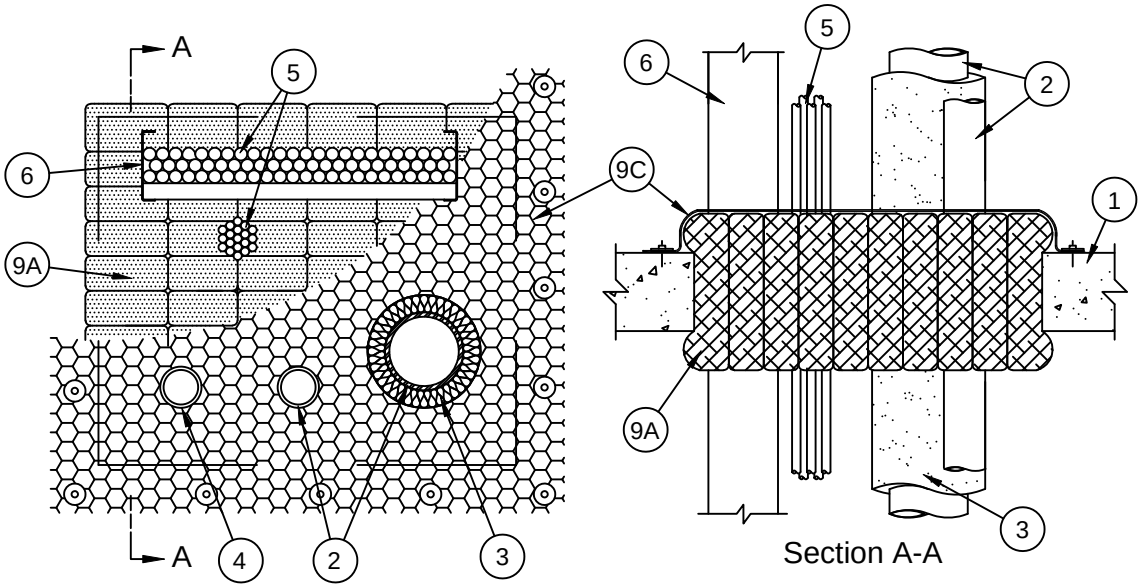
System No. C-AJ-8008

F Ratings - 2 and 3 Hr (See Items 3, 4, 6 & 8)
FT Ratings - 0, 1/4, 1/2, 3/4, 1-1/2 and 2 Hr (See Items 2 through 8)
FH Ratings - 2 and 3 Hr (See Items 3, 4, 6 & 8)
FTH Ratings - 0, 1/4, 1/2, 3/4, 1-1/2 and 2 Hr (See Items 2 through 8)



Section A-A

1. **Floor or Wall Assembly -** Min 114 mm (4-1/2 in.) thick reinforced lightweight or normal weight (1600-2400 kg/m3 or 100-150 pcf) concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. Max area of opening is 1.67 m2 (18 sq ft) with a max single dim of 1.82 m (6 ft). When any dim exceeds 0.91 m (3 ft), 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 13 mm (1/2 in.) clearance between penetrants. Min clearance between penetrants and periphery of opening is 0 mm (0 in., point contact). 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 305 mm (12 in.) diam (or smaller) Schedule 10 (or heavier) steel pipe.

   B. **Iron Pipe -** Nom 305 mm (12 in.) diam (or smaller) cast or ductile iron pipe.

   C. **Conduit -** Nom 152 mm (6 in.) diam (or smaller) rigid steel conduit, nom 102 mm (4 in.) diam (or smaller) electrical metallic tubing (EMT), or nom 102 mm (4 in.) diam (or smaller) steel **Flexible Metal Conduit#.**

   D. **Copper Pipe or Tube -** Nom 152 mm (6 in.) diam (or smaller) Regular (or heavier) copper pipe or Type M (or heavier) copper tube.

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

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 51 mm (2 in.) thick hollow cylindrical heavy density (min 56 kg/m3 or 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.

   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. thick unfaced mineral fiber pipe insulation having a nom density of 56 kg/m3 (3.5 pcf, or heavier) and sized to the outside diam of the pipe or tube. Pipe insulation secured with min 8 AWG steel wire spaced max 305 mm (12 in.) OC.

   IIG MINWOOL 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 25 mm (1 in.) thick acrylonitrile butadiene/polyvinyl chloride (AB/PVC) flexible foam furnished in the form of tubing. When tube insulation is used, nom diam of pipe or tube shall not exceed 102 mm (4 in.).

   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 76 mm (3 in.) thick cellular glass units sized to the outside diam of the pipe or tube and supplied in nom 610 mm (24 in.) long half sections or nom 457 mm (18 in.) 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 305 mm (12 in.) long jacket formed from min 0.254 mm (0.010 in.) thick aluminum sheet cut to wrap tightly around the pipe insulation with a min 51 mm (2 in.) 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 51 mm (2 in.) of each end of the jacket and spaced max 254 mm (10 in.) 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 76 mm (3 in.) thick hollow cylindrical calcium silicate (min 160 kg/m3 or 10.0 pcf) sized to the outside diam of the pipe or tube. Pipe insulation secured with min 8 AWG steel wire spaced max 305 mm (12 in.) 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 Rating is 2 hr. When other pipe covering materials are used, F Rating is 3 hr. When Item 3D is used, the T Rating is 3/4 hr. When other pipe covering materials are used, T Rating is 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 25 mm (1 in.). Min clearance between nonmetallic and metallic penetrants to be 4 in. Min clearance between penetrants and periphery of opening is 25 mm (1 in.). 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 51 mm (2 in.) diam (or smaller) solid or cellular core Schedule 40 PVC pipe for use in closed (process or supply) piping systems.

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

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

D. **Electrical Nonmetallic Tubing (ENT)+ -** Nom 51 mm (2 in.) 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 51 mm (2 in.) 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 and T Ratings of the firestop system are 2 hr.

5. **Cables -** Nom 102 mm (4 in.) diam (or smaller) tight bundle of cables. Cable bundle spaced min 102 mm (4 in.) from all other penetrants. Clearance between cable bundle and periphery of opening is 0 mm (0 in., 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) or cross-linked polyethylene (XLPE) 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 insulation and jacket.

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

   E. Multiple fiber optic cables with PVC 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 Rating is 1/2 hr. When other cables are used, T Rating is 3/4 hr.

6. **Cable Tray -** Max 762 mm (30 in.) wide by max 152 mm (6 in.) deep open ladder cable tray with channel-shaped side rails formed from min 1.524 mm (0.060 in.) thick (No. 16 MSG) galv steel or min 1.524 mm (0.060 in.) thick aluminum with rungs spaced max 229 mm (9 in.) OC. A max of two cable trays may be installed within the opening with a min separation of 203 mm (8 in.) between trays. The min space between the cable tray and the periphery of the opening is 0 mm (0 in., 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 76 mm (3 in.) cable loading depth within tray. Any combination of the cable types specified in Item 5 may be used. **When width of cable tray exceeds 457 mm (18 in.), the F Rating is 2 hr.**

7. **Busway+ -** (Not Shown) - Nom 483 mm (19 in.) wide (or smaller) by 127 mm (5 in.) 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 13 mm (1/2 in.) to a max 89 mm (3-1/2 in.) Busways spaced min 152 mm (6 in.) 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 Rating is 0 hr.**

8. **Steel Duct -** (Not Shown) - Nom 457 mm (18 in.) 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 102 mm (4 in.) apart and min 203 mm (8 in.) from insulated penetrants and nonmetallic penetrants. The clearance between the steel duct and the periphery of the opening shall be min 0 mm (0 in., point contact). Steel ducts to be rigidly supported on both sides of floor or wall assembly. **When steel duct is used, the F Rating is 2 hr and the T Rating is 0 hr.**

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

   A. **Fill, Void or Cavity Materials* - Pillows -** Nom 229 mm (9 in.) long by 102 to 153 mm (4 to 6 in.) wide by 25 to 76 mm (1 to 3 in.) thick plastic covered intumescent pillows. In floors, pillows to be installed lengthwise through opening and positioned to extend a maximum of 64 mm (2-1/2 in.) 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 13 mm (1/2 in.) 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.

   SPECIFIED TECHNOLOGIES INC - SpecSeal Series 100, 101, 102, 120, 129 or 105 Sealant or SpecSeal Putty

   C. **Wire Mesh -** Nom 25 mm (1 in.) 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 51 mm (2 in.) lap beyond the periphery of the opening. Wire mesh secured to both sides of floor or wall by means of 6 mm (1/4 in.) diam by 38 mm (1-1/2 in.) long steel concrete screws in conjunction with 32 mm (1-1/4 in.) diam steel fender washers spaced max 153 mm (6 in.) OC. Any joints within wire mesh shall overlap 51 mm (2 in.) and be secured together by means of No. 20 AWG steel wire spaced 153 mm (6 in.) OC. When both the length and width dimensions of the through opening are less than 914 mm (36 in.) and when the max space between penetrants or between the penetrant and the perimeter of the opening is less than 254 mm (10 in.), the wire mesh is optional. When the area of the opening exceeds 0.836 m2 (1296 sq in.), 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 25 mm (1 in.) wide by 0.381 mm (0.015 in.) thick steel banding straps sized to lap 51 mm (2 in.) beyond the periphery of the opening may be installed either horizontally or vertically between rows of penetrants with a max on center spacing of 102 mm (4 in.) Steel banding straps secured to concrete with 6 mm (1/4 in.) diam by 38 mm (1-1/2 in.) long steel concrete screws in conjunction with 32 mm (1-1/4 in.) diam steel fender washers.

   *Bearing the UL Classification Mark

   #Bearing the UL Recognized Components Mark

   +Bearing the UL Listing Mark