

FIRESTOPPING

BUILDING CODE INFORMATION

What is Firestopping?

- ❖ To help prevent the spread of fire, smoke and toxic gases within a building certain walls, floors and joints are required to meet a specific fire resistance rating. The firestopping of penetrations and joints ensures that fire, smoke and toxic gases are contained to reduce the tragic loss of human life and damage to property.

Where is Firestopping Required:

- ❖ It is required by the Building Codes that every penetration or membrane penetration, joint or open gap in a fire-rated wall or floor assembly is adequately protected by sealing or “firestopping” such that the building component is restored to its original fire-rated condition in order to maintain compartmentalization.

How is Firestopping Accomplished?

- ❖ Through penetrations or membrane penetrations shall be protected by an approved penetration firestop system *installed as tested* in accordance with ASTM-E-814 and shall have an F rating of not less than the required fire-resistance rating of the wall or floor assembly penetrated.
- ❖ Where penetrating items are steel, ferrous, or copper pipes or steel conduits penetrate rated walls or floor assemblies, the annular space between the penetrating item and the fire-resistance-rated assemblies may be protected as follows:
 - In concrete or masonry walls or floor assemblies where the penetrating item is a maximum 6-inch nominal diameter and the opening is a maximum of 144 square inches, concrete, grout or mortar shall be permitted where installed *the full thickness of the wall or floor ceiling* assembly or may be the thickness required to maintain the fire resistance rating (documentation will be required); or
 - The material used to fill the annular space shall prevent the passage of flame and hot gasses sufficient to ignite cotton waste where subject to ASTM-E-119 (documentation will be required).

Where Does an Installer/Contractor Start?

- ❖ Start by choosing a firestopping manufacturer that will provide you with the technical support you need to simplify the entire process. They need to not only supply you with the products but also with the necessary *UL listed firestop assembly details* or other approved third party testing agency and be able to answer your questions about properly installing their products. They need to be able to provide you with *Engineering Judgements* (see definitions) in a timely manner, when necessary. The least expensive product available may end up costing you the most with wasted product and time delays waiting for required installation details. Once you have all your details, be sure to read through all of the requirements for the assembly. All requirements must be met or you will need an alternative detail from the manufacturer.

When Do I Call For a Firestop Inspection?

- ❖ Call for a firestop inspection at least 24 hours before the time you would like it to be scheduled. If the inspection is for penetrations through top and bottom plates of walls, firestop should all be complete including any required electrical box protection, but before anything is covered. If the inspection is for penetrations through the drywall membranes of a firewall or floor / ceiling assembly, firestop should all be complete, but before any ceiling tile or other covering is installed.

What Will be Required at the Time of the Firestop Inspection?

- ❖ The U.L. listed firestop assembly detail for each deferent type of penetration from the manufacturer of the firestop products you are using. They need to include the following minimum information:
 - The U.L. listing identification number;
 - The “F” & “T” rating of the assembly;
 - The type of wall or ceiling materials you are penetrating. (Such as pre-cast hollow core concrete floor);
 - What it is you are penetrating the assembly with; (Such as 2” PVC vented pipe)
 - How many items may be in the same opening?
 - Whether or not there is insulation or a sleeve included;
 - Minimum & maximum annular space requirements; (See definitions)
 - Minimum depth and location of firestop;
 - Identifying the firestop product to be used.
- ❖ You will need to provide safe access to both sides of the assembly. An appropriate size ladder or lift will need to be available.
- ❖ Save at least one container of the firestop product for identifying the product used.
- ❖ If your detail has a maximum “percent of fill” (see definitions) requirement, you will need to provide your calculations.

What if the Opening in the Drywall Exceeds the Maximum Annular Space Requirements of the Firestop Assembly Detail Selected?

- ❖ If no alternative firestop detail can be obtained from the manufacturer, the drywall must be properly repaired with a new area of drywall properly fastened to framing members on each side of the penetration. The repair must completely encircle the penetrating item with at least 3-inches of drywall where possible. *See attached Example.*

Do the Penetrations Through the Top and Bottom Plates Need to be Firestopped?

- ❖ **Yes**, If you are penetrating a fire rated floor / ceiling assembly or fire rated roof assembly, the penetrations through the membrane must be properly protected.

How are Joints and Gaps in Drywall Sealed?

- ❖ Joints installed between fire-resistive walls, floors, floor/ceilings assemblies and 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 walls or floors in which it is installed. If the joint is a static joint (no movement anticipated) and there are no open gaps 1/8 inch or greater, simply “fire taping” may be the answer. If there are open gaps in the drywall joints they will need to be properly repaired with new drywall, **full thickness** joint compound or a UL listed firestop system. If it is a dynamic joint (where movement is anticipated) a UL listed firestop system will be required.

What About Electrical Boxes?

- ❖ Steel electrical boxes that do not exceed 16 square inches in area provided the total area of such openings does not exceed 100 square inches for any 100 square feet of wall area are permitted. **Outlet boxes on opposite sides of wall shall be separated as follows:**
 - By a **horizontal** distance of not less than 24 inches;
 - By a horizontal distance of not less than the depth of the wall cavity where the cavity is filled with **mineral fiber** insulation;
 - By solid fire-blocking in accordance with the Building Code;
 - Or protected by a UL listed system.

What if the Electric Boxes are Larger than 16 sq. in. or are Non-Metallic?

- ❖ They may be able to be used as per their UL listing, but **documentation will need to be provided.**

Can Sleeves be Used?

- ❖ Yes, sleeves may be used when they are part of the UL listed assembly and they are of the size and materials listed.
Note: That the Building code requires all sleeves to be properly secured to the framing!

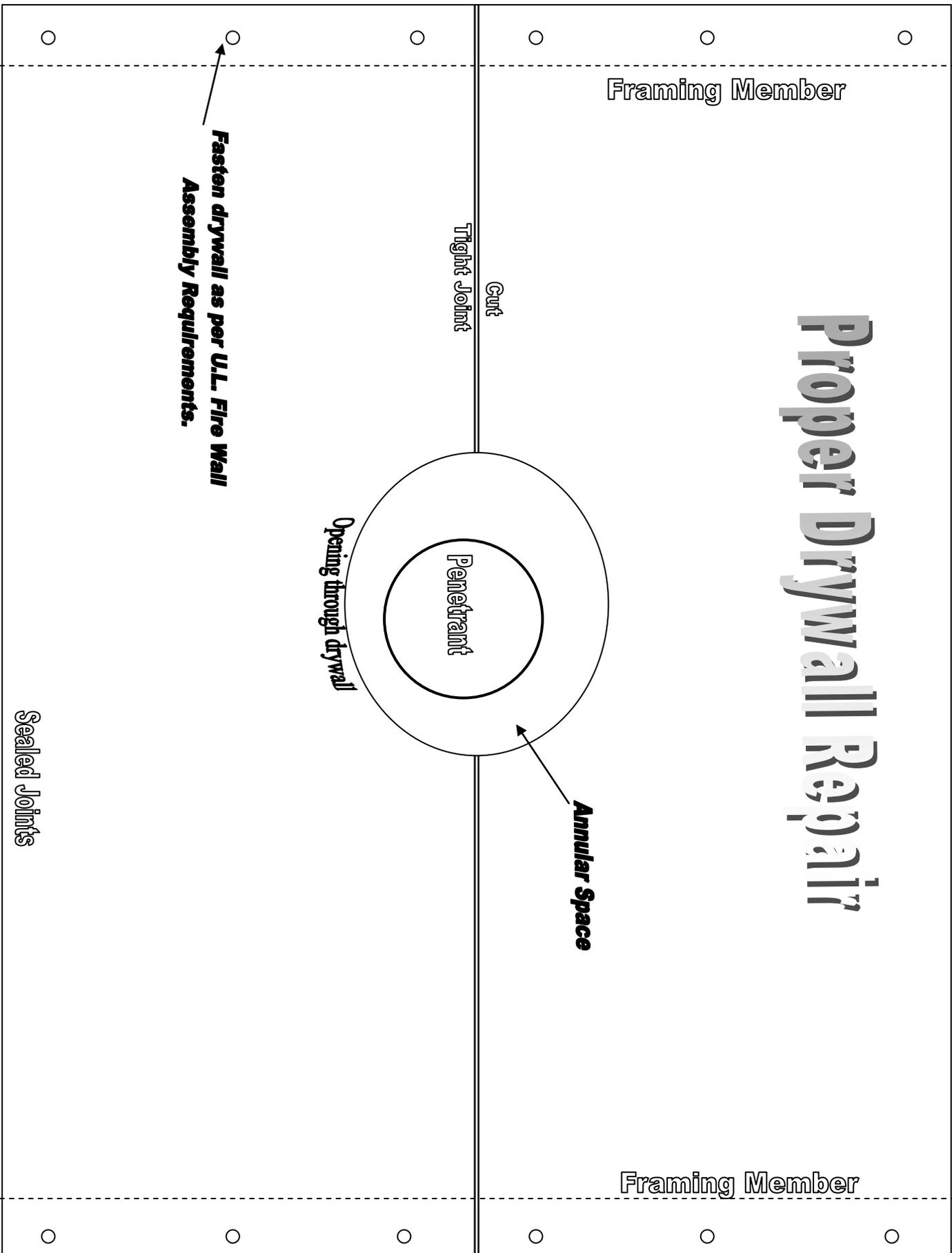
Terms & Definitions:

- ❖ **Annular space (Annulus)** - The region, measured in a straight line, between penetrants, or between the outer most portions of the penetrants and the inside of the circular or rectangular opening.
 - *Example:* A pipe with an outer diameter of 4.5" centered in a 6" diameter hole has an annular space of $(6 - 4.5) \div 2 = 3/4"$
- ❖ **Assembly Rating** - The F ratings indicate the time in hours that a firestop system will prevent the passage of flames through an opening, remain in place, and not permit the projection of a water stream through the assembly. The T rating indicates the time in hours for the temperature on the unexposed surface of a fire rated assembly to rise 325 degrees above the surrounding temperature as tested to ASTM-E-814.
- ❖ **Closed piping system** - Piping system which is completely enclosed, usually carrying fluids under pressure.
Example: Hot/cold water distribution or sprinkler piping.
- ❖ **Engineering Judgment** - Provided by the manufacturer of the firestop product you are using in lieu of a specific tested firestop system when there are conditions that do not fall into the requirements of any of the available systems. Their qualified Engineer designs a firestop system that if tested would be expected to pass the stated fire rating. Engineering Judgements are only approved for a specific project.
- ❖ **Fire damper** - A damper arranged to seal off airflow automatically through part of an air duct system, so as to restrict the passage of heat.
- ❖ **Intumescent** - A term describing materials, which are 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 penetrants.
- ❖ **Membrane penetration** - An opening made through only one side (wall, floor or ceiling) of an assembly.
- ❖ **Penetrant (Penetrating Item)** - Any item passing through a wall floor or ceiling, such as ducts, pipes, conduits, cables, etc.
- ❖ **Percent of fill** - The cross sectional area of an opening that is occupied by a penetrating item(s). Typically found in a UL System containing cables. Percent of fill may be calculated with the following formulas:
 - Percent of fill $(O/O_f) = (A_w/A_o) \times 100$ $N =$ number of wires
 - Area of wire $(A_w) = [3.14 \times (rc^2)] \times N$ $rc =$ Radius of wire
 - Area of opening $(A_o) = 3.14 \times (ro^2)$ $ro =$ Radius of opening
 - Calculations will need to be provided at time of inspection.
- ❖ **Point of contact** - When the listed UL system drawing allows the penetrating item to touch the edge of the opening.
- ❖ **Smoke damper** - A listed device installed in ducts and air transfer openings that are designed to resist the passage of air and smoke. The device is installed to operate automatically, controlled by a smoke detection system.
- ❖ **Through penetration** - Penetrating items passing entirely through both protective membranes fire rated walls or floor/ceiling assemblies.
- ❖ **Vented (open) Piping System** - Piping system which is atmospherically vented by design to prevent backflow or vacuum. *Example:* Drain, waste, vent piping.

More Questions:

- ❖ If you have more questions please feel free to contact Don Winter, Building Inspector for the City of St. Cloud (320) 255-7230 or a Technical Representative of the Firestop Manufacturer of the product you are using.

Proper Drywall Repair



Fasten drywall as per U.L. Fire Wall Assembly Requirements.

Framing Member

Framing Member

Tight Joint
Cut

Opening through drywall

Penetrant

Annular Space

Sealed Joints

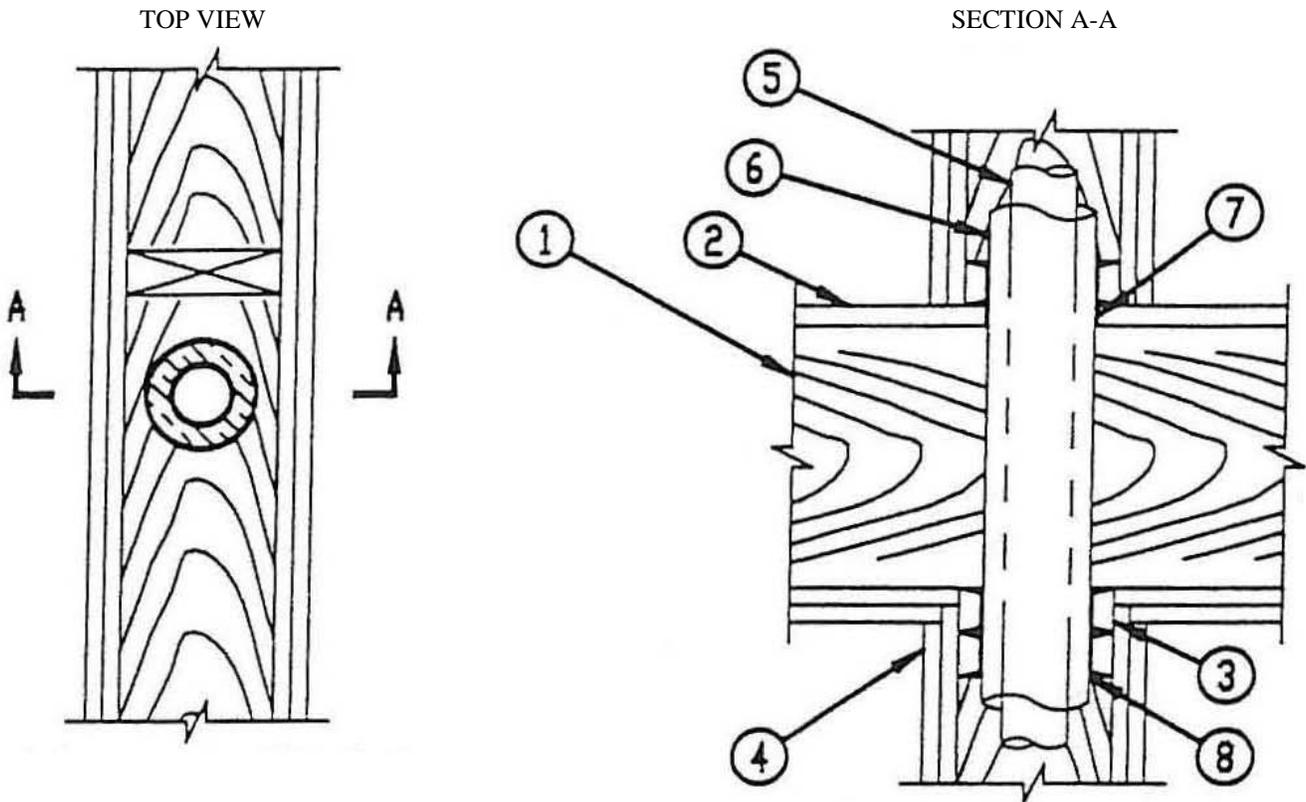
This is just an **EXAMPLE** of a UL firestop system detail. You will need to find a rated/tested firestop system detail that matches the projects construction/situation. (*UL is not the only systems available*).

UL/cL SYSTEM NO. *EXAMPLE #1*

INSULATED METAL PIPE THROUGH 1-HOUR OR 2-HOUR WOOD ASSEMBLY

F RATING = 1-HOUR OR 2-HOUR
T RATING = 1-HOUR OR 2-HOUR

L RATING AT AMBIENT = 4 CFM/SQ. FT.
L RATING AT 400° F = LESS THAN 1 CFM/SQ.FT.



Wood flooring/ceiling assembly (UL/UCL classified L500 series) (1-hour or 2-hour fire-rating)(2-hour shown).

1. Lumber or plywood subfloor with finish floor of lumber, plywood or floor topping mixture.
2. Top plate.
3. Gypsum wall assembly (1-hour or 2-hour fire-rating)(2-hour shown).
4. Penetrating item to be one of the following:
 - a. Maximum 2" nominal diameter steel pipe (Schedule 10 or heavier);
 - b. Maximum 2" nominal diameter copper pipe;
 - c. Maximum 2" nominal diameter steel conduit;
 - d. Maximum 2" nominal diameter EMT.
5. Pipe insulation to be one of the following:
 - a. Maximum 1/2" thick glass fiber insulation;
 - b. Maximum 3/4" thick AB/PVC flexible insulation.
6. Minimum 3/4" depth (*manufacturer's-name*) intumescent firestop sealant.
7. Provide a generous bead of (*manufacturer's-name*) intumescent firestop sealant flush with the bottom of the plate.

NOTES:

1. Maximum diameter of opening = 4".
2. Annular space = 1/8" when glass fiber pipe insulation is used.
Minimum 1/8", maximum 3/4" when AB/PVC pipe insulation is used.

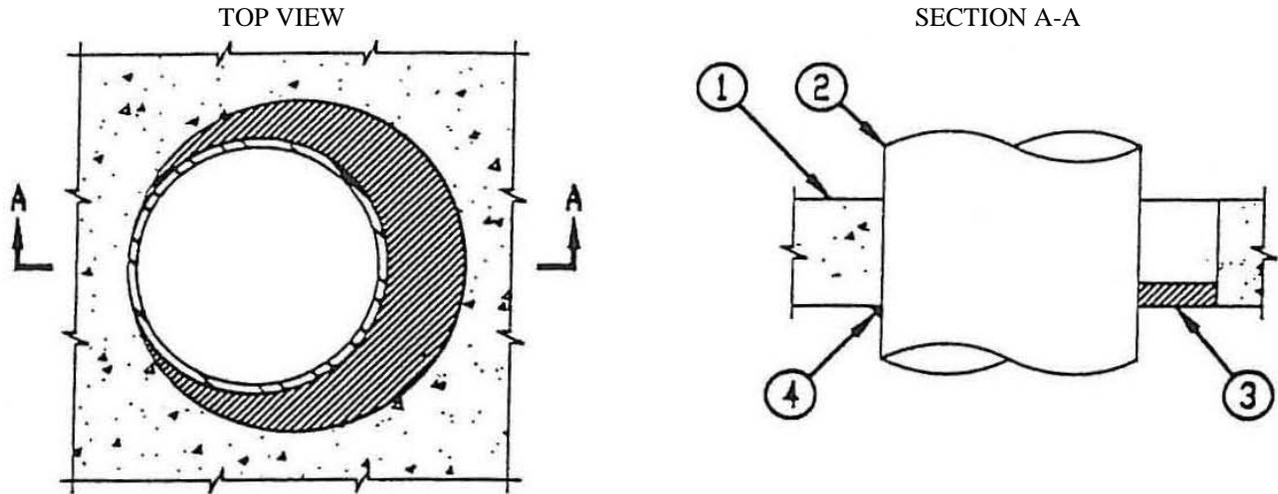
Installation Instructions for UL System No. Example #1:

- Step 1: Preparation: all surfaces must be clean, sound, dry and frost free prior to application of firestopping materials.
- Step 2: Firestop Sealant: apply the required depth of firestop sealant in the annular space between the insulated pipe and subfloor and between the insulated pipe and gypsum ceiling. Tool the sealant with a putty knife to push it in place and smooth the surface. Leave both completed seals undisturbed for 48 hours.

EXAMPLE ONLY

This is just an **EXAMPLE** of a UL firestop system detail. You will need to find a rated/tested firestop system detail that matches the projects construction/situation. (*UL is not the only systems available*).

UL/cUL SYSTEM NO. *EXAMPLE #2*
METAL PIPE THROUGH CONCRETE FLOOR/WALL OR BLOCK WALL
 F RATING = 3-HOUR
 T RATING = 0-HOUR



1. Concrete floor or wall assembly (3-hour fire-rating):
 - a. Lightweight or normal weight concrete floor or wall (minimum 4 ½” thick).
 - b. Precast (hollow-core) concrete floor (minimum 7 ½” thick).
 - c. Any UL/UCL classified concrete block wall.
2. Penetrating item to be one of the following:
 - a. Maximum 10” nominal diameter steel pipe (schedule 10 or heavier);
 - b. Maximum 10” nominal diameter cast iron pipe;
 - c. Maximum 4” nominal diameter copper pipe;
 - d. Maximum 4” nominal diameter EMT or steel conduit.
3. Minimum 1” depth (*manufacturer’s-name*) intumescent firestop sealant flush with top or bottom of floor. (See note #3 below).
4. Minimum ½” crown (*manufacturer’s-name*) intumescent firestop sealant applied at point of contact.

NOTES:

1. Maximum diameter of opening = 14” for normal concrete, 7” for precast (hollow core) concrete.
2. Annular space = minimum 0”, maximum ¾”.
3. Minimum 1” depth (*manufacturer’s-name*) intumescent firestop sealant is required on both sides of a wall assembly.
4. When precast (hollow core) units are used (*manufacturer’s-name*) intumescent firestop sealant shall be installed flush with lower surface of floor.
5. Mineral wool may be used as a backer for proper installation of firestop sealant.

Installation Instructions for UL System No. Example #2:

- Step 1: Preparation: all surfaces must be clean, sound, dry and frost free prior to application of firestopping materials.
- Step 2: Firestop Sealant: apply the required depth of Firestop Sealant flush with top or bottom of the floor. Wall penetrations require Firestop Sealant installed flush with both sides. Hollow-core floors require Firestop Sealant flush with bottom surface of floor.

The information in this handout is just an overview.
 See the 2007 Minnesota State Building Code for complete information.

EXAMPLE ONLY