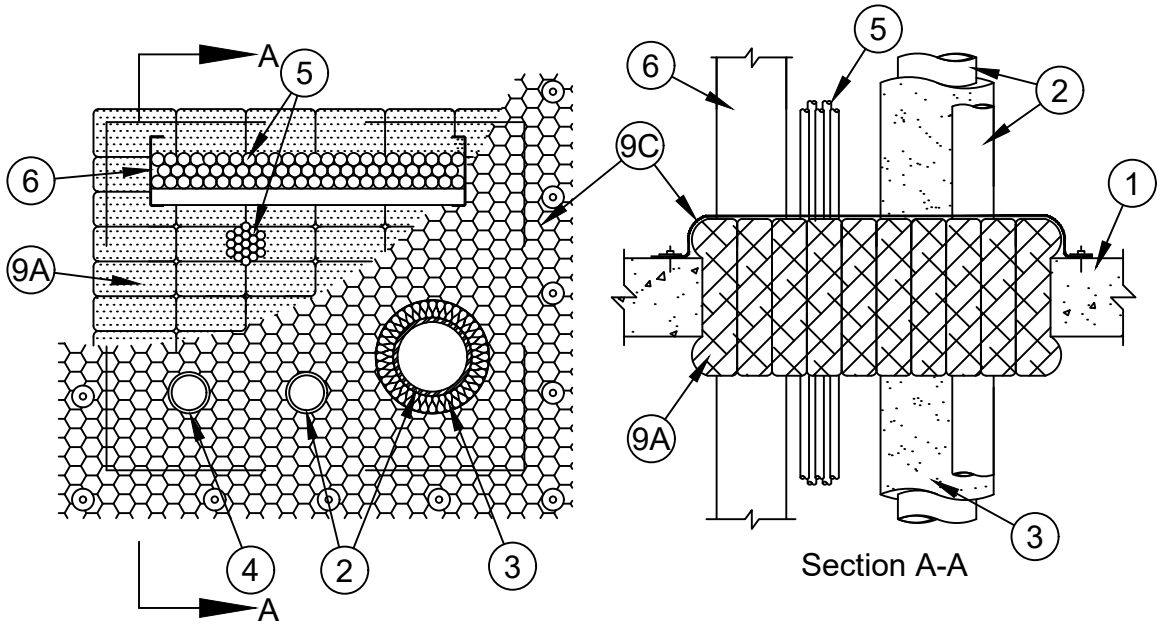
Classified by
Underwriters Laboratories, Inc.
to ANSI/UL 1479 (ASTM E814) and CAN/ULC S115

# System No. C-AJ-8093

| ANSI/UL1479 (ASTM E814) | CAN/ULC S115 |
|---|---|
| F Ratings - 2 and 3 Hr (See Items 3, 4, 6 and 8) | F Ratings - 2 and 3 Hr (See Items 3, 4, 6 and 8) |
| T Ratings - 0, 1/4, 1/2, 3/4, 1-1/2 and 2 Hr (See Items 2 through 9) | FT Ratings - 0, 1/4, 1/2, 3/4, 1-1/2 and 2 Hr (See Items 2 through 9) |
| L Rating At Ambient - Less than 1, 1.6, and 3.2 CFM/sq ft (See Item 2, 4, 5, 6, 8 and 9B) | FH Ratings - 2 and 3 Hr (See Items 3, 4, 6 and 8) |
| L Rating at 400 F - Less than 1, 1.6, and 2 CFM/sq ft (See Item 2, 4, 5, 6, 8 and 9B) | FTH Ratings - 0, 1/4, 1/2, 3/4, 1-1/2 and 2 Hr (See Items 2 through 9) |
| | L Rating At Ambient - Less than 1, 1.6, and 3.2 CFM/sq ft (See Item 2, 4, 5, 6, 8 and 9B) |
| | L Rating at 400 F - Less than 1, 1.6, and 2 CFM/sq ft (See Item 2, 4, 5, 6, 8 and 9B) |



Section A-A

**System tested with a pressure differential of 2.5 Pa between the exposed and the unexposed surfaces with the higher pressure on the exposed side.**

1. **Floor or Wall Assembly -** Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m3) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max area of opening is 18 sq ft with a max single dim of 6 ft (1.6 m) When any dim exceeds 3 ft (0.76 m), see Item 9C.
   See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.
2. **Metallic Penetrants -** One or more metallic pipes, conduits or tubes to be installed within the opening. Min 1/2 in. (13 mm) clearance between penetrants. Min clearance between penetrants and periphery of opening is 0 in. (point contact) (0 mm). Penetrants rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
   A. **Steel Pipe -** Nom 12 in. (305 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
   B. **Iron Pipe -** Nom 12 in. (305 mm) diam (or smaller) cast or ductile iron pipe.
   C. **Conduit -** Nom 6 in. (152 mm) diam (or smaller) rigid steel conduit, nom 4 in. (102 mm) diam (or smaller) electrical metallic tubing (EMT), or nom 4 in. (102 mm) diam (or smaller) steel **Flexible Metal Conduit#**.
   D. **Copper Pipe or Tube -** Nom 6 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe or Type M (or heavier) copper tube.

| Type of Metallic Penetrant | Max Diam of Throught Penetrant, in. (mm) | T Rating, Hr |
|---|---|---|
| Steel or Iron Pipe, Conduit or Copper Pipe or Tube | 12 (305) | 1/4 |
| Steel or Iron Pipe, Conduit or EMT | 4 (102) | 3/4 |
| Steel or Iron Pipe, Conduit or EMT | 2 (51) | 2 |

**The L Rating is Less than 1 CFM/sq ft at ambient and 400 F for metallic penetrants.**

3. **Pipe Insulation -** (Optional) - The following types of pipe insulations may be installed on one or more of the metallic pipes or tubing:

   A. **Pipe and Equipment Covering Materials* -** Max 2 in. (51 mm) thick hollow cylindrical heavy density (min 3.5 pcf or 57 kg/m3) 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.

   See **Pipe and Equipment Covering Materials** (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering 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.

   B. **Pipe Covering Materials* -** Max 2 in. (51 mm) thick unfaced mineral fiber pipe insulation having a nom density of 3.5 pcf (57 kg/m3) (or heavier) and sized to the outside diam of the pipe or tube. Pipe insulation secured with min 8 AWG steel wire spaced max 12 in. (305 mm) OC.

   **INDUSTRIAL INSULATION GROUP L L C** - High Temperature Pipe Insulation 1200, High Temperature Pipe Insulation BWT and High Temperature Pipe Insulation Thermaloc

   C. **Sheathing Material* -** Use in conjunction with Item 3B. Foil-scrim-kraft or all service jacket material shall be wrapped around the outer circumference of the pipe insulation (Item 3B) with the kraft side exposed. Longitudinal and transverse joints sealed with metal fasteners or butt tape.

   See **Sheathing Materials** (BVDV) category in the Building Materials Directory for names of manufacturers. Any sheathing 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.

   D. **Tube Insulation - Plastics## -** Max 1 in. (25 mm) thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. When tube insulation is used, nom diam of copper pipe or tube shall not exceed 4 in. (102 mm).

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

   E. **Pipe Covering Materials*- Cellular Glass Insulation -** Max 3 in. (76 mm) thick cellular glass units sized to the outside diam of the pipe or tube and supplied in nom 24 in. (610 mm) long half sections or nom 18 in. (457 mm) long segments. Pipe insulation installed on pipe in accordance with the manufacturer's instructions.

   **PITTSBURGH CORNING CORP** - FOAMGLAS

   F. **Metal Jacket -** Used in conjunction with Item 3E. Min 12 in. long jacket formed from min 0.010 in. (0.254 mm) thick aluminum sheet cut to wrap tightly around the pipe insulation with a min 2 in. (51 mm) lap and secured using bands and seals of a similar material or min No. 18 AWG steel tie wire. Bands or steel tie wire to be located within 2 in. (51 mm) of each end of the jacket and spaced max 10 in. (254 mm) OC. Jacket installed with edge abutting surface of fill material (Item 9A) on top surface of floor or both surfaces of wall. Metal jacket to be used in addition to any other jacketing material which may be required on the pipe covering.

   G. **Pipe and Equipment Covering Materials* -** Max 3 in. (76 mm) thick hollow cylindrical calcium silicate (min 10.0 pcf or 160 kg/m3) sized to the outside diam of the pipe or tube. Pipe insulation secured with min 8 AWG steel wire spaced max 12 in. (305 mm) OC. See Pipe and Equipment Covering Materials (BRGU) category in the Building Materials Directory for names of manufacturers. Any pipe covering 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.

   **When Items 3A or 3D are used, the F and FH Ratings are 2 hr. When other pipe covering materials are used, F and FH Ratings are 3 hr. When Item 3D is used, the T, FT and FTH Ratings are 3/4 hr. When other pipe covering materials are used, T, FT and FTH Ratings are 1-1/2 hr.**

4. **Nonmetallic Penetrants -** One or more nonmetallic pipes, conduits or tubes to be installed within the opening. Min clearance between nonmetallic penetrants to be 1 in. (25 mm). Min clearance between nonmetallic and metallic penetrants to be 4 in. (102 mm) Min clearance between penetrants and periphery of opening is 0 in. (0 mm) (point contact). Penetrants rigidly supported on both sides of floor or wall assembly. The following types and sizes of nonmetallic pipes, conduits or tubing may be used:

   A. **Polyvinyl Chloride (PVC) Pipe -** Nom 2 in. (51 mm) diam (or smaller) solid or cellular core Schedule 40 PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

   B. **Chlorinated Polyvinyl Chloride (CPVC) Pipe -** Nom 2 in. (51 mm) diam (or smaller) SDR17 CPVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.

   C. **Rigid Nonmetallic Conduit+ -** Nom 2 in. (51 mm) diam (or smaller) Schedule 40 PVC conduit installed in accordance with the National Electrical Code (NFPA 70).

   D. **Electrical Nonmetallic Tubing (ENT)+ -** Nom 2 in. (51 mm) diam (or smaller) corrugated wall ENT formed of polyvinyl chloride (PVC) installed in accordance with the National Electrical Code (NFPA 70).

   E. **Optical Fiber Raceway (OFR)+ -** Nom 2 in. (51 mm) diam (or smaller) OFR formed of either polyvinyl chloride (PVC) or polyvinylidene fluoride (PVDF) installed in accordance with the National Electrical Code (NFPA 70).

   **When Item 4 is used, the F, T, FT, FH and FTH Ratings of the firestop system are 2 hr. The L Rating is Less than 1 CFM/sq ft at ambient and 400 F.**

5. **Cables -** Nom 4 in. (102 mm) diam (or smaller) tight bundle of cables. Cable bundle spaced min 4 in. (102 mm) from all other penetrants. Clearance between cable bundle and periphery of opening is 0 in. (0 mm) (point contact). Cable bundle rigidly supported on both sides of floor or wall assembly. The following types and sizes of cables may be used:

   A. Max 1/C - 350 kcmil cable with polyvinyl chloride (PVC), cross-linked polyethylene (XLPE) or plenum rated insulation and jacket.

   B. Max 7/C - No. 12 AWG cable with PVC-nylon insulation and PVC jacket.

   C. Max 100 pair - No. 24 AWG copper conductor telephone cable with PVC or plenum rated insulation and jacket.

   D. Max RG/U coaxial cables with fluorinated ethylene or plenum rated jacket and insulation.

   E. Multiple fiber optic cables with PVC or plenum rated insulation.

   F. **Through Penetrating Products* -** Max 2/C with ground No. 12 AWG Metal-Clad Cable+.

   **AFC CABLE SYSTEMS INC**

   **When Item 5A or 5F is used, the T, FT and FTH Ratings are 1/2 hr. When other cables are used, T, FT and FTH Ratings are 3/4 hr. The L Rating is Less than 1.6 CFM/sq ft at ambient and 400 F.**

6. **Cable Tray -** Max 30 in. (762 mm) wide by max 6 in. (152 mm) deep open ladder cable tray with channel-shaped side rails formed from min 0.060 in. (1.5 mm) thick (No. 16 MSG) galv steel or min 0.060 in. (1.5 mm) thick aluminum with rungs spaced max 9 in. (227 mm) OC. A max of two cable trays may be installed within the opening with a min separation of 8 in. (204 mm) between trays. The min space between the cable tray and the periphery of the opening is 0 in. (0 mm) (point contact). Cable trays to be rigidly supported on both sides of the floor or wall assembly. Aggregate cross-sectional area of cables in cable tray not to exceed 40 percent of the cross-sectional area of the cable tray based on a max 3 in. (76 mm) cable loading depth within tray. Any combination of the cable types specified in Item 5 may be used. **When width of cable tray exceeds 18 in. (457 mm), the F and FH Ratings are 2 hr. The L Rating is 3.2 CFM/sq ft at ambient and 2 at 400 F when putty is used (See Item 9B).**

7. **Busway+ -** (Not Shown) - Nom 19 in. (483 mm) wide (or smaller) by 5 in. (127 mm) deep "I" shaped aluminum enclosure containing factory-mounted copper bars rated for 600 V, 5000 A or aluminum bars rated for 600 V, 4000 A. A max two busways to be installed within the opening. The annular space between the busway and the periphery of the opening shall be a min 1/2 in. (13 mm) to a max 3-1/2 in. (89 mm). Busways spaced min 6 in. (152 mm) from all other penetrants. Busway to be rigidly supported on both sides of floor or wall assembly. The busway shall bear the UL Listing Mark and shall be installed in accordance with all provisions of the National Electrical Code, NFPA 70. **When busway is used, the T, FT and FTH Ratings are 0 hr.**

8. **Steel Duct -** (Not Shown) - Nom 18 in. (457 mm) diameter (or smaller) No. 28 GA (or heavier) steel duct installed within opening when opening contains no cable tray. A max of two steel ducts may be installed within the through-opening. Ducts to be spaced min 4 in. (102 mm) apart and min 8 in. (204 mm) from insulated penetrants and nonmetallic penetrants. The clearance between the steel duct and the periphery of the opening shall be min 0 in. (0 mm) (point contact). Steel ducts to be rigidly supported on both sides of floor or wall assembly. **When steel duct is used, the F and FH Ratings are 2 hr and the T, FT and FTH Ratings are 0 hr. The L Rating is Less than 1 CFM/sq ft at ambient and 400 F.**

9. **Firestop System -** The firestop system shall consist of the following items:

   A. **Fill, Void or Cavity Materials* - Pillows -** Nom 9 in. (227 mm) long by 4 to 6 in. (102 to 152 mm) wide by 1 to 3 in. (25 to 76 mm) thick plastic covered intumescent pillows. In floors, pillows to be installed lengthwise through opening and positioned to extend a maximum of 2-1/2 in. (64 mm) below the bottom plane of the floor. In walls, pillows to be installed lengthwise through opening and positioned to extend an equal distance from the approximate center line of the wall. Pillows tightly packed into the opening to fill the annular space between the annular space and the penetrating items.

      **SPECIFIED TECHNOLOGIES INC** - SpecSeal Firestop Pillows

   B. **Fill, Void or Cavity Materials* - Sealant or Putty -** Min 1/2 in. (13 mm) depth of fill material applied at point contact locations between penetrating items and periphery of opening. Additional fill material forced into interstices of grouped cables and grouped cables within cable trays. **For L Ratings, apply nom 3/16 in. (4.8 mm) thick by 4-3/4 in. (121 mm) wide band of putty to top of cables in the cable tray.**

      **SPECIFIED TECHNOLOGIES INC** - SpecSeal Series 100, 101, 102, 120, 129 or 105 Sealant, SpecSeal LCI Sealant, SpecSeal SIL300 Silicone Firestop Sealant, or SpecSeal Putty

   C. **Wire Mesh -** Nom 1 in. (25 mm) hexagonal wire mesh fabricated from min 20 ga galv steel wire cut to fit the contours of the penetrating items and the opening with a min 2 in. (51 mm) lap beyond the periphery of the opening. Wire mesh secured to both sides of floor or wall by means of 1/4 in. (6 mm) diam by 1-1/2 in. (38 mm) long steel concrete screws in conjunction with 1-1/4 in. (31 mm) diam steel fender washers spaced max 6 in. (152 mm) OC. Any joints within wire mesh shall overlap 2 in. (51 mm) and be secured together by means of No. 20 AWG steel wire spaced 6 in. (152 mm) OC. When both the length and width dimensions of the through opening are less than 36 in. (914 mm) and when the max space between penetrants or between the penetrant and the perimeter of the opening is less than 10 in. (254 mm), the wire mesh is optional. When the area of the opening exceeds 1296 sq in. (0.84 m2), the gauge of the steel wire mesh shall be increased to min 16 AWG.

   D. **Steel Straps -** (Not shown) - As an alternate to the wire mesh (Item 9C) in wall assemblies, min 1 in. (25 mm) wide by 0.015 in. (0.38 mm) thick steel banding straps sized to lap 2 in. (51 mm) beyond the periphery of the opening may be installed either horizontally or vertically between rows of penetrants with a max on center spacing of 4 in. (102 mm). Steel banding straps secured to concrete with 1/4 in. (6 mm) diam by 1-1/2 in. (38 mm) long steel concrete screws in conjunction with 1-1/4 in. (31 mm) diam steel fender washers.

   E. **Steel Plate -** (Not Shown) - As an alternate to Item 9C or 9D, min 28 GA (or heavier) steel plate sized to lap 2 in. (51 mm) beyond periphery of opening may be installed on minimum one side of floor or wall assembly on either side of assembly. Steel plate secured to concrete with 1/4 in. (6 mm) diam by 1-1/2 in. (38 mm) long steel concrete screws in conjunction with 1-1/4 in. (31 mm) diam steel fender washers. Fasteners spaced 1 in. (25 mm) from each corner and 8 in. (204 mm) center-to-center. **When steel plate is used, the T, FT and FTH Ratings are 0 hr.**

   * Bearing the UL Classification Marking

   #Bearing the UL Recognized Components Mark

   +Bearing the UL Listing Mark

   *** Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.**