FIRESTOP SUBMITTAL PACKAGE

PLUMBING

Materials
FS-ONE Intumescent Caulk

Includes:
Technical and Installation Data
UL Certificate of Compliance
LEED information
MSDS

UL Details

Gypsum Wall Assemblies
W-L-1054 - Max. 30" steel, cast iron, Max. 6" copper
W-L-1408 - Multiple steel pipe, Max 4", 0 to 1" annular space - one row
W-L-1410 - Max. 3" steel pipe, steel conduit or EMT (membrane penetration)
W-L-2466 - Max. 1" PEX, Max. 1-1/2 PVC pipe, PVC conduit, CPVC in same hole, Max. diameter Hole 4"
W-L-2377 - Max. 2" Blasemaster CPVC, Max. 2" Flowgaurd Gold
W-L-5028 - Max. 4" steel, Max. 2" copper with 3/4" AB/PVC insulation

Wood Floor Assemblies
F-C-1009 - Max. 4" steel, cast iron, copper(Chase wall required)
F-C-1059 - Max. 6" steel, cast iron, steel conduit, (Chase wall optional)
F-C-2204 - Max 1-1/2" PVC or ABS drain fittings with bathtub waste/overflow Fittings
F-C-2270 - Max. 2" Blasemaster CPVC, Max. 2" Flowgaurd Gold
F-C-2310 - Max. 1", Max 3 each in same hole crosslinked polyethylene (PEX) SDR 9 tube closed/vented piping
F-C-5004 - Max. 2" steel, copper with 1/2" glass fiber or 3/4" AB/PVC insulation (Chase wall required)
FS-ONE
High Performance
Intumescent Firestop Sealant

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
- Protects most typical firestop penetration applications
- Can be painted
- Single component systems available
- Meets LEED™ requirements for indoor environmental quality credit

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

Installation instructions for FS-ONE

Notice
- Before handling, read Material Safety DataSheet and product label for safe usage and health information.
- Instructions below are general guidelines — always refer to the applicable drawing in the UL Fire Resistance Directory or Hilti Firestop Systems Guide for complete installation information

Opening
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.

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

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

FS-ONE Technical Data

<table>
<thead>
<tr>
<th>Chemical basis</th>
<th>Water-based intumescent acrylic dispersion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Red</td>
</tr>
<tr>
<td>Application temperature</td>
<td>40°F to 104°F (5°C to 40°C)</td>
</tr>
<tr>
<td>Skin forming time</td>
<td>Approx. 20-30 min.</td>
</tr>
<tr>
<td>Curing time</td>
<td>Approx. 2 mm / 3 days</td>
</tr>
<tr>
<td>Movement capability</td>
<td>Approx. 5%</td>
</tr>
<tr>
<td>Expansion rate (unrestricted)</td>
<td>Up to 3-5 times original volume</td>
</tr>
<tr>
<td>Temperature resistance (cured)</td>
<td>40°F to 212°F (-40°C to 100°C)</td>
</tr>
<tr>
<td>Surface burning characteristics</td>
<td>Flame Spread: 0  Smoke Development: 5</td>
</tr>
<tr>
<td>(ASTM E 84-96)</td>
<td></td>
</tr>
<tr>
<td>Sound transmission classification (ASTM E 90-96)</td>
<td>56 (Relates to specific construction)</td>
</tr>
</tbody>
</table>

Approvals
- California State Fire Marshal 4485-1200:108
- City of New York MFA 326/06-M Vol. IV
- UL 1479
- UL 814
- UL 84

At 73°F (22°C) and 50% relative humidity
Product name: FS-ONE High Performance Intumescent Firestop Sealant
Description: One-part acrylic-based sealant
Supplier: Hilti, Inc. P.O. Box 21148, Tulsa, OK 74121
Emergency # (Chem-Trec): 1 800 424 9300 [USA, PR, Virgin Islands, Canada]; 001 703 527 3887 (other countries)

INGREDIENTS AND EXPOSURE LIMITS

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>CAS Number</th>
<th>PEL:</th>
<th>TLV:</th>
<th>STEL:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyacrylate dispersion</td>
<td>Mixture</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Calcium carbonate</td>
<td>001317-65-3</td>
<td>5 mg/m³ (T)</td>
<td>10 mg/m³ (T)</td>
<td>NE</td>
</tr>
<tr>
<td>Zinc borate</td>
<td>138265-86-0</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Ammonium polyphosphate</td>
<td>068333-79-9</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Talc</td>
<td>014807-96-6</td>
<td>20 mppcf</td>
<td>2 mg/m³</td>
<td>NE</td>
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<tr>
<td>Expandable graphite</td>
<td>012777-87-6</td>
<td>5 mg/m³ (T)</td>
<td>2 mg/m³ (T)</td>
<td>NE</td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>000107-21-1</td>
<td>NE</td>
<td>C:100 mg/m³ (A)</td>
<td>NE</td>
</tr>
<tr>
<td>Polybutene</td>
<td>009003-29-6</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Iron oxide</td>
<td>001309-37-1</td>
<td>10 mg/m³</td>
<td>5 mg/m³</td>
<td>NE</td>
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<tr>
<td>Glass filament</td>
<td>065997-17-3</td>
<td>NE</td>
<td>5 mg/m³ (T)</td>
<td>NE</td>
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<tr>
<td>Silicon dioxide</td>
<td>014808-60-7</td>
<td>0.05 mg/m³ (T)</td>
<td>0.1 mg/m³ (T)</td>
<td>NE</td>
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<tr>
<td>Water</td>
<td>007732-18-5</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
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</tbody>
</table>

Abbreviations: PEL = OSHA Permissible Exposure Limit. TLV = ACGIH Threshold Limit Value. C = Ceiling. STEL = Short Term Exposure Limit. NE = None Established. NA = Not Applicable. (T) indicates “as total dust”. (R) indicates “as respirable fraction”. (A) indicates “as an aerosol”. mppcf = million particles per cubic foot.

PHYSICAL DATA

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vapor Density (air = 1)</td>
<td>Not determined.</td>
<td>Vapor Pressure:</td>
<td>23mbar @ 20°C / 68F</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>Not applicable.</td>
<td>VOC Content:</td>
<td>75.0 g/L.</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>Not applicable.</td>
<td>Solubility in Water:</td>
<td>Soluble.</td>
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<tr>
<td>Specific Gravity</td>
<td>1.5</td>
<td>pH:</td>
<td>Not determined.</td>
</tr>
</tbody>
</table>

FIRE AND EXPLOSION HAZARD DATA

<table>
<thead>
<tr>
<th>Flash Point</th>
<th>Non-flammable.</th>
<th>Flammable Limits:</th>
<th>Not applicable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extinguishing Media</td>
<td>Not applicable.</td>
<td>Use extinguishing media as appropriate for surrounding fire.</td>
<td></td>
</tr>
<tr>
<td>Special Fire Fighting Procedures</td>
<td>None known. Use a self-contained breathing apparatus when fighting fires involving chemicals.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Unusual Fire and Explosion Hazards: None known. Thermal decomposition products can be formed such as oxides of carbon, sulfur and phosphorous.

REACTIVITY DATA

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Incompatibility:</td>
<td>Strong acids, peroxides, and oxidizing agents.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decomposition Products:</td>
<td>Thermal decomposition can yield CO and CO₂.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditions to Avoid:</td>
<td>None known.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HEALTH HAZARD DATA

| Known Hazards: | None known. |
| Signs and Symptoms of Exposure: | Possibly irritating upon contact with the eyes or upon repeated contact with the skin. |
| Medical Conditions | Eye and skin conditions. |
| Aggravated by Exposure: | None known. |
| Routes of Exposure: | Dermal. |
Carcinogenicity: IARC classifies crystalline silica (quartz sand) as Group 1 based upon evidence among workers in industries where there has been long-term and chronic exposure (via inhalation) to silica dust; e.g. mining, quarry, stone crushing, refractory brick and pottery workers. This product does not pose a dust hazard; therefore, this classification is not relevant. Based upon the nature and intended use of this product, it does not pose an increased cancer risk to workers.

**EMERGENCY AND FIRST AID PROCEDURES**

**Eyes:** Immediately flush with plenty of water. Call a physician if symptoms occur.

**Skin:** Immediately wipe off material and wash with soap and water. Material can adhere to the skin. If material has adhered to the skin, use an abrasive containing hand cleaner. If material does not come off, buff with a pumice stone.

**Inhalation:** Move victim to fresh air if discomfort develops. Call a physician if symptoms persist.

**Ingestion:** Seek medical attention. Do not induce vomiting unless directed by a physician. If a large quantity was ingested, give 1 to 2 glasses of water to dilute. Never give anything by mouth to an unconscious person.

**Other:** Referral to a physician is recommended if there is any question about the seriousness of the injury/exposure.

**CONTROL MEASURES AND PERSONAL PROTECTIVE EQUIPMENT**

**Ventilation:** General (natural or mechanically induced fresh air movements).

**Eye Protection:** Not required, however, safety glasses should be worn in most industrial settings.

**Skin Protection:** Avoid skin contact. Cloth gloves are suitable for hand protection.

**Respiratory Protection:** None normally required. Where ventilation is inadequate to control vapors, use a NIOSH-approved respirator with organic vapor cartridges. Never enter a confined space without an appropriate air-supplied respirator.

**PRECAUTIONS FOR SAFE HANDLING AND USE**

**Handling and Storing Precautions:** Store in a cool, dry area preferably between 40o and 77o F. Keep from freezing. Do not store in direct sunlight. Avoid contact with the eyes or skin. Practice good hygiene; i.e. always wash thoroughly after handling and before eating or smoking. For industrial use only. Keep out of reach of children. Follow label/use instructions.

**Spill Procedures:** Immediately wipe away spilled material before it hardens. Place in a container for proper disposal in accordance with all applicable local, state, or federal requirements.

**REGULATORY INFORMATION**

**Hazard Communication:** This MSDS has been prepared in accordance with the federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

**HMIS Codes:** Health 1, Flammability 0, Reactivity 0, PPE B

**DOT Shipping Name:** Not regulated.

**IATA / ICAO Shipping Name:** Not regulated.

**TSCA Inventory Status:** Chemical components listed on TSCA inventory. SARA Title III, Section 313: This product contains < 3% ethylene glycol (CAS 107-21-1) and < 15% zinc borate (re: zinc compounds) which are subject to reporting under Section 313 of SARA Title III (40 CFR Part 372).

**EPA Waste Code(s):** Not regulated by EPA as a hazardous waste.

**Waste Disposal Methods:** Consult with regulatory agencies or your corporate personnel for disposal methods that comply with local, state, and federal safety, health and environmental regulations.

**CONTACTS**

**Customer Service:** 1 800 879 8000  
**Technical Service:** 1 800 879 8000  
**Health / Safety:** 1 800 879 6000 Jerry Metcalf (x6704)  
**Emergency # (Chem-Trec):** 1 800 424 9300 (USA, PR, Virgin Islands, Canada); 001 703 527 3887 (other countries)

The information and recommendations contained herein are based upon data believed to be correct; however, no guarantee or warranty of any kind expressed or implied is made with respect to the information provided.
Certificate of Compliance

Certificate Number: 20060214-R13240E
Report Reference: 2006 February 14
Issue Date: 2006 February 14

Issued to: Hilti, Inc.
5400 S 122ND East Ave
Tulsa, OK 74146 USA

This is to certify that representative samples of
Fill, Void or Cavity Materials
FS-ONE

Have been investigated by Underwriters Laboratories Inc.® in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety:
ANSI/UL 1479, ANSI/UL 2079, CAN/ULC-S115-05


Only those products bearing the UL Classification Mark should be considered as being covered by UL’s Classification and Follow-Up Service.

The UL Classification Mark includes: UL in a circle symbol: with the word “CLASSIFIED” (as shown); a control number (may be alphanumeric) assigned by UL; a statement to indicate the extent of UL’s evaluation of the product; and, the product category name (product identity) as indicated in the appropriate UL Directory.

Look for the UL Classification Mark on the product

Issued by: Môna Couloute
Underwriters Laboratories Inc.

Reviewed by: Christopher Johnson
Underwriters Laboratories Inc.
February 24, 2009

To Whom It May Concern:

Re: Hilti FS-ONE Intumescent Firestop – LEED Info.

The Hilti FS-ONE Intumescent Firestop is manufactured in Kaufering, Germany.

The FS-ONE pail is made of polyethylene and can be completely recycled. There is no post-consumer or post-industrial content in FS-ONE and it cannot be recycled. The VOC content for FS-ONE is 75 grams/liter.

FS-ONE is not regulated as a hazardous waste by the Federal EPA Standards. The regulations for the disposal of non-regulated industrial waste can vary from state to state and even city to city. For this reason, you should consult your local and state regulatory agencies for direction on disposal.

Please feel free to contact me at (918) 872-3704 if you have questions.

Sincerely,

Jerry Metcalf  MPH, CHMM
Safety/Environmental Manager
Hilti Inc
(918) 872 3704
jerry.metcalf@hilti.com

Rev. Date: 2/24/09
1. Floor-Ceiling Assembly - The 1 or 2 hr fire-rated solid or trussed lumber joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in the individual L500 Series Floor-Ceiling Designs in the UL Fire Resistance Directory. The F Rating of the firestop system is equal to the rating of the floor-ceiling and wall assemblies. The general construction features of the floor-ceiling assembly are summarized below:

A. Flooring System - Lumber or plywood subfloor with finish floor of lumber, plywood or Floor Topping Mixture* as specified in the individual Floor-Ceiling Design. Diam of opening to be max 1 in. larger than diam of pipe. As an alternate, the opening may be square-cut with a max dimension 1 in. greater than the diam of the pipe.

B. Wood Joists* - Nom 10 in. deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or Structural Wood Members* with bridging as required and with ends firestopped.

C. Furring Channels - (Not Shown) - (As required) Resilient galvanized steel furring installed in accordance with the manner specified in the individual L500 Series Designs in the Fire Resistance Directory.

D. Gypsum Board* - Thickness, type, number of layers and fasteners shall be as specified in the individual Floor-Ceiling Design. Diam of opening to be max 1 in. larger than diam of pipe.

B. Sole Plate - Nom 2 by 4 in., 2 by 6 in. or parallel 2 by 4 in. lumber plates, tightly butted. Diam of opening is to be max 1 in. larger than diam of pipe. As an alternate, the opening may be square-cut with a max dimension 1 in. greater than the diam of the pipe. Plates may be discontinuous over opening, terminating at two opposing edges of opening. Max length of discontinuity to be 1 in. greater than diam of through penetrant.

C. Top Plate - The double top plate shall consist of two nom 2 by 4 in., 2 by 6 in. or two sets of parallel 2 by 4 in. lumber plates, tightly butted. Diam of opening is to be max 1 in. larger than diam of pipe. As an alternate, the opening may be square-cut with a max dimension 1 in. greater than the diam of the pipe. Plates may be discontinuous over opening, terminating at two opposing edges of opening. Max length of discontinuity to be 1 in. greater than diam of through penetrant.
D. **Steel Plate** - When lumber plates are discontinuous, nom 1-1/2 in. wide No. 20 gauge (or heavier) galv steel plates shall be installed to connect each discontinuous lumber plate and to provide a form for the fill material. Steel plates sized to lap 2 in. onto each discontinuous lumber plate and secured to lumber plates with steel screws or nails.

E. **Gypsum Board** - Thickness, type, number of layers and fasteners shall be as specified in individual Wall and Partition Design.

2. **Chase Wall** - The through penetrant (Item 3) shall be routed through a 1 or 2 hr fire-rated single, double or staggered wood stud/gypsum board chase wall having a fire rating consistent with that of the floor-ceiling assembly. Depth of chase wall to be min 1 in. greater than the diameter of the through penetrant. The chase wall shall be constructed of the materials and in the manner specified in the individual U300 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

   A. **Studs** - Nom 2 by 4 in., 2 by 6 in. or double nom 2 by 4 in. lumber studs. Nom 2 by 4 in. studs are allowed for through-penetrants (Item 3) not exceeding nom 2 in. diam.

3. **Through Penetrants** - One metallic pipe, conduit or tubing to be installed within the firestop system. Pipe, conduit or tubing to be rigidly supported on both sides of floor assembly. The annular space within the firestop system shall be min 0 in. (point contact) to max 1 in.. The following types and sizes of metallic pipes or conduits may be used:

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

4. **Fill, Void or Cavity Material** - Sealant - Min 3/4 in. thickness of fill material applied within the annulus, flush with the top surface of the floor or the sole plate. A generous bead of fill material also applied within the annulus of the top plate, flush with bottom surface of lower top plate. HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC - CP601S, CP606 or FS-One Sealant. (Note: L Ratings apply only when FS-ONE Sealant is used.)

*Bearing the UL Classification Mark*
1. Floor-Ceiling Assembly — The 1 or 2 hr fire-rated solid or trussed lumber joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in the individual L500 Series Floor-Ceiling Designs in the UL Fire Resistance Directory. The F Rating of the firestop system is equal to the rating of the floor-ceiling and wall assemblies. The general construction features of the floor-ceiling assembly are summarized below:

A. Flooring System — Lumber or plywood subfloor with finish floor of lumber, plywood or Floor Topping Mixture* as specified in the individual Floor-Ceiling Design. Max diam of opening shall be 7-5/8 in.

B. Wood Joists* — Nom 10 in deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or Structural Wood Members* with bridging as required and with ends firestopped.

C. Gypsum Board* — Thickness, type, number of layers and fasteners shall be as specified in the individual Floor-Ceiling Design. Diam of opening shall be 1 in. larger than the outside diam of pipe (item 2).

D. Furring Channels — (Not Shown) (As required) Resilient galvanized steel furring installed in accordance with the manner specified in the individual L500 Series Designs in the Fire Resistance Directory.
System No. F-C-1059
F Ratings = 1 and 2 Hr
T Ratings = 0 and 1/2 Hr

1.1 Chase Wall -- (Not Shown, Optional) -- The through penetrants (Item 2) may be routed through a 1 or 2 hr fire-rated single, double or staggered wood stud/gypsum wallboard chase wall having a fire rating consistent with that of the floor-ceiling assembly. The chase wall shall be constructed of the materials and in the manner specified in the individual U300 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs -- Nom 2 by 8 in. lumber or double nom 2 by 6 in. lumber studs.
   B. Sole Plate -- Nom 2 by 8 in. lumber or parallel 2 by 6 in. lumber plates, tightly butted.
   C. Top Plate -- The double top plate shall consist of two nom 2 by 8 in. lumber plates or two sets of nom 2 by 6 in. lumber plates tightly butted. Max diam of opening is 7-5/8 in.
   D. Gypsum Board* -- Thickness, type, number or layers and fasteners shall be as specified in individual Wall and Partition Designs.

2. Through Penetrants -- One metallic tubing, pipe or conduit to be installed concentrically or eccentrically within the firestop system. Annular space between pipe or conduit and edge of opening to be min 1/4 in. and max 3/4 in. Pipe, tubing or conduit to be rigidly supported on both sides of floor-ceiling assembly. The following types and sizes of metallic pipes, tubing or conduit may be used:
   A. Steel Pipe -- Nom 6 in. diam (or smaller) Schedule 40 (or heavier) steel pipe.
   B. Iron Pipe -- Nom 6 in. diam (or smaller) cast or ductile pipe.
   C. Conduit -- Nom 4 in. diam (or smaller) steel electrical metallic tubing or nom 6 in. diam (or smaller) steel conduit.
   D. Steel Flexible Metal Conduit + -- Nom 2 in. diam (or smaller) steel flexible metal conduit.
      See Flexible Metal Conduit (DXUZ) category in the Electrical Construction Materials Directory for names of manufacturers.

3. Fill, Void or Cavity Material* -- Sealant -- Min 5/8 in. or 1-1/4 in. thickness of sealant applied within annular space, flush with the bottom surface of gypsum wallboard or lower top plate for 1 and 2 hr floors respectively. Min. 3/4 in. thickness of sealant applied within annular space, flush with top surface of floor.
   HILTI INC -- FS-ONE Sealant
   +Bearing the UL Listing Mark.
   *Bearing the UL Classification Mark
1. Floor -- Ceiling Assembly  The 1 hr fire-rated solid or trussed lumber joist floor–ceiling assembly shall be constructed of the materials and in the manner specified in the individual L500 Series Floor–Ceiling Designs in the UL Fire Resistance Directory. The general construction features of the floor–ceiling assembly are summarized below:

A. Flooring System  Lumber or plywood subfloor with finish floor of lumber, plywood or Floor Topping Mixture* as specified in the individual Floor–Ceiling Design. Rectangular cutout in flooring to accommodate the bathtub drain piping (Item 2) to be max 8 in. by 12 in. Cutout to be patched on underside of subfloor using one layer of min 3/4 in. thick plywood or min 5/8 in. thick gypsum board (item 1C) sized to lap min 2 in. beyond each edge of rectangular cutout. Patch split into two pieces at opening and hole–sawed for bathtub drain piping. Diameter of opening hole sawed through patch to accommodate drain piping (Item 2) to be 1 in. larger than outside diameter of drain piping and positioned such that the annular space between drain piping and periphery of opening is min 0 in. (point contact) to max 1 in. Two pieces positioned around drain piping, with cut edges tightly butted, and screw-attached to underside of subfloor with 1–1/4 in. long steel screws spaced max 6 in. OC.

B. Wood Joists*  Nom 10 in. deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or Structural Wood Members* with bridging as required and with ends firestopped.

C. Gypsum Board*  Nom 5/8 in. thick, 4 ft wide as specified in the individual Floor–Ceiling Design.
2. Drain Piping Nom 1–1/2 in. (or smaller) diam Schedule 40 acrylonitrile butadiene styrene (ABS) or polyvinyl chloride (PVC) pipe and drain fittings cemented together and provided with ABS or PVC bathtub waste/overflow fittings. Annular space shall be min 0 in. (point contact) to max 1 in.

3. Fill Void or Cavity Materials* Min 5/8 in. depth or fill material applied within the annulus, flush with both surfaces of plywood or gypsum board patch.

HILTI CONSTRUCTION CHEMICALS, DIV OF
HILTI INC -- FS–ONE Sealant
*Bearing the UL Classification Mark
1. **Floor-Ceiling Assembly** - The fire-rated solid or trussed lumber joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in individual L500 Series Floor-Ceiling Designs in the UL Fire Resistance Directory. The general construction details of the floor-ceiling assembly are summarized below:

   A. **Flooring System** - Lumber or plywood subfloor with finish floor of lumber, plywood or Floor Topping Mixture as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 3 in.

   B. **Wood Joists** - Nom 2 by 10 in. lumber joists spaced 16 in. OC with nom 1 by 3 in. lumber bridging and with ends firestopped. As an alternate to lumber joists, nom 10 in. deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or Structural Wood Members with bridging as required with ends firestopped.

   C. **Furring Channels** - (Not shown) - Resilient galv steel furring installed perpendicular to wood joists (Item 1B) between wallboard (Item 1D) and wood joists as required in the individual Floor-Ceiling Design.

   D. **Gypsum Board** - Nom 4 ft wide by 5/8 in. thick as specified in the individual Floor-Ceiling Design.

2. **Chase Wall** - The through penetrant (Item 3) shall be routed through a 1 hr fire-rated single, double or staggered wood stud/gypsum wallboard chase wall constructed of the materials and in the manner specified in the individual U300 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

   A. **Studs** - Nom 2 by 4 in. lumber studs.

   B. **Sole Plate** - Nom 2 by 4 in. lumber plates. Max diam of opening is 3 in.

   C. **Top Plate** - The double top plate shall consist of two nom 2 by 4 in. lumber plates. Max diam of opening is 3 in.

   D. **Gypsum Board** - Thickness, type, number of layers and fasteners shall be as specified in individual Wall and Partition Design.
3. Through Penetrants – One nonmetallic pipe to be installed either eccentrically or concentrically within the firestop system. The annular space between the through penetrant and the periphery of the opening shall be a min 0 in. (point contact) to a max of 5/8 in. Pipe to be rigidly supported on both sides of the floor-ceiling assembly. The following types and sizes of nonmetallic pipes may be used.
   A. Chlorinated Polyvinyl Chloride (CPVC) Pipe – Nom 2 in. diam (or smaller) FLOWGUARD GOLD? SDR11 CPVC pipe for use in closed (process or supply) piping systems.
   B. Chlorinated Polyvinyl Chloride (CPVC) Pipe – Nom 2 in. diam (or smaller) BLAZEMASTER? SDR13.5 CPVC pipe for use in closed (process or supply) piping systems.

4. Fill, Void or Cavity Material* – Sealant – Min 3/4 in. thickness of fill material applied within the annulus, flush with top surface of floor or sole plate and flush with bottom surface of lower top plate. At point contact location, a min 1/2 in. diam bead of fill material shall be applied flush with bottom surface of lower top plate.

HILTI CONSTRUCTION CHEMICALS, DIV OF
HILTI INC – FS-ONE Sealant

*Bearing the UL Classification Mark
1. Floor-Ceiling Assembly - The 1 or 2 hr fire-rated solid or trussed lumber joist floor-ceiling assembly shall be constructed of the materials and in the manner specified in the individual L500 Series Floor-Ceiling Designs in the UL Fire Resistance Directory. The F Rating of the firestop system is equal to the rating of the floor-ceiling and wall assemblies. The T Rating of the firestop system is 1 hr for 1 hr rated floor-ceiling and wall assemblies and 1-1/2 hr for 2 hr rated floor-ceiling and wall assemblies. The general construction features of the floor-ceiling assembly are summarized below:

A. Forming Material - Lumber or plywood subfloor with finish floor or lumber, plywood or Floor Topping Mixture* as specified in the individual Floor-Ceiling Design. Max diam of floor opening is 3 in.

B. Wood Joists* - For 1 hr fire-rated floor-ceiling assemblies nom 10 in. deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or Structural Wood Members* with bridging as required and with ends firestopped. For 2 hr fire-rated floor-ceiling assemblies, nom 2 by 10 in. lumber joists spaced 16 in. OC with nom 1 by 3 in. lumber bridging and with ends firestopped.

C. Furring Channels - (Not Shown) - (As required) - Resilient galvanized steel furring installed in accordance with the manner specified in the individual L500 Series Designs in the Fire Resistance Directory.

D. Gypsum Board* - Thickness, type, number of layers and fasteners shall be as specified in the individual Floor-Ceiling Design.
2. Chase Wall - The 1 or 2 hr fire-rated single wood stud/gypsum wallboard chase wall shall be constructed of the materials and in the manner specified in the individual U300 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs - Nom 2 by 4 in. lumber studs.
   B. Sole Plate - Nom 2 by 4 in. lumber plates.
   C. Top Plate - The double top plate shall consist of two nom 2 by 4 in. lumber plates. Max diam of opening is 3 in.
   D. Gypsum Board - Thickness, type, number of layers and fasteners shall be as specified in individual Wall and Partition Design.

3. Through-Penetrants - Nom 1 in. diam (or smaller) SDR 9 (or heavier) cross-linked polyethylene (PEX) tubing for use in closed (process or supply) piping systems. A max of three tubes may be installed in the opening. The annular space between the tubing and the periphery of the opening shall be a min of 3/16 in. to a max of 1 in. The space between the tubes shall be a min of 0 in. (point contact) to a max of 1/4 in. Tubing to be rigidly supported on both sides of the floor-ceiling assembly.

4. Fill, Void or Cavity Material* - Sealant - Min 3/4 in. thickness of fill material applied within the annulus, flush with top surface of floor or sole plate and a min 3/4 in. thickness of fill material applied within the annulus, flush with the bottom surface of the lower top plate. Additional fill material forced within the group of tubing to max extent possible on the top surface of floor or sole plate and bottom surface of lower top plate.

HILTI CONSTRUCTION CHEMICALS, DIV OF
HILTI INC - FS-ONE Sealant

*Bearing the UL Classification Mark
System No. F-C-5004
F Ratings – 1 and 2 Hr (See Item 1)
T Ratings – 1 and 2 Hr (See Item 1)
L Rating At Ambient – 4 CFM/sq ft (See Item 4)
L Rating At 400 F – Less Than 1 CFM/sq ft (See Item 4)

1. Floor–Ceiling Assembly — The 1 or 2 hr fire-rated solid or trussed lumber joist floor–ceiling assembly shall be constructed of the materials and in the manner specified in the individual L500 Series Floor–Ceiling Designs in the UL Fire Resistance Directory. The F Rating of the firestop system is equal to the rating of the floor–ceiling and wall assemblies. The general construction features of the floor–ceiling assembly are summarized below:

A. Flooring System — Lumber or plywood subfloor with finish floor of lumber, plywood or Floor Topping Mixture* as specified in the individual Floor–Ceiling Design. Max. diam of floor opening is 4 in.
B. Wood Joists* — Nom 10 in deep (or deeper) lumber, steel or combination lumber and steel joists, trusses or Structural Wood Members* with bridging as required and with ends firestopped.
C. Furring Channels — (Not Shown) — (As required) — Resilient galvanized steel furring installed in accordance with the manner specified in the individual L500 Series Designs in the Fire Resistance Directory.
D. Gypsum Board* — Thickness, type, number of layers and fasteners shall be as specified in the individual Floor–Ceiling Design.
System No. F-C-5004
F Ratings – 1 and 2 Hr (See Item 1)
T Ratings – 1 and 2 Hr (See Item 1)
L Rating At Ambient – 4 CFM/sq ft (See Item 4)
L Rating At 400 F – Less Than 1 CFM/sq ft (See Item 4)

2. Chase Wall -- The through penetrant (Item 3) shall be routed through a fire-rated single, double or staggered wood stud/gypsum wallboard chase wall having a fire rating consistent with that of the floor-ceiling assembly. The chase wall shall be constructed of the materials and in the manner specified in the individual U300 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs -- Nom 2 by 6 in. or double nom 2 by 4 in. lumber studs.
   B. Sole Plate -- Nom 2 by 6 in. or parallel 2 by 4 in. lumber plates, tightly butted.
   C. Top Plate -- The double top plate shall consist of two nom 2 by 6 in. or two sets of parallel 2 by 4 in. lumber plates, tightly butted. Max diam of opening is 4 in.
   D. Gypsum Board* -- Thickness, type, number of layers and fasteners shall be as specified in the individual Wall and Partition Design.

3. Through Penetrants -- One metallic pipe or tubing to be installed within the firestop system. Pipe or tubing to be rigidly supported on both sides of floor assembly. The following types and sizes of metallic pipes or tubing may be used:
   A. Steel Pipe -- Nom 2 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. Copper Tubing -- Nom 2 in. diam (or smaller) Type L (or heavier) copper tubing.
   C. Copper Pipe -- Nom 2 in. diam (or smaller) Regular (or heavier) copper pipe.

4. Pipe Covering* -- Nom 1/2 in. thick hollow cylindrical heavy density (min 3.5 pcf) glass fiber units jacketed on the outside with an all service jacket. Longitudinal joints sealed with metal fasteners or factory-applied self-sealing lap tape. Transverse joints secured with metal fasteners or with butt tape supplied with the product. A nom annular space of 1/8 in. is required within the firestop system.
   See Pipe and Equipment Covering -- Materials (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specifications and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.

4A. Tube Insulation -- Plastics+ -- Nom 3/4 in. thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. An annular space of min 1/8 in. to max 3/8 in. is required within the firestop system.
   See Plastics+ (QMFZ2) category in the Recognized Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL 94 Flammability Classification of 94-5VA may be used.
   (Note: L Ratings apply only when glass fiber insulation is used).

5. Fill, Void or Cavity Material* -- Sealant -- Min 3/4 in. thickness of fill material applied within the annulus, flush with top surface of floor. A generous bead of fill material also applied within the annulus of the top plate, flush with bottom surface of lower top plate.
   HILTI CONSTRUCTION CHEMICALS, DIV OF
   HILTI INC -- FS--One Sealant
*Bearing the UL Classification Mark
System No. W–L–1054
F Ratings – 1 and 2 Hr (See Items 1 and 3)
T Rating – 0 Hr
L Rating At Ambient – Less Than 1 CFM/Sq Ft
L Rating At 400 F – 4 CFM/Sq Ft

1. Wall Assembly -- The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs -- Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2–1/2 in. wide and spaced max 24 in. OC. When steel studs are used and the diam of opening exceeds the width of stud cavity, the opening shall be framed on all sides using lengths of steel stud installed between the vertical studs and screw-attached to the steel studs at each end. The framed opening in the wall shall be 4 to 6 in. wider and 4 to 6 in. higher than the diam of the penetrating item such that, when the penetrating item is installed in the opening, a 2 to 3 in. clearance is present between the penetrating item and the framing on all four sides.
   B. Gypsum Board* -- 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 32–1/4 in. for steel stud walls. Max diam of opening is 14–1/2 in. for wood stud walls. The F Rating of the firestop system is equal to the fire rating of the wall assembly.
2. Through-Penetrants -- One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space shall be min 0 in. to max 2–1/4 in. Pipe may be installed with continuous point contact. Pipe, conduit or tubing may be installed at an angle not greater than 45 degrees from perpendicular. Pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes, conduits or tubing 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. Conduit — Nom 4 in diam (or smaller) steel electrical metallic tubing or 6 in. diam steel conduit.
   D. Copper Tubing — Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing.
   E. Copper Pipe — Nom 6 in. diam (or smaller) regular (or heavier) copper pipe.

3. Fill, Void or Cavity Material* -- Sealant -- Min 5/8 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point or continuous contact locations between pipe and wall, a min 1/2 in. diam bead of fill material shall be applied at the pipe wall interface on both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF
HILTI INC -- FS—One Sealant

*Bearing the UL Classification Mark
1. Wall Assembly — The 1 and 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

   A. Studs — Wall framing shall consist of min 3-5/8 in. (92 mm) wide steel studs spaced max 24 in. (610 mm) OC.
   B. Gypsum Board* — Thickness, type, number of layers and fasteners, as specified in the individual U400 or V400 Series Wall and Partition Design. Max area or opening is 114 in.² (735 cm²) with max height of 5 in. (127 mm) and max width of 23 in. (584 mm).

   The hourly F Rating of the firestop system is equal to the hourly rating of the wall. The hourly T Rating of the firestop system is 0 hr and 1/4 hr when installed in 1 hr and 2 hr fire rated wall assemblies, respectively.

2. Through Penetrants — Multiple pipes or conduits installed in single layer array within the firestop system. The annular space between the pipes and conduits and the edges of the opening shall be min 0 in. (0 mm, point contact) to max 1 in. (25 mm). The separation between pipes and conduits to be a min 0 in. (0 mm, point contact) to a max 1-1/2 in. (38 mm). Pipes and conduits to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes or conduits may be used:

   A. Steel Pipe — Nom 4 in. (102 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.
   B. Conduit — Nom 4 in. (102 mm) diam (or smaller) rigid steel conduit or steel electrical metallic tubing (EMT).

3. Fill Void or Cavity Materials* - Sealant — Min 5/8 in. (16 mm) thickness of fill material installed to completely fill annular space between pipes, conduits and gypsum flush with each surface of wall. Min 1/2 in. (13 mm) diam bead of fill material applied to the through penetrant/wall interface at the point contact locations on both sides of the wall.

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   HILTI INC — FS-ONE Sealant

*Bearing the UL Classification Mark
System No. W-L-1410
F Rating - 1 and 2 Hr (See Item 1)
T Rating - 0 Hr

1. Wall Assembly — The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
   A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC.
   B. Gypsum Board* — One or two layers of nom 5/8 in. (16 mm) thick gypsum board as specified in the individual Wall and Partition Design. Max diam of opening is 5 in. (127 mm).
   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly.

2. Through penetrants — One metallic pipe or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space shall be 0 in. (point contact) to 1 in. (25 mm). Pipe or conduit to be rigidly supported on the penetrated side of the wall assembly. The following types and sizes of metallic pipes or conduits may be used:
   A. Steel pipe — Nom 3 in. (76 mm) diam (or smaller) Schedule 5 (or heavier) steel pipe.
   B. Conduit — Nom 3 in. (76 mm) diam (or smaller) steel electrical metallic tubing (EMT) or 3 in. (76 mm) diam steel conduit.

3. Fill, Void or Cavity Material++ — Sealant — Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, flush with surface of wall. Min 1/2 in. (13 mm) diam bead of sealant applied at point contact location.

HILTI CONSTRUCTION CHEMICALS, DIV OF

++ Bearing the UL Classification Mark

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1. Wall Assembly - The 1 and 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 or U400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

A. Studs - Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nominal 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide by 1-3/8 in. deep channels spaced max 24 in. OC.

B. Gypsum Board* - The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 3 in.

The hourly F and T Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. Through Penetrant - One nonmetallic pipe, conduit or tubing installed either concentrically or eccentrically within the firestop system. The annular space between pipe and periphery of opening shall be min of 0 in. (point contact) to a max 1-1/4 in. Pipe to be rigidly supported on both sides of wall assembly. The following types and sizes of nonmetallic pipes may be used:

A. Chlorinated Polyvinyl Chloride (CPVC) Pipe - Nom 2 in. diam (or smaller) FLOWGUARD GOLD® SDR11 CPVC pipe for use in closed (process or supply) piping systems.

B. Chlorinated Polyvinyl Chloride (CPVC) Pipe - Nom 2 in. diam (or smaller) BLAZEMASTER® SDR13.5 CPVC pipe for use in closed (process or supply) piping systems.

3. Fill, Void or Cavity Material* - Sealant - Min 5/8 in. and 1-1/4 in. thickness of fill material applied within annulus, flush with both surfaces of wall for 1 and 2 hr rated assemblies, respectively. At point contact location, a min 1/2 in. diam bead of fill material shall be applied to the wall/penetrant interface on both surfaces of the wall.

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HILTI INC - FS-ONE Sealant

*Bearing the UL Classification Mark
System No. W-L-2466

F Ratings - 1 and 2 Hr
T Rating - 0 Hr
1. Wall Assembly — The 1 or 2 hr fire rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300, U400 or V400 Series Wall and Partition Design in the UL Fire Resistance Directory and shall include the following construction features:

   A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. (51 by 102 mm) lumber spaced 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide spaced max 24 in. (610 mm) OC.
   B. Gypsum Board* — The gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Design in the UL Fire Resistance Directory. Max diam of opening is 4 in. (102 mm).

   The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. Through-Penetrants — One or more nonmetallic pipes, conduits or tubes installed concentrically or eccentrically within opening. Annular space between penetrants and periphery of opening to be min 0 in. (point contact) to max 1 in. (25 mm). Space between penetrants shall be min 0 in. (point contact) to max 1 in. (25 mm). Penetrants to be rigidly supported on both sides of wall. The following types and sizes of penetrants may be used:

   A. Polyvinyl Chloride (PVC) Pipe — Nom 1-1/2 in. (38 mm) diam (or smaller) Schedule 40 solid or cellular core PVC pipe for use in closed (process or supply) piping systems.
   B. Rigid Nonmetallic Conduit++ — Nom 1-1/2 in. (38 mm) diam (or smaller) Schedule 40 PVC conduit installed in accordance with the National Electrical Code (NFPA No. 70).
   C. Chlorinated Polyvinyl Chloride (CPVC) Pipe — Nom 1-1/2 in. (38 mm) diam (or smaller) SDR13.5 CPVC pipe for use in closed (process or supply) piping systems.
   D. Crosslinked Polyethylene (PEX) Tubing — Nom 1 in. (25 mm) diam (or smaller) SDR 9 PEX tubing for use in closed (process or supply) piping systems.

3. Fill, Void or Cavity Material* - Caulk or Sealant — Min 5/8 in. (16 mm) thickness of caulk applied within annulus, flush with both surfaces of wall. Min 1/4 in. (6 mm) diam bead of caulk applied to gypsum board/penetrant interface at point contact location on both sides of wall.

* Bearing the UL Classification Mark
++ Bearing the UL Listing Mark
1. Wall Assembly — The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:

   A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC.
   
   B. Gypsum Board* — 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual Wall and Partition Design. Max diam of opening is 7-1/2 in. The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.

2. Through Penetrants — One metallic pipe or tubing to be centered within the firestop system. Pipe or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes or tubing may be used:

   A. Steel Pipe — Nom 4 in. diam (or smaller) Schedule 40 (or heavier) steel pipe.
   
   B. Copper Tubing — Nom 2 in. diam (or smaller) Type L (or heavier) copper tubing.
   
   C. Copper Pipe — Nom 2 in. diam (or smaller) Regular (or heavier) copper pipe.
3. Tube Insulation — Plastics+ — Nom 3/4 in. thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. An annular space of min 0 in. (point contact) to max 1-1/2 in. is required within the firestop system.

See Plastics+ (QMFZ2) category in the Recognized Component Directory for names of manufacturers. Any Recognized Component tube insulation material meeting the above specifications and having a UL 94 Flammability Classification of 94-5VA may be used.

The hour T Rating of the firestop system is dependent on the hourly fire rating of the wall assembly in which it is installed, the size and type of through penetrant and the pipe covering thickness, as shown in the table below:

<table>
<thead>
<tr>
<th>Wall Assembly Hr Rating</th>
<th>Type +</th>
<th>Through Penetrant Max Diam In.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>A, B, or C</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>A, B, or C</td>
<td>2</td>
</tr>
</tbody>
</table>

+Indicates penetrant type as itemized in Item 2.

4. Fill, Void or Cavity Material* — Sealant — Min 5/8 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point contact location between pipe covering and gypsum wallboard, a min 1/2 in. diam bead of fill material shall be applied at the pipe covering/gypsum wallboard interface on both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC — FS-ONE Sealant

*Bearing the UL Classification Mark