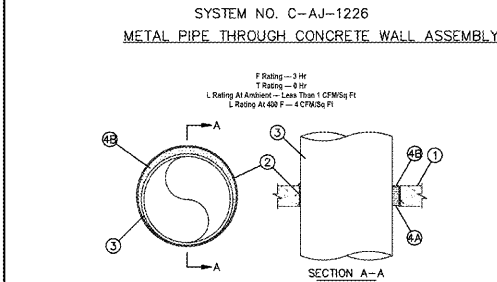


1. Wall Assembly — The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
 - A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nominal 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 diameter 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-fastened to the steel studs at each end. The framing 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 Board¹ — 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 (EMT).
 - 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 Material² — Sealant — Min 5/8 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point of 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.

¹Bearing the UL Classification Mark

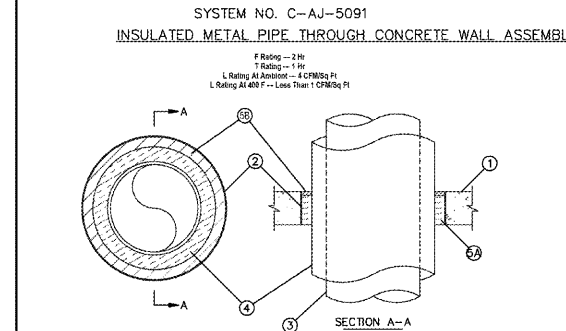
4 UL SYSTEM NO W-L-1054 DETAIL
NO SCALE



1. Floor or Wall Assembly — Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified Concrete Block¹. Max diam of opening is 32 in.
2. Metallic Sleeve — (Optional) Nom 30 in. diam (or smaller) Schedule 40 (or heavier) steel sleeve cast or grouted into floor or wall assembly, flush with floor or wall surfaces or extending a max of 3 in. above floor or beyond both surfaces of wall.
3. Through-Penetrant — One metallic pipe, tube or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space between the pipe or conduit and the periphery of opening shall be min 0 in. (point contact) to max 1-7/8 in. Penetrant may be installed with continuous point contact. Penetrant to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic penetrants may be used:
 - A. Steel Pipe — Nom 30 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
 - B. Iron Pipe — Nom 30 in. diam (or smaller) cast or ductile iron pipe.
 - C. Copper Pipe — Nom 6 in. diam (or smaller) regular (or heavier) copper pipe.
 - D. Copper Tubing — Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing.
 - E. Conduit — Nom 6 in. diam (or smaller) steel conduit.
4. Firestop System — The firestop system shall consist of the following:
 - A. Framing Material — Min 4 in. thickness of min 4 pcf mineral wool insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or steel or from both surfaces of wall or sleeve as required to accommodate the required thickness of fill material.
 - B. Fill, Void or Cavity Material² — Sealant — Min 1/4 in. thickness of fill material applied within the annulus, flush with top surface of floor or sleeve or from both surfaces of wall or sleeve. At the point of continuous contact locations between penetrant and concrete or sleeve, a min 1/4 in. diam bead of fill material shall be applied at the concrete or sleeve/pipe penetrant interface on the top surface of floor and on both surfaces of wall.

²Bearing the UL Classification Mark

5 UL SYSTEM NO C-AJ-1226 DETAIL
NO SCALE



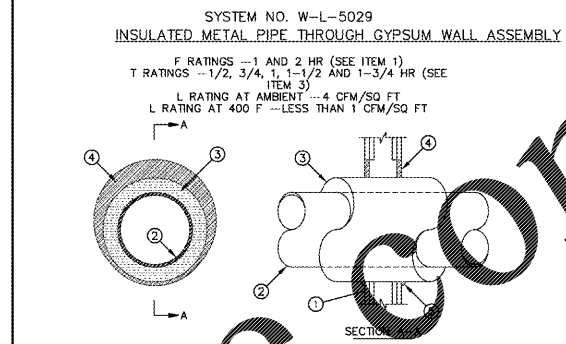
1. Floor or Wall Assembly — Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified Concrete Block¹. Max diam of opening is 18-1/2 in. See Concrete Blocks (CBX) category in the Fire Resistance Directory for names of manufacturers.
2. Metallic Sleeve — (Optional) — Nom 30 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
3. Through-Penetrant — One metallic pipe, tube or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space between the pipe or conduit and the periphery of opening shall be min 0 in. (point contact) to max 1-7/8 in. Penetrant may be installed with continuous point contact. Penetrant to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes or tubes may be used:
 - A. Steel Pipe — Nom 30 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
 - B. Iron Pipe — Nom 12 in. diam (or smaller) cast or ductile iron pipe.
 - C. Copper Pipe — Nom 6 in. diam (or smaller) regular (or heavier) copper pipe.
 - D. Copper Tubing — Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing.
4. Pipe Covering² — Nom 2 in. thick black cylindrical heavy density (min 3.5 pcf) glass fiber units jacketed on the outside with an all-service jacket. Longitudinal joints sealed with self-sealing tape. Transverse joints sealed with metal fasteners or with built tape applied with the product. The annular space between the insulated pipe and the edge of the periphery of the opening shall be min 1/2 in. to a max 2-1/4 in.

¹UL Classified Concrete Block¹ — See Concrete Blocks (CBX) 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.

²See Pipe and Equipment Covering — Materials (BRU) 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.
5. Firestop System — The firestop system shall consist of the following:
 - A. Framing Material — Min 4 in. thickness of min 4 pcf mineral wool insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall or sleeve to accommodate the required thickness of fill material.
 - B. Fill, Void or Cavity Material² — Sealant — Min 1/2 in. thickness of fill material applied within the annulus, flush with top surface of floor or sleeve or from both surfaces of wall or sleeve. At the point of continuous contact locations between penetrant and concrete or sleeve, a min 1/4 in. diam bead of fill material shall be applied at the concrete or sleeve/pipe penetrant interface on the top surface of floor and on both surfaces of wall.

²Bearing the UL Classification Mark

6 UL SYSTEM NO C-AJ-5091 DETAIL
NO SCALE



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 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 nominal 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 Board¹ — 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 Wall and Partition Design. Max diam of opening is 18-5/8 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 12 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
 - B. Iron Pipe — Nom 12 in. diam (or smaller) cast or ductile iron pipe.
 - C. Copper Tubing — Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing.
 - D. Copper Pipe — Nom 6 in. diam (or smaller) regular (or heavier) copper pipe.
3. Pipe Covering² — Nom 1, 1-1/2 or 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 tape. Transverse joints sealed with metal fasteners or with built tape applied with the product. The annular space between the insulated pipe and the edge of the periphery of the opening shall be min 1/2 in. to a max 2-1/4 in.

¹UL Classified Gypsum Board¹ — See Gypsum Board 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.

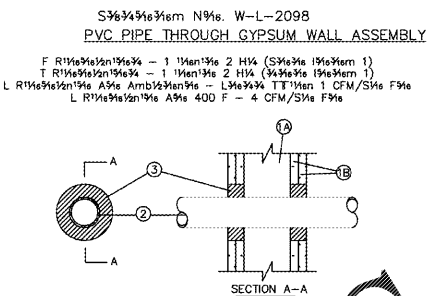
The hourly F Rating of the firestop system is dependent on the hourly fire rating of the wall assembly in which it is installed, the size and type of through penetrant and the pipe covering thickness, as shown in the table below:

WALL ASSEMBLY	THROUGH PENETRANT	PIPE COVERING	ANNULAR SPACE	FLAME SPREAD INDEX	SMOKE DEVELOPED INDEX	F RATING
1 A	4	1-1/2	0	1-1/2	1/2	1
1 B	6	1-1/2	0	1-1/2	1/2	1
1 C	6	1-1/2	0	1-1/2	1	1
1 D	6	2	0	1-7/8	3/4	1
1 E	6	2	0	1-7/8	1	1
2 A	4	1-1/2	0	1-1/2	1	1
2 B	6	1-1/2	0	1-1/2	1	1
2 C	6	2	0	1-7/8	1	1
2 D	6	1-1/2	0	1-1/2	1-3/4	1
2 E	6	2	0	1-7/8	1-1/2	1
2 F	6	2	0	1-7/8	1	1

4. Fill, Void or Cavity Material² — Sealant — Min 5/8 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. At the point of contact location between pipe covering and gypsum board, a min 1/2 in. diam bead of fill material shall be applied at the pipe covering/gypsum board interface on both surfaces of wall.

²Bearing the UL Classification Mark

10 UL SYSTEM NO W-L-5029 DETAIL
NO SCALE

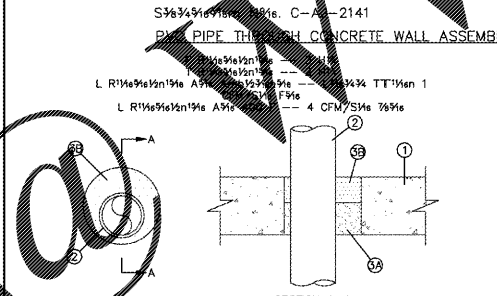


1. Wall Assembly — The fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
 - A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nominal 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 Board¹ — 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 Wall and Partition Design. Max diam of opening is 4-1/2 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 non-metallic pipe or tubing to be centered within the firestop system. Pipe to be rigidly supported on both sides of wall assembly. The following types and sizes of non-metallic pipes or tubes may be used:
 - A. Polyvinyl Chloride (PVC) Pipe — Nom 3 in. diam (or smaller) Schedule 40 PVC pipe for use in closed (process or supply) piping systems.
 - B. Chlorinated Polyvinyl Chloride (CPVC) Pipe — Nom 3 in. diam (or smaller) SR17 CPVC pipe for use in closed (process or supply) piping systems.
3. Firestop System — The firestop system shall consist of the following:
 - A. Framing Material — Min 2-1/2 in. thickness of forming material formed into opening as a permanent form. Forming material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material.
 - B. Fill, Void or Cavity Material² — Sealant — Min 2 in. thickness of fill material applied within annulus flush with top surface of floor or within both surfaces of wall.

¹UL Classified Gypsum Board¹ — See Gypsum Board 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.

²Bearing the UL Classification Mark

7 UL SYSTEM NO W-L-2098 DETAIL
NO SCALE

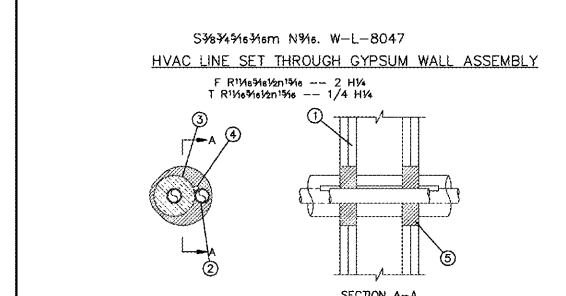


1. Floor or Wall Assembly — Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified Concrete Block¹. Max diam of opening is 6 in.
2. Through-Penetrant — One non-metallic pipe or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space between the pipe or conduit and the periphery of the opening shall be a min 1/2 in. to a max 2 in. The pipe or conduit to be rigidly supported on both sides of floor or wall. The following types and sizes of pipes or conduits may be used:
 - A. Polyvinyl Chloride (PVC) Pipe — Nom 3 in. diam (or smaller) Schedule 40 PVC pipe for use in closed (process or supply) piping systems.
 - B. Chlorinated Polyvinyl Chloride (CPVC) Pipe — Nom 3 in. diam (or smaller) SR17 CPVC pipe for use in closed (process or supply) piping systems.
3. Firestop System — The firestop system shall consist of the following:
 - A. Framing Material — Min 2-1/2 in. thickness of forming material formed into opening as a permanent form. Forming material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material.
 - B. Fill, Void or Cavity Material² — Sealant — Min 2 in. thickness of fill material applied within annulus flush with top surface of floor or within both surfaces of wall.

¹UL Classified Concrete Block¹ — See Concrete Blocks (CBX) 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.

²Bearing the UL Classification Mark

8 UL SYSTEM NO C-AJ-2141 DETAIL
NO SCALE



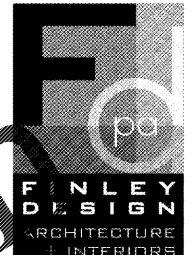
1. Wall Assembly — The 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
 - A. Studs — Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nominal 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 Board¹ — 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 specified in the individual Wall and Partition Design in the UL Fire Resistance Directory. Max diam of opening is 4-1/2 in.
2. Through-Penetrants — One or more pipe or tubing to be installed concentrically or eccentrically within the opening. The space between the penetrant and the periphery of the opening shall be min 0 in. (point contact) to max 1-1/4 in. Pipes or tubing to be rigidly supported on both sides of wall assembly. The following types and sizes of metallic pipes or tubes may be used:
 - A. Copper Tube — Nom 1 in. diam (or smaller) Type L (or heavier) copper tube.
 - B. Copper Pipe — Nom 1 in. diam (or smaller) regular (or heavier) copper pipe.
3. Tube Insulation — Plastic² — Nom 3/4 in. thick acrylic/ethylene butadiene/polyvinyl chloride (AEB/PVC) flexible foam furnished in the form of tubing. Tube insulation to be installed on one or more of the metallic pipes or tubes.
4. Sealant — Min of one 4 pcf NS-18 AWG (or smaller) cable with PVC insulation and jacket material.
5. Fill, Void or Cavity Material² — Sealant — Min 1-1/4 in. thickness of fill material applied within annulus between penetrants and gypsum board, flush with both surfaces of wall. At point contact, a 1/4 in. bead of fill material shall be applied at the penetrant/gypsum board interface on both sides of wall.

¹UL Classified Gypsum Board¹ — See Gypsum Board 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.

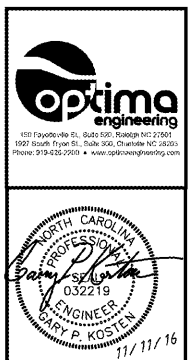
²Bearing the UL Classification Mark

9 UL SYSTEM NO W-L-8047 DETAIL
NO SCALE

Order



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REVISIONS

PROJECT:	1342
DATE:	11/11/16
DRAWN BY:	ECC
CHECKED BY:	GPX

MECHANICAL
U.L. DETAILS

M3.3
14 OF 14