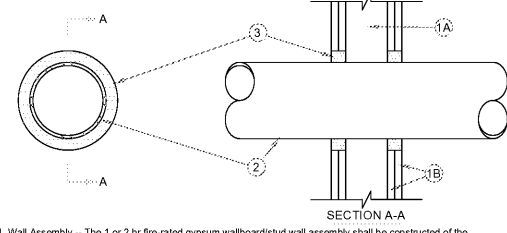


System No. W-L-1054
 F Ratings - 1 and 2 Hr (See Items 1 and 3)
 T Rating - 0 Hr
 L Rating At Ambient - Less Than 1 CFM/Sq Ft
 L Rating At 400 F - 4 CFM/Sq Ft

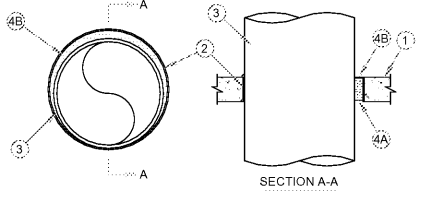


1. Wall Assembly - The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features: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



System No. C-AJ-1226
 F Rating - 3 Hr
 T Rating - 0 Hr
 L Rating At Ambient - Less Than 1 CFM/Sq Ft
 L Rating At 400 F - 4 CFM/Sq Ft

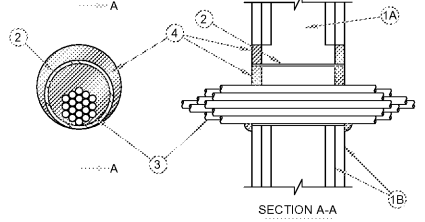


1. Floor or Wall Assembly - Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified Concrete Block*. Max diam of opening is 32 in.
2. Metallic Sleeve - (Optional) Nom 32 in. diam (or smaller) Schedule 40 (or heavier) steel 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.
- 2A. Sheet Metal Sleeve - (Optional) Max 6 in. diam, min 26 ga galv steel provided with a 26 ga galv steel square flange spot welded to the sleeve at approx mid-height, or flush with bottom of sleeve in floors, and sized to be a min of 2 in. larger than the sleeve diam. The sleeve is to be cast in place and may extend a max of 4 in. below the bottom of the deck and a max of 1 in. above the top surface of the concrete floor.
- 2B. Sheet Metal Sleeve - (Optional) - Max 12 in. diam, min 24 ga galv steel provided with a 24 ga galv steel square flange spot welded to the sleeve at approx mid-height, or flush with bottom of sleeve in floors, and sized to be a min of 2 in. larger than the sleeve diam. The sleeve is to be cast in place and may extend a max of 4 in. below the bottom of the deck and a max of 1 in. above the top surface of the concrete floor.
3. Through-Penetrant - One metallic pipe, tube or conduit to be installed either concentrically or eccentrically within the firestop system. The annular space between penetrant and 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.
 - F. Conduit - Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT).
4. Firestop System - The firestop system shall consist of the following:
 - A. Packing Material - Min 4 in. thickness of min 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or sleeve or from both surfaces of wall or sleeve as required to accommodate the required thickness of fill material.
 - B. Fill, Void or Cavity Material* - Sealant - Min 1/4 in. thickness of fill material applied within the annulus, flush with top surface of floor or sleeve or with both surfaces of wall or sleeve. At the point or 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 both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC - FS-One Sealant
 *Bearing the UL Classification Mark



System No. W-L-3065
 F Ratings - 1 and 2 Hr (See Item 1)
 T Rating - 0 Hr



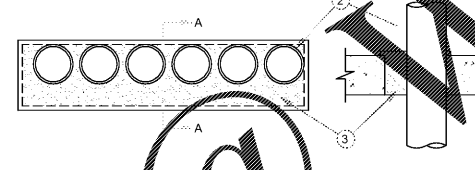
1. Wall Assembly - The 1 or 2 fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
 - 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 2-1/2 in. (64 mm) wide and spaced max 24 in. (610 mm) OC.
 - B. Gypsum Board - Nom 5/8 in. (16 mm) thick gypsum board, 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, U400 or V400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 5-1/2 in. (138 mm) when sleeve (Item 2) is employed. Max diam of opening is 4 in. (102 mm) when sleeve (Item 2) is not employed. The F Rating of the firestop system is equal to the fire rating of the wall assembly.
2. Metallic Sleeve - (Optional) - Nom 4 in. (102 mm) diam (or smaller) steel electrical metallic tubing (EMT) or Schedule 5 (or heavier) steel pipe or min 0.016 in. thick (0.41 mm, No. 28 ga) galv steel sleeve installed flush with wall surfaces. The annular space between steel sleeve and periphery of opening shall be min 0 in. (0 mm, point contact) to max 1 in. (25 mm). Cables to be rigidly supported on both sides of the wall assembly. Any combination of the following types and sizes of copper conductor cables may be used:
 - A. Max 7/C No. 12 AWG with polyvinyl chloride (PVC) insulation and jacket.
 - B. Max 25 pair No. 24 AWG telephone cable with PVC insulation and jacket.
 - C. Type RG/U coaxial cable with polyethylene (PE) insulation and PVC jacket having a max outside diameter of 1/4 in. (13 mm).
 - D. Multiple fiber optical communication cable jacketed with PVC and having a max OD of 5/8 in. (16 mm).
3. Cables - Aggregate cross-sectional area of cable in opening to be max 45 percent of the cross-sectional area of the opening. The annular space between the cable bundle and the periphery of the opening to be min 0 in. (0 mm, point contact) to max 1 in. (25 mm). Cables to be rigidly supported on both sides of the wall assembly. Any combination of the following types and sizes of copper conductor cables may be used:
 - A. Max 7/C No. 12 AWG with polyvinyl chloride (PVC) insulation and jacket.
 - B. Max 25 pair No. 24 AWG telephone cable with PVC insulation and jacket.
 - C. Type RG/U coaxial cable with polyethylene (PE) insulation and PVC jacket having a max outside diameter of 1/4 in. (13 mm).
 - D. Multiple fiber optical communication cable jacketed with PVC and having a max OD of 5/8 in. (16 mm).
4. Through Penetrating Products* - Max three copper conductor No. 8 AWG, Metal-Clad Cable+ AFC CABLE SYSTEMS INC
 F. Max 3/C (with ground) (or smaller) No. 8 AWG copper conductor cable with PVC insulation and jacketing.
 G. Max 3/4 in. (19 mm) diam copper ground cable with or without a PVC jacket.
 H. Fire Resistive Cables* - Max 1-1/4 in. (32 mm) diam single conductor or multi conductor Type MI cable. A min 1/8 in. (3 mm) separation shall be maintained between MI cables and any other types of cable. Through Penetrating Product* - Any cables, Metal-Clad Cable+ or Armored Cable+ currently Classified under the Through Penetrating Products category. See Through Penetrating Product (XHLV) category in the Fire Resistance Directory for names of manufacturers.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC - CP6015, CP606, FS-One Sealants or CP616
 *Bearing the UL Classification Mark
5. Fill, Void or Cavity Material* - Sealant or Putty - Fill material applied within the annulus, flush with each end of the steel sleeve or wall surface. Fill material installed symmetrically on both sides of the wall. A min 5/8 in. (16 mm) thickness of sealant is required for the 1 or 2 hr F Rating. An additional 1/2 in. (13 mm) diam bead of fill material shall be applied around the perimeter of sleeve on both sides of the wall when sleeve extends beyond surface of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC - CP6015, CP606, FS-One Sealants or CP616
 *Bearing the UL Classification Mark



System No. C-AJ-1388
 F RATING = 2-HR
 T RATING = 0-HR



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 Block*. Max area of opening 224 sq in. with max dimension of 32 in.
2. Conduit One or more nom 4 in. diam (or smaller) steel electrical metallic tubing or steel conduit to be installed either concentrically or eccentrically within the firestop system. The space between conduits or tubes shall be min 0 in. (point contact) to max 1/2 in. The annular space between the conduit or tube and periphery of opening shall be min 0 in. (point contact) to max 1-7/8 in. Conduit or tube to be rigidly supported on both sides of floor or wall assembly.
3. Fill, Void or Cavity Material* - Foam Min 5 in. thickness of fill material applied within the annulus, extending 1/2 in. above the floor or both surfaces of wall and overlapping the concrete 1/2 in. on all sides of the opening.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC - CP 620 Fire Foam
 *Bearing the UL Classification Mark



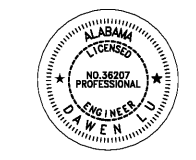
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 DRAWINGS

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