely attached thereto. Where said ceiling is not a part of an assembly having a fire resistance rating at least equal to that required for the partition, the partition shall be constructed tight against the floor or roof deck above.

**Hilti Interpretation**
- All vertical fire-rated assemblies (except shaft assemblies) shall extend from the floor to the ceiling above providing the ceiling is fire rated.
- If the ceiling is non fire-rated, the fire-rated vertical assembly shall be continuous to the floor/ceiling or roof/ceiling assembly above.

**Protection of Openings (Sec. 705)**

**Fire Rated Walls**

Section 705.5.1.2 Penetration Firestop System. Penetrations shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E 814, with a minimum positive pressure differential of 0.01 inch of water and shall have an F rating of not less than the required rating of the wall penetrated.

**Hilti Interpretation**
- Wall penetrations shall be protected by a system that has been tested in accordance with ASTM E 814.
- The tested system shall have a fire-rating (F) of not less than that of the wall being penetrated.

**Fire Rated Horizontal Assemblies**

Section 705.6.1.2 Penetration Firestop System. Penetrations shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E 814, with a minimum positive pressure differential of 0.01 inch of water and shall have an F rating and a T rating of not less than 1 hour but not less than the required rating of the floor penetrated.

**Hilti Interpretation**
- Floor penetrations shall be protected by a system that has been tested in accordance with ASTM E 814.
- The tested system shall have a fire-rating (F) and a temperature-rating (T) of the greater of 1 hour or that of the floor being penetrated.
FIRE RESISTIVE JOINT SYSTEMS (Sec. 709)

Section 709.4 Continuity. All vertical fire separation assemblies shall extend from the top of the fire resistance rated floor/ceiling assembly below to the underside of the floor or roof slab or deck above and shall be securely attached thereto. These walls shall be continuous through all concealed spaces such as the space above a suspended ceiling. The supporting construction shall be protected to afford the required fire resistance rating of the fire separation assembly supported.

Hilti Interpretation
- All vertical fire-rated assemblies shall be continuous from one fire-rated assembly to the other.
- Walls shall be continuous through concealed spaces.

Section 713.2 Continuity. All floor/ceiling and roof/ceiling assemblies shall be continuous without openings or penetrations except as permitted by this section. Floor assemblies which are required to be fire resistance rated shall extend to and be tight against exterior walls, or other provisions shall be made for maintaining the fire resistance rating of the assembly at such locations.

Hilti Interpretation
- All horizontal fire-rated assemblies shall be continuous from the rated assembly to the exterior curtain wall.
- The joint between a fire-rated floor assembly and an exterior wall shall be firestopped.

PENETRATIONS (Sec. 714)

Section 714.1.3 Through-penetration firestop system. The through-penetration firestop system shall be tested in accordance with ASTM E 814 listed in Chapter 35 with a minimum positive pressure differential of 0.01 inch of water column. The penetration firestop system shall have an F rating of not less than the required rating of the assembly penetrated.

Hilti Interpretation
- Through-penetration firestop systems shall be tested in accordance to ASTM E 814.
- The firestop system shall have a fire-rating (F) equal to that of the assembly being penetrated.
Section 714.1.4 Annular space protection. The annular space between the penetrating item and the fire resistance rated assembly being penetrated shall be protected with a material capable of preventing the passage of flame and hot gases.

**Hilti Interpretation**
- The annular space shall be filled with an appropriate material that will prevent flame and hot gases from passing from one side of the assembly to the other.

Section 714.2.3 Through-penetration firestop system. Where cables, cable trays, conduits, tubes or pipes penetrate a floor assembly, such penetrations shall be protected by an approved through-penetration firestop system. Through-penetration firestop systems shall be tested in accordance with ASTM E 814 listed in Chapter 35 with a minimum positive pressure differential of 0.01 inch of water column. Through-penetration firestop systems shall have an F rating and a T rating of not less than 1 hour but not less than the required rating of the assembly penetrated.

**Hilti Interpretation**
- Non-combustible penetrants shall be firestopped.
- The firestop system shall be tested in accordance with ASTM E 814.
- The firestop system shall have a fire-rating (F) and a temperature-rating (T) of not less than 1 hour or that of the fire-rated assembly, whichever is greater.
Product Data Sheets
Installation instructions for FS-ONE

1. Clean the opening. Surfaces to which FS-ONE will be applied should be cleaned of loose debris, dirt, oil, moisture, frost and wax. Structures supporting penetrating items must be installed in compliance with local building and electrical standards.

Application of firestop sealant

2. Install the prescribed backfilling material type and depth to obtain the desired rating (if required). Leave sufficient depth for applying FS-ONE.

3. Application of firestop sealant: Apply FS-ONE to the required depth in order to obtain the desired fire rating. Make sure FS-ONE contacts all surfaces to provide maximum adhesion. For application of FS-ONE use a standard caulking gun, foil pack gun, bulk loader and bulk gun. With FS-ONE buckets, Graco type sealant pumps may be used. (Contact pump manufacturer for proper selection).

4. Smoothing of firestop sealant: To complete the seal, tool immediately to give a smooth appearance. Excess sealant, prior to curing, can be cleaned away from adjacent surfaces and tools with water.

5. Leave completed seal undisturbed for 48 hours.

6. For maintenance reasons, a penetration seal could be permanently marked with an identification plate. In such a case, mark the identification plate and fasten it in a visible position next to the seal.

Notice about approvals

• Check that the penetration has been sealed according to the specified drawing in the UL Fire Resistance Directory or Hilti Firestop Manual. For further advice, please contact Hilti customer service. Refer to Hilti product literature and UL fire resistance directory for specific application details.

Not for use...

• High movement expansion joints
• Underwater
• On materials where oil, plasticizers or solvents may bleed i.e. impregnated wood, oil based seals, green or partially vulcanized rubber
• In any penetration other than those specifically described in this manual or the test reports

Safety precautions

• Before handling, read the product and Material Safety Data Sheet for detailed use and health information
• Keep out of reach of children
• Wear suitable gloves and eye protection

Storage

• Store only in the original packaging in a location protected from moisture at temperatures between 40°F (5°C) and 86°F (30°C)
• Observe expiration date on the packaging

Product Information

Product description

• Intumescent (expands when exposed to fire) firestop sealant that helps protect combustible and non-combustible penetrations for up to 4 hours fire rating

Product features

• Smoke, gas and water resistant after material has cured
• Contains no halogen, solvents or asbestos
• High fire rating properties
• Water based, easy to clean

Areas of application

• Steel, copper and EMT pipes
• Insulated steel and copper pipes
• Cable bundles
• Closed or vented plastic pipes
• HVAC penetrations

For use with

• Concrete, masonry, drywall and wood floor assemblies
• Wall and floor assemblies rated up to 4 hours

Examples

• Sealing around plastic pipe penetrations in fire rated construction
• Sealing around combustible and non-combustible penetrations in fire rated construction

Application of firestop sealant

1. Clean the opening. Surfaces to which FS-ONE will be applied should be cleaned of loose debris, dirt, oil, moisture, frost and wax. Structures supporting penetrating items must be installed in compliance with local building and electrical standards.

System Advantage / Customer Benefits

• Protects most typical firestop penetration applications
• Easy to work with and fast cleanup
• Can be painted
• Single component systems available
• Meets LEED™ requirements for indoor emitting materials, sealants and adhesives and 4.2 Paints and Coatings

Technical Data

At 73°F (23°C) and 50% relative humidity

Chemical basis
Water-based intumescent acrylic dispersion

Density
Approx. 1.5 g/cm³

Color
Red

Working time
Approx. 28-30 min.

Curing time
Approx. 4 min. / 3 days

Shore A Hardness
Approx. 35

Movement capability
Approx. 5%

Intumescent Activation
Approx 482°F (250°C)

Expansion rate (unrestricted):
Up to 3-5 times original volume

Temperature resistance (cured):
-40°F to 212°F (-40°C to 100°C)

Application temperature
41°F to 104°F (5°C to 40°C)

Surface burning characteristics
(ASTM E 84-96) Flame Spread: 0
Smoke Development: 5

Sound transmission classification
(ASTM E 90-99) 56

Approvals

ICBO (International Conference of Building Officials)
Report No. 5071

California State Fire Marshal
Listing No. 4485-1200:108
City of New York
MEA 326-96-M

Tested in accordance with
• UL 1479
• ASTM E 814
• ASTM E 84

Internationally tested and approved

FM

APPROVED

SYSTEM COMPATIBLE

FM

Approve

FM

Approved

latest product information:
www.us.hilti.com

ordering information see page:
www.us.hilti.com
FS 657 Technical Data

At 73°F (23°C) and 50% relative humidity

Density
Approx. 0.27 g/cm³

Dimensions
2” x 5” x 8”

Color
Red

Application temperature
23°F to 104°F (-5°C to 40°C)

Temperature resistance
5°F to 140°F (-15°C to 60°C)

Intumescent Activation
Approx. 572°F (300°C)

Expansion ratio (unrestricted)
Up to 1:3

Surface burning characteristics
ASTM E 84-96

Flame Spread Index: 0
Smoke Development Index: 25

Sound transmission classification
ASTM E 90-99

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FS 657 Fire Block

Product description
• Ready-to-use, intumescent flexible block based on a two-component polyurethane foam

Product features
• Completely free from dust and fibers
• Halogen, asbestos and solvent free
• Operational immediately after installation
• Can be painted
• One sided wall systems available

Areas of application
• Sealing single or multiple penetrations in small to large openings
• Temporary or permanent sealing of cables and cable tray penetrations
• Temporary or permanent sealing of insulated and non-insulated metallic pipes and combustible pipe penetrations

For use with
• Walls (UL tested up to max. opening 52” x 48”)
• Floors (UL tested up to max. opening 36” x 36”)
• Concrete, porous concrete, masonry and gypsum wall assemblies
• Wall assemblies rated up to 4 hours
• Floor assemblies rated up to 3 hours

Examples
• Completely dust and fiber-free rooms and places where electrical installations are frequently used, such as computer centers, hospitals and laboratories
• New buildings in the construction phase and during renovation
• Large openings containing multiple penetrations as found in production bays, warehouses, hospitals etc.

Installation instructions for FS 657

Opening
1. Clean the opening. Penetration and penetration supporting structures must be installed in compliance with local building and electrical standards.

Application of Fire Blocks
2. If no penetrations are located, build up FS 657 FIRE BLOCK firmly seated, within opening.
3. Finish building up FIRE BLOCKS until entire opening is filled.
4. Completely fill cable spaces, gaps between blocks and pipes, and joints with FS-ONE Firestop Sealant.
5. For maintenance reasons, a penetration seal could be permanently marked with an identification plate. In such a case, mark the identification plate and fasten it in a visible position next to the seal.

Re-installing cables or other penetrations
• Remove or cut the block from the seal.
• Install the penetrant and re-lay the block in compliance with the approval. Fill gaps and spaces with FS-ONE.
Single cables can be run through joints between blocks or a hole can be drilled through a block using a sharpened piece of metal pipe or tubing.

Notice about approvals
• When making a seal using Hilti FS 657 Intumescent FIRE BLOCK, national approvals must be observed. Please refer to the UL Directory or the Hilti Firestop Manual for complete details, including restrictions as to opening size, type and thickness of wall or floor, maximum cable diameter, etc.

For use...
• In wet rooms, outdoors or exposed to the weather or UV radiation (can be done only after applying an additional silicone coating, i.e. CP 601S).

Safety precautions
• Keep out of the reach of children
• Read the Material Safety Data Sheet

Storage
• Store only in the original packaging in a location protected from moisture and direct sunlight

Product Information

Internationally tested and approved

Approvals
ICBO Evaluation Service, Inc.
Report No. 5071
California State Fire Marshal
Listing No. 4485-1200:106
City of New York
MCA 325-96-M

Tested in accordance with
• UL 1479
• ASTM E 814
• ASTM E 84

FM Approved


latest product information: www.us.hilti.com

ordering information see page: 34
System Advantage / Customer Benefits

- Maximum flexibility, meets 500 cycle requirements (Class II & III Approval) (ASTM E 1966 & UL 2079)
- Quick and easy installation with the Spray Tech EPX 2505 Sprayer can save you time and money
- CP 672 Speed Spray contains no halogens, solvents or asbestos so it is safe to use and won’t harm the environment.
- Water based formulation so spills and over-spray cleanup quick and easy.
- Paintable
- Meets LEED™ requirements for indoor environmental quality credit 4.1 Low Emitting Materials, Sealants and Adhesives, and 4.2 Paints and Coatings.

Installation instructions for CP 672

Opening
1. Clean the opening. Surfaces to which CP 672 will be applied should be cleaned of loose debris, dirt, oil, wax and grease. The surface should be moisture and frost free.
2. Mineral wool packing: Install the prescribed back filling material type and depth to obtain desired rating.
3. Application of firestop spray: Apply CP 672 to the required depth in order to obtain the desired rating. Make sure CP 672 contacts all surfaces and overlaps beyond all surrounding surfaces (Refer to UL/cUL System). Spray Tech EPX 2505 pumps have been successful in applying CP 672 Firestop Joint Spray. Hilti recommends the use of the Spray Tech EPX 2505 CP 672 Sprayer. CP 672 may also be brushed on with a paint brush. Contact Hilti Technical Support for more information.
4. Curing time: Allow 24 hours (@ 73°F / 23°C) for the CP 672 to fully cure.
5. Identification: For maintenance reasons all CP 672 applications can be permanently marked with an identification plate and fastened in a visible position next to the seal.

Notice about approvals

- When making a seal using Hilti CP 672 Firestop Joint Spray, please refer to the UL Fire Resistance Directory or the Hilti Firestop Manual for complete details, including restrictions as to joint size, type and thickness of wall or floor, movement capabilities, etc.

Examples

Where a gypsum wall assembly meets the underside of a metal or concrete deck
Where a concrete floor assembly meets with non-rated exterior wall (concrete, glass, etc.)
Where two concrete floor/wall assemblies meet

Complete Top-of-Wall Firestopping Solution!

Product information

CP 672

Technical Data

- At 73°F (23°C) and 50% relative humidity
- Density: Approx. 9 lb/gal (1.27 g/cm³)
- Color: Red
- Application temperature: 50°F to 90°F (5°C to 32°C)
- Temperature resistance: -4°F to 212°F (-20°C to 100°C)
- Consistency: Sprayable liquid
- Chemical basis: Latex based dispersion
- Working time: 30–45 minutes
- Curing time: 24 hours
- Ph-value: Approx. 8.0
- Movement capability: Up to 50%
- Surface burning characteristics (ASTM E 84-00):
  - Flame spread: 5
  - Smoke development: 5
- Sound transmission classification (ASTM E 90-99): 55
- Approvals:
  - ICSO Evaluation Service, Inc.
    - Report No. ER-5614
  - California State Fire Marshal
    - Listing No. 1451-1200:114
    - Listing No. 1452-1200:109
  - City of New York
    - MEA 99-99-M
    - MEA 132-01-M
- Tested in accordance with
  - UL 2079
  - ASTM E 1966
  - ASTM E 84
  - CAN4-S115-95M
  - ASTM E 2307

Internationally tested and approved

- UL 2079
- ASTM E 1966
- ASTM E 84
- CAN4-S115-95M
- ASTM E 2307
- UL 2079
- ASTM E 1966
- ASTM E 84
- CAN4-S115-95M
- ASTM E 2307

Benefits

- Water based formulation so spills and over-spray cleanup quick and easy.
- CP 672 Speed Spray contains no halogens, solvents or asbestos so it is safe to use and won’t harm the environment.
- Quick and easy installation with the Spray Tech EPX 2505 Sprayer can save you time and money.
- Paintable
- Meets LEED™ requirements for indoor environmental quality credit 4.1 Low Emitting Materials, Sealants and Adhesives, and 4.2 Paints and Coatings.

Application temperature

- 50°F to 90°F (5°C to 32°C)

Notice about approvals

When making a seal using Hilti CP 672 Firestop Joint Spray, please refer to the UL Fire Resistance Directory or the Hilti Firestop Manual for complete details, including restrictions as to joint size, type and thickness of wall or floor, movement capabilities, etc.

Examples

Where a gypsum wall assembly meets the underside of a metal or concrete deck
Where a concrete floor assembly meets with non-rated exterior wall (concrete, glass, etc.)
Where two concrete floor/wall assemblies meet

Completed Top-of-Wall Firestopping Solution!
CP 767 & CP 777

Technical Data

Tested in accordance with:
- UL 2079
- ASTM E 1966
- ASTM C G12 Type I-IUB
- CAN4-S115-95M

Internationally tested and approved

FORMING MATERIAL
FOR USE IN JOINT SYSTEMS
SEE UL FIRE RESISTANCE DIRECTORY 179L

Product Information

Product description
- Pre-formed mineral wool plugs for 1.5", 2" and 3" decks

Product features
- Pre-cut to industry standard size decking flutes
- Reduces material waste
- 3 sizes available

Areas of application
- Top-of-wall

Tested and approved
- UL/cUL Classified when used in conjunction with CP 606 Flexible Firestop Sealant, CP 601S Elastomeric Firestop Sealant or CP 672 Speed Spray

System Advantage / Customer Benefits
- Pre-cut—leaves no gaps or voids
- Smooth surface provides cost effective spray coverage
- Safe to use—no asbestos / inorganic, will not mildew
- Up to 60% faster than castle cutting!

CP 767 Speed Strips &
CP 777 Speed Plugs

Complete Top-of-Wall Firestopping Solution
when used with CP 672, CP 606, or CP 601S

Saves Time and Money!

Castle Cutting
Conventional Mineral Wool
Hilti Speed Plugs

50 MINUTES
35 MINUTES
20 MINUTES

60% Faster than Castle Cutting
43% Faster than Conventional Mineral Wool

*Based upon 40 linear feet of installation

Installation instructions for CP 777 Speed Plugs

Easy One step installation...
Simply cut to length and install.

Full Coverage
Pre-cut flute configuration
leaves no gaps or voids.

Superior Finish
Smooth surface allows quick and cost effective coverage with
Hilti CP 672 Speed Spray.

Easy Utilize Speed Strips in joints between
wall substrate and bottom of deck. Compress per UL System.

latest product information:
www.us.hilti.com

ordering information see page:
14
**Product Information**

**CP 601S**

**Technical Data**

At 73°F (23°C) and 50% relative humidity

- **Density**: Approx. 1.4 g/cm³
- **Color**: Red
- **Application temperature**: 40°F to 104°F (5°C to 40°C)
- **Skin-forming time**: Approx. 15 min.
- **Curing rate**: Approx. 2 min / 3 days
- **Volume shrinkage**: Approx. 0 - 5%
- **Shore A Hardness**: Approx. 25%
- **Temperature resistance**: -40°F to 320°F (-40°C to 160°C)
- **Surface burning characteristics (ASTM E84-96)**: Flame spread: 0, Smoke development: 30
- **Sound transmission classification (ASTM E 90-97)**: 50

**Approvals**

- ICBO Evaluation Service, Inc.
  - Report No. ER-5614
- California State Fire Marshal
  - Listing No. 1451-1200:115
  - Listing No. 1452-1200:113
- City of New York
  - MEA 101-99-M

**Internationally tested and approved**

- **UL**
- **FM Approved**

**Product description**

- A silicone-based firestop sealant that provides maximum movement in fire-rated joint applications and pipe penetrations

**Product features**

- Halogen and solvent free
- Weather and UV-resistant
- Asbestos free

**Areas of application**

- Sealing construction/expansion joints
- Top-of-wall joints
- Metal pipes
- Cable bundles
- HVAC penetrations*

**For use with**

- Various base materials such as masonry, concrete, metal, glass, etc.
- Wall and floor assemblies rated up to 4 hours

**Examples**

- Where a gypsum wall assembly meets the underside of a metal or concrete deck
- Sealing expansion joints to impede the passage of fire, smoke, and toxic fumes
- Sealing HVAC penetrations through fire-rated assemblies

* For metal ducts with dampers, consult damper manufacturer.

**Installation instructions for CP 601S**

**Opening**

1. Clean the opening. Surfaces to which CP 672 will be applied should be cleaned of loose debris, dirt, oil, wax, and grease. The surface should be moisture and frost free.

**Application of firestop**

2. Insert fill of mineral wool (or backer as required).
3. Apply firestop over backer.
4. Smooth firestop sealant with a towel before the skin forms. Once cured, CP 601S can only be removed mechanically.
5. For maintenance reasons, a penetration seal can be permanently marked with an identification plate and fastened in a visible position next to the seal.

**Chemical resistance**

- At room temperature the cured silicone sealant is resistant for a short time to diluted (15%) acids and aliphatic hydrocarbons as well as most commercially available cleaning agents and disinfectants (except those containing iodine).
- Concentrated acids and aliphatic hydrocarbons destroy silicone rubber over time.
- Solvents and mineral oils cause cured silicone to swell. Consequently, proper functioning of the sealant should be checked after exposure to a solvent or mineral oil.

Please contact your local sales representative or the nearest Hilti center if special requirements for chemical resistance have to be met.

**Notice about approvals**

- When using Hilti CP 601S Elastomeric Firestop Sealant, check that the joint or pipe application has been sealed according to the applicable drawing in the UL/cUL Fire Resistance Directory or the Hilti Firestop Manual.

**Not for use...**

- In areas immersed in water
- Not to be painted

**Safety precautions**

- Keep out of reach of children
- Read the Material Safety Data Sheet
- Eyes and hands must be suitably protected
- Avoid contact with eyes/skin
- Only use in well-ventilated areas

**Storage**

- Store only in the original packaging in a location protected from moisture at a temperature of 40°F to 77°F (5°C to 25°C)
- Observe expiration date on packaging

**Data and information**

- Latest product information: www.us.hilti.com
- Ordering information see page: 35

![Hilti Firestop Guide 2005-2006](N3321_02_Product_TP_28.qxd)

CP 604
Self-Leveling Firestop Sealant

Product description
• Self-leveling, single-component, silicone-based firestop sealant for use with through-penetrations as well as construction joints in floors.

Product features
• Self-leveling—requires no tooling
• Excellent elongation/compression properties
• Resistant to smoke and water

Areas of application
• Sealing construction/expansion joints
• Metal pipes
• Cable bundles
• Sealing multiple penetrations in small or large openings

For use with
• Concrete floors rated up to 3-hours

Examples
• Penetrations for metal pipes between floor levels
• Construction joints and expansion joints in floors

Installation instructions for CP 604

Opening
1. Clean the opening. Surfaces to which CP 672 will be applied should be cleaned of loose debris, dirt, oil, wax and grease. The surface should be moisture and frost free.

Application of firestop
2. Insert fill of mineral wool (or backer as required).
3. Apply firestop over backer.
4. Allow firestop sealant to level. Once cured, CP 604 can be removed mechanically.
5. For maintenance reasons, a penetration seal could be permanently marked with an identification plate. In such a case, mark the identification plate and fasten it in a visible position next to the seal.

Chemical resistance
• At room temperature the cured silicone sealant is resistant to a short time to diluted (15%) acids and lyes/alkalis as well as commercially available cleaning agents and disinfectants (except those containing iodine).
• Concentrated acids and lyes/alkalis destroy silicone rubber over time.
• Solvents and mineral oils cause cured silicone to swell.

Joint installation: For floor applications. Not to be used in walls.

Through Penetration Installation (Top View): For floor applications. Not to be used in walls.

CP 604 Technical Data

At 73°F (23°C) and 50% relative humidity

Chemical basis
Neutral elastic silicone

Density
Approx. 1.35 g/cm³

Color
Gray

Application temperature
40°F to 104°F (5°C to 40°C)

Temperature resistance
-40°F to 320°F (-40°C to 160°C)

Curing time
Approx. 5 mm/3 days

Tensile strength (modulus of elasticity)
Approx. 0.7 N/mm²

Shore A Hardness
Approx. +20%

Joint movement capability
Approx. +20%

Surface burning characteristics
(ASTM E 84-00)
Flame Spread: 5
Smoke Development: 60

Not for use...
• In areas immersed in water
• Not to be painted

Safety precautions
• Keep out of reach of children
• Read the Material Safety Data Sheet
• Eyes and hands must be suitably protected
• Avoid contact with eyes/skin
• Only use in well-ventilated areas

Storage
• Store only in the original packaging in a location protected from moisture at a temperature of 40°F (5°C) to 77°F (25°C)
• Observe expiration date on packaging

Notice about approvals
• When using Hilti CP 604 Self-Leveling Firestop Sealant, check that the joint or pipe application has been sealed according to the applicable drawing in the UL/cUL Fire Resistance Directory or Hilti Firestop Manual.

International tested and approved

Smoke Development: 60
Flame Spread: 5

Approvals
ICBO Evaluation Service, Inc.
In progress, call for details
California State Fire Marshall
Listing No. 4485-1200:117
City of New York
MEA 237-02-M

Tested in accordance with
• UL 1479
• UL 2079
• ASTM E 1966
• ASTM E 814
• ASTM E 84
• ASTM E 2307
CP 606
Flexible Firestop Sealant

Product description
- An acrylic based firestop sealant that provides movement capability in fire rated joints and seals through penetrations applications.

Product features
- Silicone free
- Halogen, asbestos and solvent free
- UV-resistant

Areas of application
- Sealing construction/expansion joints
- Top-of-wall joints
- Metal pipes
- Cable bundles
- HVAC penetrations

For use with
- Various base materials such as masonry, concrete, metal, etc.
- Wall and floor assemblies rated up to 3 hours

Examples
- Where a gypsum wall assembly meets the underside of a metal or concrete deck
- Sealing expansion joints to impede the passage of fire, smoke and toxic fumes
- Sealing around HVAC penetrations through fire-rated assemblies

Installation instructions for CP 606

Opening
1. Clean the opening. Surfaces to which CP 672 will be applied should be cleaned of loose debris, dirt, oil, wax and grease. The surface should be moisture and frost free.

Application of firestop
2. Insert fill of mineral wool or backer (as required).
3. Apply firestop over backer.
4. Smooth firestop sealant with a trowel before the skin forms. Once cured, CP 606 can only be removed mechanically.
5. For maintenance reasons, a penetration seal can be permanently marked with an identification plate and fastened in a visible position next to the seal.

Notice about approvals
- When using Hilti CP 606 Flexible Firestop Sealant, check that the joint or pipe application has been sealed according to the applicable drawing in the UL Fire Resistance Directory or the Hilti Firestop Manual.

Notice about approvals
- Not to be used...
  - On areas immersed in water

Safety precautions
- Keep out of reach of children
- Read the Material Safety Data Sheet
- Eyes and hands must be suitably protected
- Avoid contact with eyes/skin
- Only use in well ventilated areas

Storage
- Store only in the original packaging in a location protected from moisture at a temperature of 40°F to 77°F (5°C to 25°C)
- Observe expiration date on package

Technical Data
CP 606

Chemical basis
Acrylic based firestop sealant

Density
Approx. 1.5 g/cm³

Color
Available in red or white

Application temperature
40°F to 104°F (5°C to 40°C)

Skin-forming time
Approx. 15 min

Curing rate
Approx. 2 mm / 3 days

Volume shrinkage
Less than 20%

Movement capability
Approx. 10%

Temperature resistance
–22°F to 176°F (–30°C to 80°C)

Surface burning characteristics
(ASTM E 84-96)
Flame Spread: 0
Smoke Development: 5

Sound transmission classification
(ASTM E 90-99) 56

Approvals
ICBO Evaluation Service, Inc.
Report No. ER-5614
California State Fire Marshal
Listing no. 1452-1200:112
City of New York
MEA 100-99-M

Tested in accordance with
- UL 2079
- ASTM E 1966
- UL 1479
- ASTM E 814
- ASTM E 84

Internationally tested and approved
- FM APPROVED
- UL APPROVED

BS 476
British Standard

Latest product information: www.us.hilti.com
Ordering information see page: 35
## Product Information

### CP 620

**Technical Data**

- **At 73°F (23°C) and 50% relative humidity**
- **Color**: Red
- **Cartridge content**: 10.2 oz (300 ml)
- **Fire Foam Yield**: Up to 110 in²
- **Application temperature**: 50°F to 86°F (10°C to 30°C)
- **Temperature resistance of cured foam**: -22°F to 212°F (-30°C to 100°C)
- **Minimum temperature**:
  - Substrate: 32°F (0°C)
  - Cartridge: 50°F (10°C)
- **Curing**:
  - Non-tacky after Approx. 35 seconds
  - Ready to cut after Approx. 1 minute
- **Thermal insulation (R-value)**: 2.8—3.0 per inch of thickness
- **Sound transmission classification**: (ASTM E60—97) 50
- **Structure-borne sound insulation**: Pipe/wall 30—50%
- **Surface burning characteristics**: (ASTM E84—01)
  - Flame spread: 0
  - Smoke development: 15
- **Approved**:
  - ICBO Evaluation Service, Inc.
  - Approvals:
    - California State Fire Marshal
    - City of New York
    - Tested in accordance with
      - UL 1479
      - ASTM E814
      - ASTM E84
  - Internationally tested and approved
- **Fire Foam Yield**
  - Ready to cut after Approx. 1 minute
- **Non-tacky** after Approx. 35 seconds

### CP 620 Fire Foam

**Installation instructions for CP 620**

**Application**

Before handling read the Material Safety Data Sheet for detailed usage and health information. Refer to the UL Fire Resistance Directory for specific application details.

1. Prepare dispenser and cartridges as shown below. The Fire Foam from the first few strokes of the dispenser should be discarded until the Fire Foam in the mixer has a consistent red color.

2. Insert the cartridge in the dispenser.

3. Apply CP 620 Fire Foam in the opening.

4. Release the dispenser and pull back the piston rod.

5. Attach the installation plate (if required).

**System Advantage / Customer Benefits**

- One solution for various applications
- Easy handling for difficult to reach applications
- One step application
- Paintable
- Virtually impervious to smoke
- Mold resistant
- No additional materials required
- Excellent water vapor impermeability
- Meets LEED™ requirements for indoor environmental quality credit 4.1 Low Emitting Materials, Sealants and Adhesives and 4.2 Paints and Coatings

**Fire Foam Features**

- Innovative firestopping solution for complex applications
- Up to 6 times expansion
- Repenetrable
- Cures within 60 seconds

**Areas of application**

- Sealing small- to medium-sized openings
- Permanent fire seal for cables and cable trays
- Permanent fire seal for non-combustible pipes
- Permanent fire seal for combustible pipes when used in conjunction with Hilti Wrap Strips

**For use with floor and wall assemblies**

- Concrete, drywall, masonry

**Examples**

- Power cables and cables of various types and diameters
- Non-combustible pipes (steel, cast iron, copper)
- Combustible pipes when used in conjunction with Wrap Strips

**Safety precautions**

- Keep out of reach of children.
- Wear protective clothing, safety glasses and gloves when installing.
- Request a copy of Material Safety Data System and read all usage and precautionary information.

**Storage**

- Store only in the original packaging in a dry place at a temperature of 40°F to 77°F (5°C to 25°C). See technical data for application and substrate temperatures. Partly-used cartridges can be stored with mixer attached until they are required again. When re-using a partially used cartridge, simply attach a new mixer and dispense accordingly.

**Notes**

- The CP 620 Fire Foam can be cut back to no less than the minimum specified installation depth (see applicable UL systems for depths).
- Pieces of cured excess CP 620 Fire Foam which have been cut off can be laid in the next opening and fresh CP 620 Fire Foam can be applied around these.

**Fire Foam**

- Exposed to UV
- Exposed to weather
- Not for use
  - Exposed to weather
  - Exposed to UV

**Material Safety Data Sheet**

- Please call for details
- www.us.hilti.com
**CP 643N**

**Firestop Collar**

**Product description**
- A ready-to-use firestop collar, made of a galvanized steel housing and intumescent inserts for firestopping combustible pipes

**Product features**
- Adjustable mounting tabs
- Ready-to-use collar; no construction required, therefore fast installation time

**Areas of application**
- Firestopping combustible pipes up to 4” in diameter in penetrations through fire walls and floors.
- Suitable for the following pipe materials: PVC, CPVC, ABS, PVDF, PP and FRPP

**For use with**
- Concrete, masonry, wood floor and gypsum wall assemblies
- Wall and floor assemblies rated up to 4 hours

**Types of installation**
- Wall: two collars, one on each side
- Floor: one collar on underside (bottom)

**Example**
- Waste water pipes
- Fresh water pipes

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**System Advantage / Customer Benefits**
- Quick and easy closure without the use of a tool
- Adjustable position tabs for simple fastening
- Low profile for tight installations

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**Installation instructions for CP 643N**

**Opening**
1. Clean the plastic pipes. Expansion of the intumescent material during a fire acts to close the plastic pipe. Very dirty pipes with, for example, remains of mortar, may lead to a delay in this closing action. Soiled plastic pipes should, therefore, be cleaned in the area where the CP 643N firestop collar is to be installed.

**Application of firestop system**
2. Seal the opening if required. Gaps may be closed with FS-ONE. The approved methods vary and are given in the specific UL/cUL system.
3. Close the CP 643N firestop collar. Place the CP 643N firestop collar around the plastic pipe and lock the closure by applying firm pressure until it latches.
4. Attach fastening hooks. The fastening hooks can be attached to various points on the metal housing. This allows the fastening points to be made to suit the space available in each case. The hooks must be positioned as symmetrically as possible. The required number of fastening hooks is indicated on the packaging.
5. Fastening the CP 643N firestop collar. Only when fastened properly can CP 643N offer protection against fire passing through.
   a. Mark the fastening points.
   b. Drill holes with a Hilti rotary hammer drill (i.e. TE 5) or, depending on base material, fasten using Hilti power actuated tool.
   c. To secure the CP 643N firestop collar, use Hilti anchors/fasteners.
   d. For maintenance reasons, a penetration seal can be permanently marked with an identification plate and fastened in a visible position next to the seal.

**Notice about approvals**
- When making a pipe seal using Hilti CP 643N Firestop Collar, please refer to the UL Fire Resistance Directory or the Hilti Firestop Manual for complete details, including restrictions as to opening size, type and thickness of wall or floor, maximum pipe diameter, etc.
- Not for use:
  - With metal pipes
  - In highly corrosive surroundings
  - With unapproved anchors/fasteners

**Safety precautions**
- Keep out of the reach of children
- Read the Material Safety Data Sheet

**Storage**
- Store only in the original packaging in a location protected from moisture

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**CP 643N Technical Data**

<table>
<thead>
<tr>
<th>Description</th>
<th>Pipe outside dia. (in.)</th>
<th>Collar outside dia. (in.)</th>
<th>Collar Height (in.)</th>
<th>No. of hooks &amp; fasteners</th>
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<tr>
<td>CP 643-50</td>
<td>1.4–2.0</td>
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<td>0.9</td>
<td>2</td>
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<td>CP 643-63</td>
<td>2.0–2.5</td>
<td>3.4</td>
<td>1.3</td>
<td>2</td>
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<td>CP 643-90</td>
<td>2.6–3.6</td>
<td>4.9</td>
<td>1.7</td>
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<td>CP 643-110</td>
<td>3.6–4.5</td>
<td>6.0</td>
<td>1.9</td>
<td>3</td>
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<td>CP 643-160</td>
<td>6.6</td>
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<td>1.9</td>
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</table>

**Temperature resistance**
- -40°F to 140°F (-40°C to 60°C)

**Intumescent Activation**
- Approx. 392°F (200°C)

**Expansion ratio (unrestricted)**
- Up to 1:10

**Approvals**
- ICBO Evaluation Service, Inc.
  Report No. ER-5071
- California State Fire Marshal
  Listing No. 4485-1200:110
- City of New York
  MEA 113-96-M

**Tested in accordance with**
- UL 1479
- ASTM E 814

**Internationally tested and approved**
- FM APPROVED
- UL FIRESTOP DEVICE FOR USE IN THROUGH-PENETRATION FIRESTOP SYSTEMS SEE UL FIRE RESISTANCE DIRECTORY 5876

**British Standard BS 476**

**System compatible**

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**latest product information :**
www.us.hilti.com

**ordering information see page:**
34

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Product Information

CP 644
Firestop Collar

Product description
• Galvanized sheet steel containing sections of intumescent material (designed to expand when exposed to fire) for firestopping large combustible pipes

Product features
• Ready-to-use collar, no construction required, therefore fast installation time
• Adjustable/moveable fastening tabs

Areas of application
• Sealing of penetrations for combustible pipes from 8” to 10” in diameter.
• Vented or closed pipe
• PVC or CPVC pipe

For use with
• Concrete, masonry, and gypsum walls
• Wall and floor assemblies rated up to 2 hours

Types of installation
• Wall: two collars, one on each side
• Floor: one collar on underside (bottom)

Examples
• Waste water pipes
• Fresh water pipes

System Advantage / Customer Benefits
• Snap connection for quick and easy closure without use of a tool
• Adjustable position tabs for convenient fastening
• Ready to use out of the package

Installation instructions for CP 644

Opening
1. Clean the plastic pipes. Expansion of the intumescent material during a fire acts to close the plastic pipe. Very dirty pipes with, for example, remains of mortar, may lead to a delay in this closing action. Soiled plastic pipes should, therefore, be cleaned in the area where the CP 644 firestop collar is to be installed.

Application of firestop system
2. Seal the opening. Gaps must be closed with FS-ONE. The approved methods vary and are given in the specific UL system.

3. Close the CP 644 firestop collar. Place the CP 644 firestop collar around the plastic pipe and lock the closure by applying firm pressure until it latches.

4. Attach fastening hooks. The fastening hooks can be attached to various points on the metal housing. This allows the fastening points to be made to suit the space available in each case.

The hooks must be positioned as symmetrically as possible. The required number of fastening hooks is indicated on the packaging.

5. Fastening the CP 644 firestop collar. Only when fastened properly can CP 644 offer protection against fire passing through.

a. Mark the fastening points.
b. Drill holes with a Hilti rotary hammer drill (i.e. TE 5) or, depending on base material, fasten using Hilti power actuated tool.
c. To secure the CP 644 firestop collar, use Hilti anchors/fasteners.
d. For maintenance reasons, a penetration seal can be permanently marked with an identification plate and fastened in a visible position next to the seal.

Notice about approvals
• When making a pipe seal using Hilti CP 644 Firestop Collar, please refer to the UL Fire Resistance Directory or Hilti Firestop Manual for complete details, including restrictions as to opening size, type and thickness of wall or floor, maximum pipe diameter, etc.

Not for use...
• With metal pipes
• In highly corrosive surroundings
• With unapproved anchors/fasteners

Safety precautions
• Keep out of the reach of children
• Read the Material Safety Data Sheet

Storage
• Store only in the original packaging in a location protected from moisture

CP 644
Technical Data

<table>
<thead>
<tr>
<th>Description</th>
<th>Pipe outside dia (in)</th>
<th>Collar outside dia (in)</th>
<th>Collar Height (in)</th>
<th>No. of hooks &amp; fasteners</th>
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Approvals
California State Fire Marshal
In progress

City of New York
In progress

Tested in accordance with
• UL 1479
• ASTM E 814

Internationally tested and approved

British Standard
BS 476

latest product information: www.us.hilti.com

ordering information see page: 36
Product Information

CP 648-E
Firestop Wrap Strip

Product description
• An intumescent, flexible firestop wrap strip for plastic and insulated pipe penetrations

Product features
• Highly Intumescent
• Long length avoids waste
• Can be continuously wrapped
• Cost effective

Areas of application
• Firestopping combustible pipe penetrations
• Difficult applications where space is limited
• Penetrations through concrete over metal deck
• Plastic and insulated penetrations using PVC, CPVC, ABS, FRPP and PEX

For use with
• Concrete, masonry, wood floor and gypsum wall assemblies
• Wall and floor assemblies rated up to 4 hours

Examples
• Waste water pipes
• Fresh water pipes
• Decking penetrations

Installation instructions for CP 648-E

Opening
1. Clean the plastic pipes or insulated pipe penetration. Expansion of the intumescent material during a fire acts to close the plastic pipe or pipe penetration. Very dirty pipes with, for example, remains of mortar, may lead to a delay in this closing action. Soiled plastic pipes or insulated pipe penetrations should, therefore, be cleaned in the area where the CP 648-E Firestop Wrap Strip is to be installed.

Application of firestop system
2. Tightly wrap the required number of strips continuously around the penetrant, and hold in place with tape.
3. Push the Hilti Wrap Strip into the opening until it is flush with the substrate surface unless otherwise required by the UL system. It may be required by the UL system to clamp, wire or use a Hilti Retaining Collar to secure the wrap strip in place for some applications.
4. If the UL system requires a cold smoke seal, then apply the proper amount of Hilti FS-ONE sealant in the opening over the wrap strip.
5. For maintenance reasons, a penetration seal can be permanently marked with an identification plate and fastened in a visible position next to the seal.

Notice about approvals
• When making a pipe seal using Hilti CP 648-E Firestop Wrap Strip, please refer to the UL Fire Resistance Directory or the Hilti Firestop Manual for complete details, including restrictions as to opening size, type and thickness of wall or floor, maximum pipe diameter, etc.

Not for use...
• In highly corrosive surroundings
• With unapproved retaining collars, anchors/fasteners

Safety precautions
• Read the Material Safety Data Sheet
• Keep out of the reach of children

Storage
• Store only in the original packaging in a location protected from moisture at temperatures between 23°F and 86°F (-5°C and 30°C).

CP 648-E Technical Data
At 73°F (23°C) and 50% relative humidity

Density
Approx. 1.35 g/cm³

Dimensions (Approximate)
3/16” x 1” x 33 ft or 3/16” x 1-3/4” x 33 ft

Color
Black with foil backing

Temperature resistance
-40°F to 212°F (-20°C to 100°C)

Intumescent activation
Approx. 320°F (160°C)

Expansion ratio (unrestricted)
1:40

Surface burning characteristics (ASTM E 84-96)
Flame Spread Index: In progress
Smoke Development Index: In progress

Tested in accordance with
• UL 1479
• ASTM E 814
• ASTM E 84

Internationally tested and approved

FM APPROVED
System compatible

FM
Approved

INTERNATIONAL
FIRE PROTECTION
SYSTEMS
FOR USE IN THROUGH-PENETRATION FIRESTOP SYSTEMS
SEE FM APPROVED LISTING 66Y7

FILL, VOID OR CAVITY MATERIAL
FOR USE IN THROUGH-PENETRATION
FIRESTOP SYSTEMS
SEE UL FIRE RESISTANCE DIRECTORY
66Y7

latest product information:
www.us.hilti.com
ordering information see page:
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Product Information

CP 648-S
Technical Data

Density
Approx. 1.35 g/cm³

Approx. Dimens. (thkns” x width” x length”)
1.5” : 3/16” x 1” x 6-3/4”
2” : 3/16” x 1” x 8-1/4”
3” : 3/16” x 1-3/4” x 11-1/2”
4” : 3/8” x 1-3/4” x 15”
6” : 1/2” x 1-3/4” x 22-1/4”

Color
Black with foil backing

Temperature resistance
-40°F to 212°F (-20°C to 100°C)

Intumescent activation
Approx. 320°F (160°C)

Expansion ratio (unrestricted)
1:40

Surface burning characteristics (ASTM E 84-96)
Flame Spread Index: In progress
Smoke Development Index: In progress

Tested in accordance with
• UL 1479
• ASTM E 814
• ASTM E 84

Internationally tested and approved

Installation instructions for CP 648-S

Installation
1. Clean the plastic pipe. Expansion of the intumescent material during a fire closes the plastic pipe. Very dirty pipes with, for example, remains of mortar, may lead to a delay in the closing action. Badly soiled plastic pipes should, therefore, be cleaned in the area where the CP 648-S Firestop Wrap Strip is to be installed.

2. Install Wrap Strip. First check the annular space to ensure compatibility with the appropriate UL System. Use the CP 648-S Firestop Wrap Strip corresponding to the diameter of the pipe to be installed. Wrap the CP 648-S strip around the pipe and fasten it tightly using the integrated adhesive strip.

3. Seal against smoke and gas. Seal the remaining gap with Hilti FS-ONE sealant.

4. For maintenance reasons, a penetration seal can be permanently marked with an identification plate and fastened in a visible position next to the seal.

Notice about approvals
• When making a pipe seal using Hilti CP 648-S Firestop Wrap Strip, please refer to the UL Fire Resistance Directory or the Hilti Firestop Manual for complete details, including restrictions as to opening size, type and thickness of wall or floor, maximum pipe diameter, etc.

Notice for use...
• In highly corrosive surroundings
• In outdoor areas

Safety precautions
• Read the Material Safety Data Sheet
• Keep out of the reach of children

Storage
• Store only in the original packaging in a location protected from moisture at temperatures between 23°F and 86°F (-5°C and 30°C).

Examples
• Waste water pipes
• Fresh water pipes
• Decking penetrations

FILL, VOID OR CAVITY MATERIAL
FOR USE IN THROUGH-PENETRATION FIRESTOP SYSTEMS
SEE UL FIRE RESISTANCE DIRECTORY

FM
APPROVED

SYSTEM COMPATIBLE

latest product information:
www.us.hilti.com

ordering information see page:
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Product Information

CP 637
Technical Data
At 73°F (23°C) and 50% relative humidity

Application temperature (ideal)
40°F to 110°F (5°C to 43°C)

Color
Light red

Form removal (depending on consistency)
Approx. 2 hours

Expansion on setting (approx.)
0.08%

Compressive strength
24 hrs. after casting

• Pourable 360 psi (2.5 N/mm²)
• Plastic 610 psi (4.2 N/mm²)
• Stiff 870 psi (6.0 N/mm²)

After full cure

• Pourable 725 psi (5.0 N/mm²)
• Plastic 1200 psi (8.3 N/mm²)
• Stiff 1784 psi (12.3 N/mm²)

Surface burning characteristics (ASTM E84-01)
Flame spread: 5
Smoke development: 0

Yield (30 lb pail)
900–1000 cubic inches depending on mix ratio

Approvals
California State Fire Marshal
4485-1200:120
City of New York
MEA 239-02-M

Tested in accordance with
• ASTM E 814
• UL 1479
• ASTM E 84

Internationally tested and approved

Mix ratio (recommended, mortar to water):

Trowelable 30 lb (14.6 kg) : 2 U.S. gal (8 L)
Pourable 30 lb (14.6 kg) : 2.5 U.S. gal (9.5 L)

System Advantage / Customer Benefits
• Saves time
• Versatile
• Simple mixing

Installation instructions for CP 637
2. Important! First add clean water to separate container. Then slowly add CP 637 to water while stirring by hand or power mixer to ensure smooth, lump-free mix. See table above for mix ratio.
3. Work prepared mortar into opening by troweling, pouring, or pumping with suitable pump. Use forms for large openings. Make sure application has been sealed according to the applicable UL Fire Resistance Directory or Hilti Firestop Manual.
4. Fasten identification plate (if required).
**CP 617, CP 617L & CP 617XL**

**Firestop Putty Pad**

**Product description**
- An intumescent moldable firestop putty designed to help protect electrical outlet boxes

**Product features**
- Applied by hand
- Fast installation

**Areas of application**
Protection of:
- Electrical outlet boxes

**For use with**
- Gypsum wall assemblies with wood or metal studs

**Examples**
- Where two outlets are within a single stud/cavity or within 24" (not back to back)

**Installation instructions for CP 617**

**Application of firestop putty**
1. Remove label from one side of pad. For a 1 to 2 hour fire rating, one CP 617 pad is required. Exposed side of pad is placed against box.
2. Adhere pad to side of the box, overlapping the stud and all edges of the box. When drywall is installed: fix pad into gap between electrical box and gypsum board slightly overlapping the inner wall board surface. When drywall will be installed later: overlap front edge of electrical box so that CP 617 will be compressed around edges of box as gypsum board is installed.
3. Reshape CP 617 to fit around conduit or cables.
4. Press CP 617 to all sides of electrical box. Trim excess at corners and apply to conduit fittings connected to the box.
5. Remove other side of label. To help prevent passage of cold smoke, CP 617 may optionally be placed into inside of electrical conduit fittings.

**Notice about approvals**
- CP 617 Firestop Putty Pad is classified by Underwriters Laboratories, Inc., (UL) as a “Wall Opening Protective Material.” Therefore, specific UL listings are not required. Specific requirements should be consulted in the current UL Fire Resistance Directory and/or the Hilti Firestop Manual.

**Not for use...**
- In areas underwater

**Safety precautions**
- Before handling, read the product Material Safety Data Sheet for detailed use and health information
- Wear suitable gloves and eye protection
- Keep out of the reach of children

**Storage**
- Store only in the original packaging in a location at temperatures 40°F (5°C) to 104°F (40°C)

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**CP 617 Technical Data**

At 73°F (23°C) and 50% relative humidity

**Dimensions**
- CP 617: 6" X 7" X 1/8" (15 X 18 X 0.3 cm)
- CP 617L: 7" X 7" X 1/8" (18 X 18 X 0.3 cm)
- CP 617XL: 9" X 9" X 1/8" (23 X 23 X 0.3 cm)

**Consistency**
- Moldable putty

**Color**
- Red

**Application temperature**
- 40°F (5°C) to 95°F (35°C)

**Storage temperature**
- 40°F (5°C) to 104°F (40°C)

**Cure**
- Non-curing

**Density**
- 1.48 g/cm³

**Intumescent activation**
- Approx. 220°F to 250°F (104°C to 121°C)

**Volatile solvents**
- None

**Asbestos fibers**
- None

**Surface burning characteristics**
- (ASTM E 84-96)
  - Flame Spread: 5
  - Smoke development: 5

**Sound transmission classification**
- (ASTM E 90-97)
  - 49

**Approvals**
- City of New York
  - MEA-102-99-M
- Tested in accordance with
  - UL 263
  - ASTM E 84
  - ASTM E 119
- Internationally tested and approved
- CP 617, CP 617L & CP 617XL

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**System Advantage / Customer Benefits**
- Applied by hand
- Fast installation

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**Product Information**
Product Information

CP 618
Technical Data
At 73°F (23°C) and 50% relative humidity
Dimensions
16 in³
Consistency
Moldable putty
Color
Red
Application temperature
40°F to 95°F (5°C to 35°C)
Cure
Non-curing
Density
Approx. 1.48 g/cm³
Intumescent activation
Approx. 220°F to 250°F (104°C to 121°C)
Surface burning characteristics
(ASTM E84-96)
Flame Spread: 5
Smoke development: 5
Sound transmission classification
(ASTM E 90-97) 49

Approvals
ICBO Evaluation Service, Inc.
Report No. ER-5071
California State Fire Marshal
Listing No. 4485-1200:111
City of New York
MEA-96-99-M

Tested in accordance with
• UL 1479
• ASTM E 814
• ASTM E 84

Internationally tested and approved

FILL, VOID OR CAVITY MATERIAL
FOR USE IN THROUGH-PENETRATION
FIRESTOP SYSTEMS
SEE UL FIRE RESISTANCE DIRECTORY
66Y7
FM APPROVED

Product description
• An intumescent, non-hardening, firestop putty for cable and pipe penetrations

Product features
• Contains no volatile solvents or asbestos
• Water resistant
• Easy to re-penetrate

Areas of application
• Single or bundled cables
• Non-combustible pipe
• Blank openings

For use with
• Concrete, masonry and gypsum wall assemblies
• Wall and floor assemblies rated up to 3 hours

Examples
• Where telecommunication and data lines penetrate gypsum wall assemblies
• Where steel conduit and EMT penetrate concrete and block wall assemblies
• Where blank openings exist in concrete and block wall assemblies

Installation instructions for CP 618
Opening
1. Clean the opening: Surfaces to which CP 618 will be applied should be cleaned of loose debris, dirt, oil, moisture, frost and wax.

Application of firestop putty
2. Install the prescribed backing material, if required.
3. Install CP 618 Firestop Putty to the required depth, making sure that the putty contacts all surfaces to provide the greatest adhesion.
4. Smooth CP 618 putty.
5. For maintenance reasons, a penetration seal can be permanently marked with an identification plate and fastened in a visible position next to the seal.
6. Re-installation (not shown): Remove and re-install CP 618 Firestop Putty as needed.

Notice about approvals
• When using Hilti CP 618 Firestop Putty Stick please refer to the UL Fire Resistance Directory or the Hilti Firestop Manual for restrictions as to opening size, type and thickness of wall or floor, penetration type, etc.

Not to be used...
• In areas underwater

Safety precautions
• Before handling, read the Material Safety Data Sheet for detailed use and health information.
• Wear suitable gloves and eye protection
• Keep out of the reach of children

Storage
• Store only in the original packaging at temperatures 40°F to 104°F (5°C to 40°C)
Product Information

CP 658T Firestop Plug

Product description
• Ready-to-use intumescent flexible plug based on a two-component polyurethane foam

Product features
• Virtually dust and fiber free
• Halogen and solvent free
• Operational immediately after installation
• Can be painted

Areas of application
• Walls and floors
• Temporary or permanent sealing of cables
  - single or bundled cables

Examples
• Dust and fiber-free rooms and places where electrical installations are frequently changed such as computer centers, hospitals, and laboratories
• New buildings in the construction phase and during renovation
• Office buildings, production bays, warehouses

System Advantage / Customer Benefits
• Suitable for laying new cables later
• Fast installation, saving time and money
• Easy installation — no special tool is required
• Immediately functional after installation
• Versatile in use (temporary or permanent protection)
• Smoke resistant
• Installation in drywall

Installation instructions for CP 658T

Opening
1. Clean the opening. Surfaces CP 658T will be in contact with should be cleaned of loose debris, dirt, oil, moisture, frost, and wax.

Application of firestop plug
2a. If there are no penetrations, install CP 658T within opening and bead with Hilti CP 618 Putty Stick where firestop plug interfaces with inside of sleeve (when required).
2b. If there are penetrations, cut CP 658T to fit around cables. Insert firestop plug into sleeve. Optional: seal cables by forcing CP 618 into interstices of cables.

Re-installing cables
• Remove firestop plug from opening
• Install the penetrant and re-install the firestop plug in compliance with the appropriate UL system.
• If single cables are installed, a hole can be drilled through the firestop plug and a cable passed through

Notice of approvals
• When making a seal using Hilti CP 658T Firestop Plug, national approvals must be observed. Please refer to the UL Fire Resistance Directory or the Hilti Firestop Manual for complete details, including restrictions as to opening size, type and thickness of wall or floor, maximum cable diameter, etc.

Not for use
• In wet rooms or outdoors exposed to the weather or UV radiation

Safety precautions
• Keep out of reach of children
• Read the Material Safety Data Sheet

Storage
• Store only in the original packaging in a location protected from moisture and direct sunlight

CP 658T Technical Data
(At 73°F (23°C) and 50% relative humidity)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>Approx. 0.25 g/cm³</td>
</tr>
<tr>
<td>Color</td>
<td>Red</td>
</tr>
<tr>
<td>Application temp.</td>
<td>&gt;41°F (&gt; 5°C)</td>
</tr>
<tr>
<td>Temperature res.</td>
<td>5°F to 140°F (-15°C to 60°C)</td>
</tr>
<tr>
<td>Intumescent act.</td>
<td>approx. 572°F (300°C)</td>
</tr>
<tr>
<td>Expansion ratio</td>
<td>Approx. 1:3</td>
</tr>
</tbody>
</table>

Approvals
California State Fire Marshal
In progress
City of New York
MEA 48-04-M

Surface burning characteristics
(ASTM E 84-96)
Flame Spread Index: 0
Smoke Development Index: 25

Tested in accordance with
• UL 1479
• ASTM E 814
• ASTM E 84

Internationally tested and approved

Not for use

Safety precautions

Storage

Opening
1. Clean opening
2. Blank opening: Install plug (sleeved opening) and CP618 Putty Stick
3. With cables: Cut plug to fit around cables
4. Install plug around cables (optional: CP618 Putty Stick forced into interstices of cables)
5. Fasten installation plate in place (if required)

Notice of approvals

6. When making a seal using Hilti CP 658T Firestop Plug, national approvals must be observed. Please refer to the UL Fire Resistance Directory or the Hilti Firestop Manual for complete details, including restrictions as to opening size, type and thickness of wall or floor, maximum cable diameter, etc.

Not for use

• In wet rooms or outdoors exposed to the weather or UV radiation

Safety precautions

• Keep out of reach of children
• Read the Material Safety Data Sheet

Storage

• Store only in the original packaging in a location protected from moisture and direct sunlight
Product Information

CP 675T
Technical Data

Color
Red

Size
26” x 39” x 1” (Large Board)
(660 mm x 990 mm x 25 mm)
26” x 28” x 1” (Small Board)
(660 mm x 711 mm x 25 mm)

Density
320 kg/m³

Application Temperature
-22°F to 176°F (-30°C to 80°C)

Temperature Resistance
-22°F to 176°F (-30°C to 80°C)

Surface burning characteristics (ASTM E 84-00)
Flame Spread Index: 5
Smoke Development Index: 10

Approved
City of New York
MEA 283-04-M

Tested in accordance with
• UL 1479
• ASTM E 814
• ASTM E 84

Internationally tested and approved

CP 675T
Firestop Board with Accessories

System Advantage / Customer Benefits
• Satisfies a wide range of application scenarios
• Allows for high flexibility and eases re-penetration / cable mining from one side of the wall
• Easy and fast cable re-penetration and cable mining with reduced labor and materials
• Labor saving “one person, one sided installation” method
• Polyurethane foam material, easy to cut without electric tools
• No dust, no fibers, no mess
• Same system for all types of wall materials

Installation Instructions for CP 675T Firestop Board

Surface Mounted Installation (wall)
1. Clean the opening.
2. Measure the size of the opening. Cut the Firestop Board to size (check system for overlap requirements) with a utility knife, hand saw, circular saw, jig saw, or table saw.
3. If penetrants run through the opening, cut the Firestop Board appropriately (max. annular space between Board and penetrant: 1/2”). The Board can be cut into two pieces or just cut to allow space for the penetrant(s).
4. Apply CP 619T Putty Roll around edges of the Firestop Board next to the wall. In case of penetrants, the cables and cable trays have to be sealed with CP 619T Putty Roll at their interface with the Firestop Board.
5. Attach Firestop Board with approved Hilti anchors as specified in accordance with the applicable firestop system. When two Firestop Boards come together, seal intersection with CP 619T Putty Roll or FS-ONE (per firestop system requirements).
6. Fasten identification plate (if required).
7. Repeat steps on other side of wall.

Frame Mounted Installation (wall)
1. Clean the opening.
2. Measure the size of the opening. Cut the CP 675T Z-Frame component to size and attach to top and both sides of opening as specified by firestop system with appropriate Hilti fasteners. Apply CP 619T Putty Roll to back lip of Z-Frame inside opening.
3. Apply a maximum of three rows (6”) of FS657 Fire Blocks in the opening above and below cable tray (lengthwise). Cut the CP 675T T-Separator Bar to the width of the opening and put it on top of the FS 657 Fire Blocks (T-edge against back of opening). Apply CP 619T Putty Roll to the backward T-Bar edge protruding above the FS 657 Fire Block section and around back lip of frames.
4. Cut Firestop Boards to size +1/2” vertically. Use the extra 1/2” to compress the FS 657 Fire Block partition and provide a tight fit into the opening. Place CP 675T Distance Holders around Firestop Board at a maximum of every 8”. With downward pressure, press top of inside Firestop Board into opening and push flush with back edge of Z-Frame followed by outside Firestop Board inserted flush with wall surface.
5. Secure front of Firestop Board with Z-Frame Latches every 8”. Apply CP 619T Putty Roll over the intersection between the Board and the Frame. Fill voids around penetrating items within FS 657 Fire Block partition with Hilti Firestop Putty. Refer to UL systems for complete details.
6. Fasten identification plate (if required).

Notice about approvals
When installing Hilti: CP 675T Firestop Board, please refer to the UL Fire Resistance Directory or the Hilti Firestop Manual for complete details such as restrictions for opening size, type and thickness of wall or floor, maximum size of cable tray, etc.

Not for use...
• In wet rooms, outdoors or in areas exposed to the weather or UV radiation.

Safety precautions
• Keep out of the reach of children
• Read the Material Safety Data Sheet

Storage
• Store only in the original packaging in a location protected from moisture and direct sunlight.

Hilti
Product Information

CP 680N / CP 682

Technical Data

Dimensions CP 680N / CP 682-75/2.5”
- O.D. of fastening flange: 6.4” (162 mm)
- Metal Deck Opening Size Required When Used With Adapter: 4.3” (110 mm)

Dimensions CP 680N / CP 682-110/4”
- O.D. of fastening flange: 8.5” (215 mm)
- Metal Deck Opening Size Required When Used With Adapter: 6.7” (170 mm)

Dimensions CP 680N-160/6”
- O.D. of fastening flange: 11.1” (282 mm)
- Metal Deck Opening Size Required When Used With Adapter: 9” (230 mm)

Expansion temperature
392°F (200°C)

Expansion rate
1:50 (unrestrained)
1:30 (Load expansion, Load=20g/cm²)

Standard Height
10”

Temperature resistance
Maximum 212°F (100°C)

Color
CP 680N: Red housing
CP 682: Black housing

Approvals
ICBO Evaluation Service, Inc.
Report No. ER 5071
California State Fire Marshal
Listing No. 4485-1200:116
City of New York
MEA-102-00-M, Vol. II,

Tested in accordance with
- UL 1479
- ASTM E 814
- UL 2043

Internationally tested and approved

Put Hilti Firestop Cast-In Solutions to work.

Hilti is your single source supplier for a comprehensive group of firestop products and services to meet your cast-in needs. Our quick and simple system selection and installation is specifically designed to reduce labor cost and increase productivity.

- Ready to use out of the package, no additional firestop material required
- Internationally tested and approved by UL and FM
- Simplifies inspection reducing the chances of project delays due to failed inspections
- Suitable for a wide variety of penetrating materials

Hilti is your single source supplier for a comprehensive group of firestop products and services to meet your cast-in needs. Our quick and simple system selection and installation is specifically designed to reduce labor cost and increase productivity.

- Ready to use out of the package, no additional firestop material required
- Internationally tested and approved by UL and FM
- Simplifies inspection reducing the chances of project delays due to failed inspections
- Suitable for a wide variety of penetrating materials
Installation Instructions

CP 680N / CP 682
Cast-In Firestop Device

Before handling, read the product and Material Safety Data Sheet for detailed usage and health information.

Installation in concrete floors

1. Place the CP 682N / 682 cast-in firestop device
2. Use the correct size CP 680N / CP 682 Cast-in Firestop Device and attach it in place to the formwork. Before pouring the concrete, secure the top cap in place, thereby preventing the flow of concrete into the cast-in device.
3. Pour the concrete slab to the required thickness.
4. Remove the formwork. CP 680N / CP 682 has been designed to help ensure the nails used for attachment are removed with the formwork.
5. Clean the penetrating pipe. The flexible sealing membrane of the device provides a water seal once the pipe has been passed through. Very dirty pipes, with remains of mortar for example, may lead to a loss of light seal by damaging this membrane. Very dirty pipes can also disturb expansion of the intumescent material and lead to delays in the closing action during fire. Soiled pipes should, therefore, be cleaned.
6. Install the pipe. Pipes can be installed from the top or bottom. Pass the pipe through, breaking the white membrane. If insulation is required, pass the pipe through first followed by the insulation. Installation is now finished and the firestop is functional.

Installation in concrete floor over metal decking

1. Create the opening in the metal deck. Use the correct size CP 680N / CP 682 Cast-in Firestop Device to slab thickness before installation or when riser clamps are used, follow the instructions. For concrete floor over metal decking applications, a special CP 680N Metal Deck Adapter is required.
2. Remove the top cap, and cut the device to the right slab thickness (min. 2-1/2”).
3. Replace the top cap and make sure it fits correctly.

Safety precautions

• Keep out of the reach of children
• Read the Material Safety Data Sheet (MSDS)

Not for use...

• In high condensation areas,
• In outdoor areas
• In walls

Notice of approvals

• When making a pipe seal using Hilti CP 680N / CP 682 Cast-in Firestop Device, please refer to the UL Fire Resistance Directory or Hilti Firestop Manual for complete details, including restrictions, such as maximum pipe diameter.

Storage

• Store only in the original packaging in a location protected from moisture

latest product information:
www.us.hilti.com

ordering information see page:

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