

PRELIMINARY
NOT FOR
CONSTRUCTION

KING+PARKS MULTI-FAMILY RESIDENCES

PROJECT SITE: NE Martin Luther King Jr. Boulevard & N Rosa Parks Way
OWNER: Portland Community Reinvestment Initiatives Inc. (PCRI)
6329 NE Martin Luther King Jr. Blvd. Portland, Oregon 97211

MBA
MERRYMAN BARNES ARCHITECTS

PROJECT NO. 16-0602
ISSUE DATE 06.23.2017

REVISIONS

SHEET

MECHANICAL
DETAILS

M6.9

NOT FOR CONSTRUCTION

PRICING SET

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Notes:

1. Refer to section 15084 of the specifications. For Quality Control requirements, refer to the Quality Control portion of the specification.
2. Details shown are typical details. If field conditions do not match requirements of typical details, approved alternate details shall be utilized. Field conditions and dimensions need to be verified for compliance with the details, including but not limited to the following:

* Minimum and maximum Width of Joints

* Type and thickness of fire-rated construction. The minimum assembly rating of the firestop assembly shall meet or exceed the highest rating of the adjacent construction.

3. If alternate details matching the field conditions are not available, manufacturers' engineering judgment drawings are acceptable. Drawings shall follow the International Firestop Council (IFC) Guidelines for Evaluating Firestop Systems Engineering Judgments.

4. References:

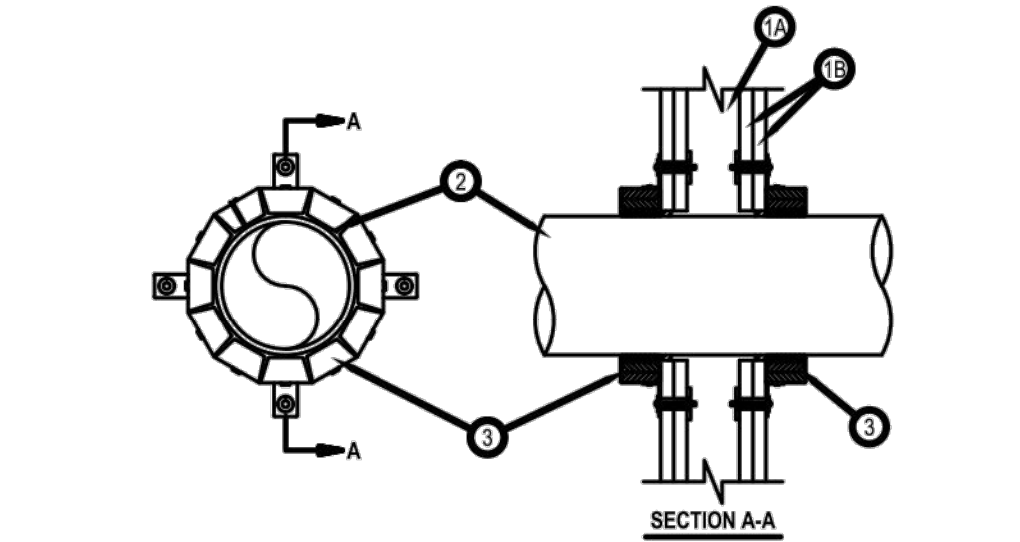
- * 2013 Underwriter's Laboratories Fire Resistance Directory, Volume 2
- * NFPA 101 Life Safety Code
- * All governing local and regional building codes

5. Firestop System installation must meet requirements of ASTM E-814 (UL 1479) tested assemblies that provide a fire rating equal to that of construction being penetrated.

6. All rated through-penetrations shall be prominently labeled with the following information:

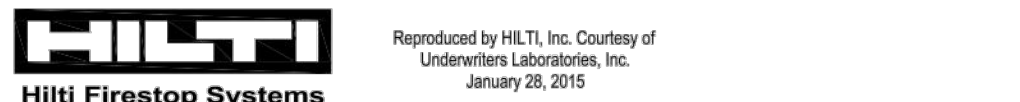
- * ATTENTION: Fire Rated Assembly
- * UL System #
- * Product(s) used
- * Hourly Rating (F-Rating)
- * Installation Date

System No. W-L-2078
F Ratings — 1 and 2 Hr (See Item 1)
T Ratings — 0, 1 and 2 Hr (See Items 2 and 3)
L Rating At Ambient — 3 CFM/sq ft
L Rating At 400 F — Less Than 1 CFM/sq ft



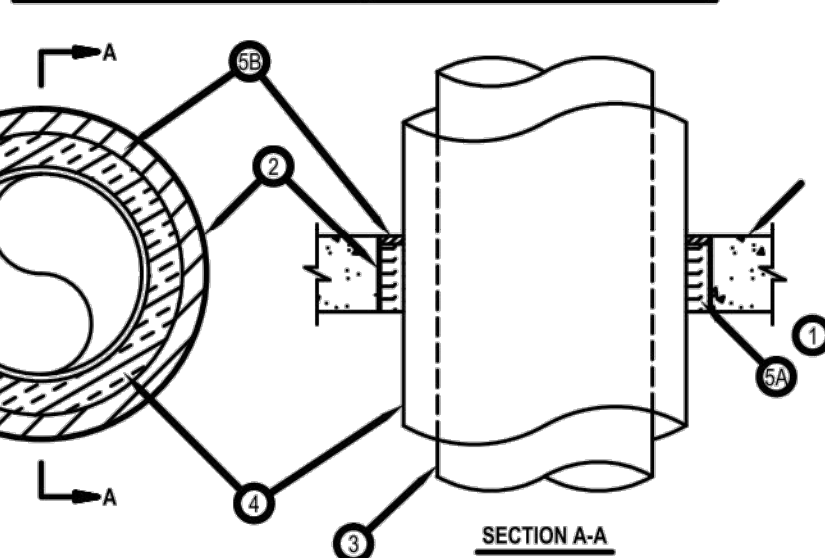
1. Wall Assembly — The fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the construction features noted below:
 - 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 max 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, as specified in the individual Wall and Partition Design. Max diam of opening is 11-1/2 in. (292 mm).
2. Through-Penetrations — One nonmetallic pipe, conduit or tubing to be installed within the firestop system. The annular space between pipe and periphery of opening shall be min 0 in. (point contact) to max 1/2 in. (13 mm). Pipe or conduit to be rigidly supported on both sides of the wall assembly. The following types and sizes of nonmetallic pipes may be used:
 - A. Polyvinyl Chloride (PVC) Pipe — Nom 10 in. (254 mm) diam (or smaller) Schedule 40 solid-core or cellular core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping system.
 - B. Chlorinated Polyvinyl Chloride (CPVC) Pipe — Nom 10 in. (254 mm) diam (or smaller) SDR13.5 CPVC pipe for use in closed (process or supply) piping systems.
 - C. Acrylonitrile Butadiene Styrene (ABS) Pipe — Nom 8 in. (152 mm) diam (or smaller) Schedule 40 solid-core or cellular core ABS pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.
 - D. Flame Retardant Polypropylene (FRPP) Pipe — Nom 8 in. (152 mm) diam (or smaller) Schedule 40 FRPP pipe for use in closed (process or supply) or vented (drain, waste or vent) piping system.
 - E. Polyvinylidene Fluoride (PVDF) Pipe — Nom 4 in. (102 mm) diam (or smaller) PVDF pipe for use in closed (process or supply) or vented (drain, waste or vent) piping system.When max 6 in. diam pipe is used, T Rating is equal to the hourly fire rating of the wall. When nom 8 in. or 10 in. (203 or 254 mm) diam pipe is used, T Rating is 0 hr.
3. Firestop Device* — Firestop Collar — Firestop collar shall be installed in accordance with the accompanying installation instructions. Collar to be installed and latched around the pipe and secured to both sides of the wall using the anchor hooks provided with the collar. (Minimum two anchor hooks for 1-1/2 and 2 in. (38 and 51 mm) diam pipes, three anchor hooks for 3 and 4 in. (76 and 102 mm) diam pipes, four anchor hooks for 6 in. (152 mm) diam pipes, ten anchor hooks for 8 in. (203 mm) diam pipes and twelve anchor hooks for 10 in. (254 mm) diam pipes. The anchor hooks are to be secured to the surface of wall with 3/16 in. (4.8 mm) diam by 2-1/2 in. (64 mm) long steel toggle bolts along with washers. As an alternate for pipe sizes of nom 4 in. diam or less, min 10 by 1-1/2 in. (254 by 38 mm) long drywall or laminate screws with min 3/4 in. (19 mm) steel washers may be used. When the drywall or laminate screw is used, T Rating shall not exceed 1 hr.
4. Fire, Void or Cavity Material* — Sealant — (Not Shown) — Min 1/2 in. (13 mm) thickness of sealant applied within the annular space for nom 8 in. and 10 in. (203 and 254 mm) diam pipes. Flush with each side of wall. Sealant in annular space is optional for max 6 in. (152 mm) diam pipes. A min 1/4 in. (6 mm) thickness of sealant is required within the annular space, flush with each side of wall, to attain the L Ratings for max 6 in. (152 mm) diam pipes.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC. — FS-One Sealant or FS-ONE MAX Intumescent Sealant
* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



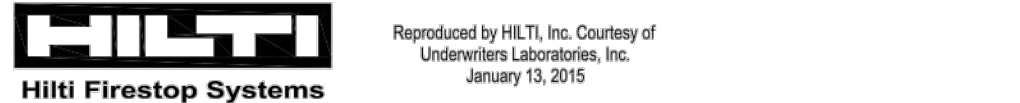
System No. C-AJ-5091

ANSI/UL1479 (ASTM E814)	CANULC S115
F Rating — 2 Hr	F Rating — 2 Hr
T Ratings — 0 and 1 Hr (See Items 2 and 4)	FT Ratings — 0 and 1 Hr (See Items 2 and 4)
L Rating At Ambient — 4 CFM/sq ft	PH Rating — 2 Hr
L Rating At 400 F — Less Than 1 CFM/sq ft	FTH Ratings — 0 and 1 Hr (See Items 2 and 4)
L Rating At Ambient — 4 CFM/sq ft	L Rating At Ambient — 4 CFM/sq ft
L Rating At 400 F — Less Than 1 CFM/sq ft	

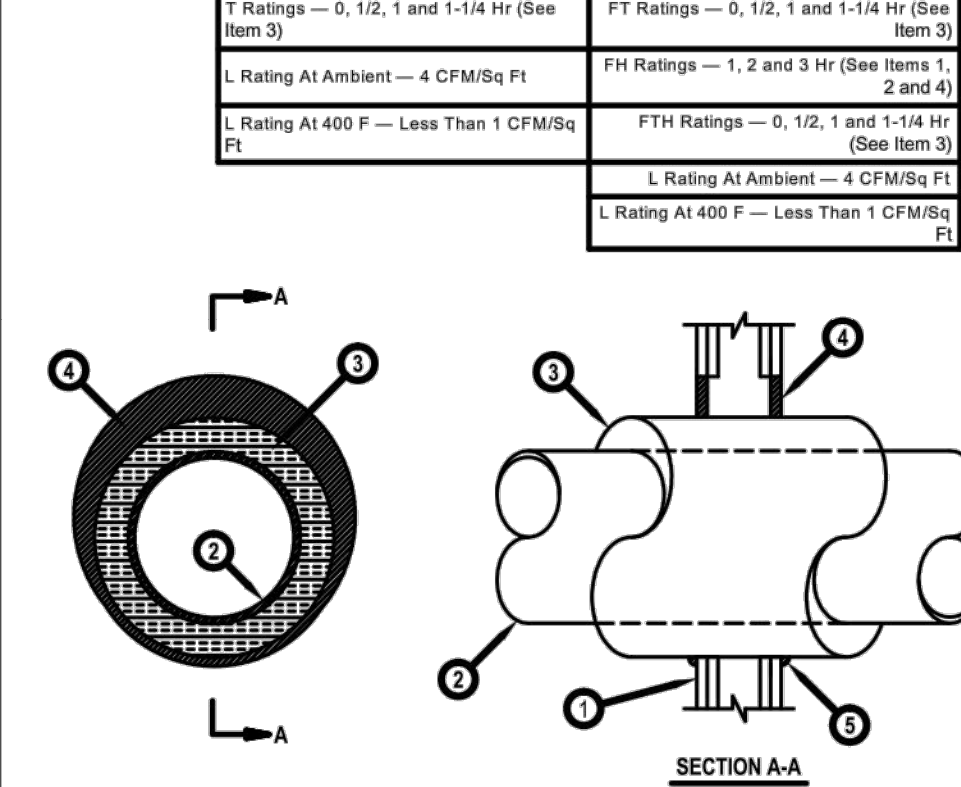


1. Floor or Wall Assembly — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete. Wall may also be constructed of any UL Classified Concrete Block*. Max diam of opening is 29 in. (737 mm).
2. Metallic Sleeve — (Optional) — Nom 30 in. (762 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe sleeve cast or grouted into floor or wall assembly, flush with floor or wall surface or extending a max of 3 in. (76 mm) above floor or beyond both surfaces of wall. If the steel sleeve extends beyond the top surface of the floor or both surfaces of the wall, the T Rating of the firestop system is 0 hr.
3. Steel Sheet Sleeve — (Optional) — Max 1 in. (152 mm) diam, min 26 ga galv steel provided with a 26 ga galv steel square flange spot welded to the sleeve at approximately mid-height, or flush with bottom of sleeve in floors, and sized to be a min of 2 in. (51 mm) larger than the sleeve diam. The sleeve is to be cast in place flush with bottom surface of floor and may extend a max of 1 in. (25 mm) above the top surface of the floor.
4. Through Penetrations — One metallic pipe or tubing to be installed either concentrically or eccentrically within the firestop system. Pipe or tubing to be 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 10 in. (254 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. Copper Pipe — Nom 8 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe.
 - D. Copper Tubing — Nom 8 in. (152 mm) diam (or smaller) Type I (or heavier) copper tubing.
 - E. Pipe Covering — Min 1/2 in. (13 mm) to max 2 in. (51 mm) thick hollow cylindrical heavy density (min 3.5 pcf or 56 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. The annular space between the insulated pipe and the edge of the periphery of the opening shall be min 1/2 in. (13 mm) to max 12 in. (305 mm). When thickness of pipe covering is less than 2 in. (51 mm), the T Rating for the firestop system is 0 hr.
 - F. Pipe Equipment Covering — Materials — (BRGU) 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. Packing Material* — Min 4 in. (102 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form for 1 or 2 hr fire-rated walls, respectively. Packing material to be recessed from top surface of floor or with both surfaces of wall.
 - B. Fill, Void or Cavity Material* — Sealant — Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC. — FS-One Sealant or FS-ONE MAX Intumescent Sealant
* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

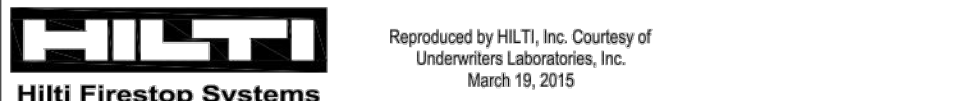


System No. W-L-3029
ANSI/UL1479 (ASTM E814) F Ratings — 1, 2 and 3 Hr (See Items 1, 3 and 4)
T Ratings — 0, 1/2, 1 and 1-1/4 Hr (See Item 3)
L Rating At Ambient — 4 CFM/sq ft
L Rating At 400 F — Less Than 1 CFM/sq ft
CANULC S115 F Ratings — 1, 2 and 3 Hr (See Items 1, 3 and 4)
FT Ratings — 0, 1/2, 1 and 1-1/4 Hr (See Item 3)
FH Ratings — 1, 2 and 3 Hr (See Items 1, 2 and 4)
FTH Ratings — 0, 1/2, 1 and 1-1/4 Hr (See Item 3)
L Rating At Ambient — 4 CFM/sq ft
L Rating At 400 F — Less Than 1 CFM/sq ft

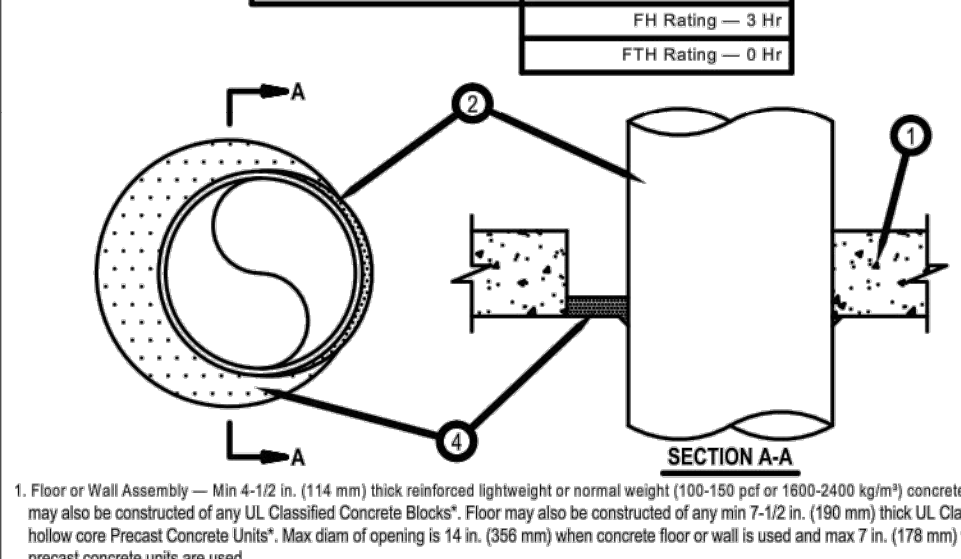


1. Wall Assembly — The 1 or 2 or 3 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction 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 for 1 and 2 hr F and FH rating and 3-1/2 in. (89 mm) wide for 3 hr F and FH rating and spaced max 24 in. (610 mm) OC.
 - B. Gypsum Board* — Min 5/8 in. (16 mm) thick 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. (473 mm).
2. Through-Penetrations — One metallic pipe, conduit or tubing to be installed 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. (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. Copper Tubing — Nom 6 in. (152 mm) diam (or smaller) Type I (or heavier) copper tubing. When the hourly F or FH Rating of the firestop system is 3 hr, the nom diam of copper tube shall not exceed 4 in. (102 mm).
 - D. Copper Pipe — Nom 8 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe. When the hourly F or FH Rating of the firestop system is 3 hr, the nom diam of copper pipe shall not exceed 4 in. (102 mm).
 - E. Pipe Covering* — Nom 1 in. (1-1/2 to 2 in. (25, 38 or 51 mm) thick hollow cylindrical heavy density (min 3.5 pcf or 56 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. For 1 and 2 hr F and FH Ratings, the annular space between insulated penetrant and periphery of opening shall be min 0 in. (point contact) to max 1-7/8 in. (48 mm). For 3 hr F and FH Ratings, the annular space shall be min 0 in. (point contact) to max 1-1/4 in. (32 mm).
3. Firestop System — The firestop system shall be as specified in the Building Materials Directory for the 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.
4. Fire, Void or Cavity Material* — Sealant — (Not Shown) — As an alternate to Item 3, max 2 in. (51 mm) thick cylindrical calcium silicate (min 14 pcf) units sized to the outside diam of the pipe or tube may be used. Pipe insulation secured with stainless steel bands or min 18 AWG stainless steel wire spaced max 12 in. (305 mm) OC. When the alternate pipe covering is used, the 1 and 2 hr F and FH Rating shall be as specified in Item 3 above.
5. Firestop System — The firestop system shall be as specified in the Building Materials Directory for the 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.

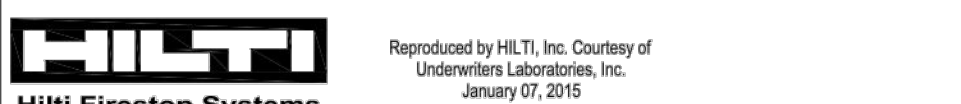
HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC. — FS-One Sealant or FS-ONE MAX Intumescent Sealant
* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



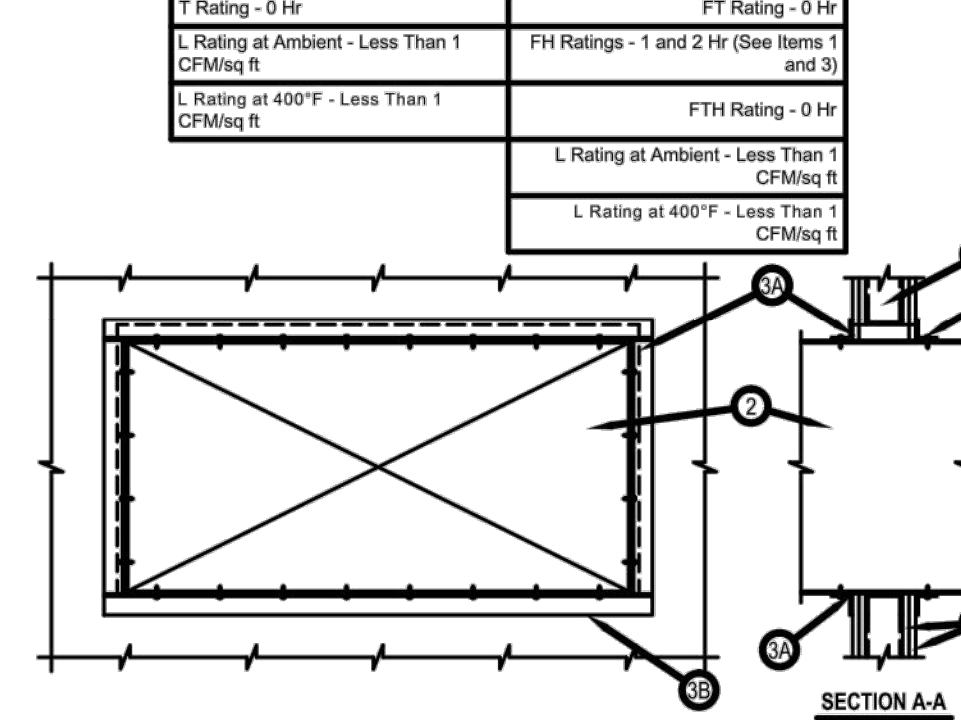
System No. C-AJ-1184
ANSI/UL1479 (ASTM E814) F Rating — 3 Hr
T Rating — 0 Hr
L Rating At Ambient — Less Than 1 CFM/sq ft
L Rating At 400 F — Less Than 1 CFM/sq ft
CANULC S115 F Rating — 3 Hr
FT Rating — 0 Hr
FH Rating — 3 Hr
FTH Rating — 0 Hr



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 Block*. Floor may also be constructed of any min T-12 in. (190 mm) thick UL Classified hollow core Precast Concrete Units*. Max diam of opening is 18 in. (305 mm) when concrete floor or wall is used and max 18 in. (178 mm) when precast concrete units are used.
2. Through-Penetrations — One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min 0 in. (point contact) to max 1-1/2 in. (38 mm). Pipe, conduit or tubing to be 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 10 in. (254 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
 - B. Iron Pipe — Nom 10 in. (254 mm) diam (or smaller) cast or ductile iron pipe.
 - C. Conduit — Nom 8 in. (102 mm) diam (or smaller) steel or metal tubing or steel conduit.
 - D. Copper Tubing — Nom 4 in. (102 mm) diam (or smaller) Type I (or heavier) copper tubing.
 - E. Copper Pipe — Nom 4 in. (102 mm) diam (or smaller) regular (or heavier) copper pipe.
 - F. Forms — (Not Shown, Optional) — Used as a form to prevent leakage of fill material during installation. Forms to be rigid sheet material, cut to fit the contour of the penetrating item and positioned as required to accommodate the required thickness of fill material. Forms to be removed after fill material has cured. Additional forming material may be used concrete block wall is penetrated. A min 1/2 in. (13 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation is firmly packed into the annulus as a permanent form and recessed from both surfaces of the wall as required to accommodate the required thickness of fill material.
 - G. Pipe Equipment Covering — Materials — (BRGU) 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.
3. Firestop System — The firestop system shall consist of the following:
 - A. Packing Material* — Min 4 in. (102 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form for 1 or 2 hr fire-rated walls, respectively. Packing material to be recessed from top surface of floor or with both surfaces of wall.
 - B. Fill, Void or Cavity Material* — Sealant — Min 1/2 in. (13 mm) thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall.

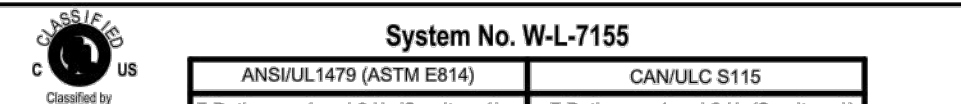


System No. W-L-7040
ANSI/UL1479 (ASTM E814) F Ratings — 1 and 2 Hr (See Items 1 and 2)
T Rating — 0 Hr
L Rating At Ambient — Less Than 1 CFM/sq ft
L Rating At 400 F — Less Than 1 CFM/sq ft
CANULC S115 F Ratings — 1 and 2 Hr (See Items 1 and 3)
FT Rating — 0 Hr
FH Ratings — 1 and 2 Hr (See Items 1 and 3)
FTH Rating — 0 Hr
L Rating At Ambient — Less Than 1 CFM/sq ft
L Rating At 400 F — Less Than 1 CFM/sq ft

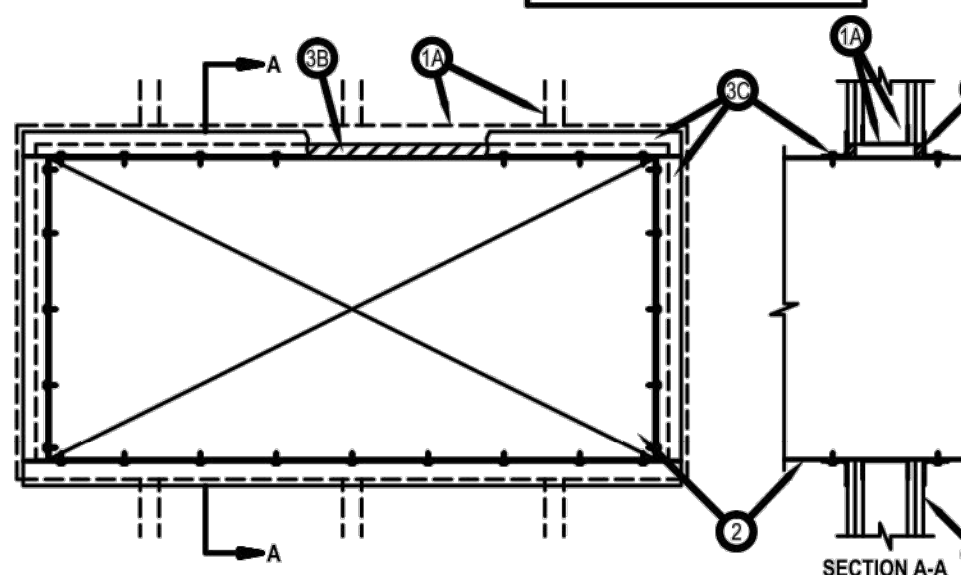


1. Wall Assembly — The fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400, U400 or V400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
 - 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. Additional framing members shall be used to completely frame around opening.
 - B. Gypsum Board* — Nom 5/8 in. (16 mm) thick with square or tapered edges. The gypsum wallboard type, number of layers and sheet orientation shall be as specified in the individual Wall and Partition Design Number. Max area of opening is 1300 x 10.84 m² (the dimension of 50 in. (127 mm). The hourly F and FH Ratings of the firestop system are equal to the hourly fire rating of the wall assembly in which it is installed.
 - C. Steel Pipe — Nom 24 in. x 48 in. (610 by 1219 mm) (or smaller) No. 24 (gauge) (or heavier) galv steel duct to be installed within the firestop system. The annular space shall be min 0 (point contact) to in. to a max 2 in. (51 mm) Duct to be rigidly supported on both sides of the wall assembly.
2. Through-Penetrations — One metallic pipe, conduit or tubing to be installed within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min 0 in. (point contact) to max 1-1/2 in. (38 mm). Pipe, conduit or tubing to be 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. Copper Tubing — Nom 6 in. (152 mm) diam (or smaller) Type I (or heavier) copper tubing. When the hourly F or FH Rating of the firestop system is 3 hr, the nom diam of copper tube shall not exceed 4 in. (102 mm).
 - D. Copper Pipe — Nom 8 in. (152 mm) diam (or smaller) Regular (or heavier) copper pipe. When the hourly F or FH Rating of the firestop system is 3 hr, the nom diam of copper pipe shall not exceed 4 in. (102 mm).
 - E. Pipe Covering* — Nom 1 in. (1-1/2 to 2 in. (25, 38 or 51 mm) thick hollow cylindrical heavy density (min 3.5 pcf or 56 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. For 1 and 2 hr F and FH Ratings, the annular space between insulated penetrant and periphery of opening shall be min 0 in. (point contact) to max 1-7/8 in. (48 mm). For 3 hr F and FH Ratings, the annular space shall be min 0 in. (point contact) to max 1-1/4 in. (32 mm).
3. Firestop System — The firestop system shall consist of the following:
 - A. Packing Material* — Min 3-1/2 in. (89 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form for 1 or 2 hr fire-rated walls, respectively. Packing material to be recessed from top surface of floor or with both surfaces of wall.
 - B. Steel Retaining Angle — No. 18 MSG (0.048 in.) galv steel angles sized to fit contour of duct with a 2 in. overlap on the duct and a min 1 in. overlap on the gypsum board surface on both surfaces of wall. 2 in. leg of angle secured to duct with min No. 8 by 3/4 in. long steel metal screws, spaced a max of 6 in. OC. When bead of fill material is used at joint contact locations, angles shall be installed prior to full material curing.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC. — FS-One Sealant, FS-ONE Intumescent Sealant, CP6015 Elastomeric Firestop Sealant or CP606 Flexible Firestop Sealant
* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.



System No. W-L-7155
ANSI/UL1479 (ASTM E814) F Ratings — 1 and 2 Hr (See Item 1)
T Rating — 0 Hr
L Rating At Ambient — Less Than 1 CFM/sq ft
L Rating At 400 F — Less Than 1 CFM/sq ft
CANULC S115 F Ratings — 1 and 2 Hr (See Item 1)
FT Ratings — 0 Hr
FH Ratings — 0 Hr
FTH Ratings — 0 Hr
L Rating At Ambient — Less Than 1 CFM/sq ft
L Rating At 400 F — Less Than 1 CFM/sq ft

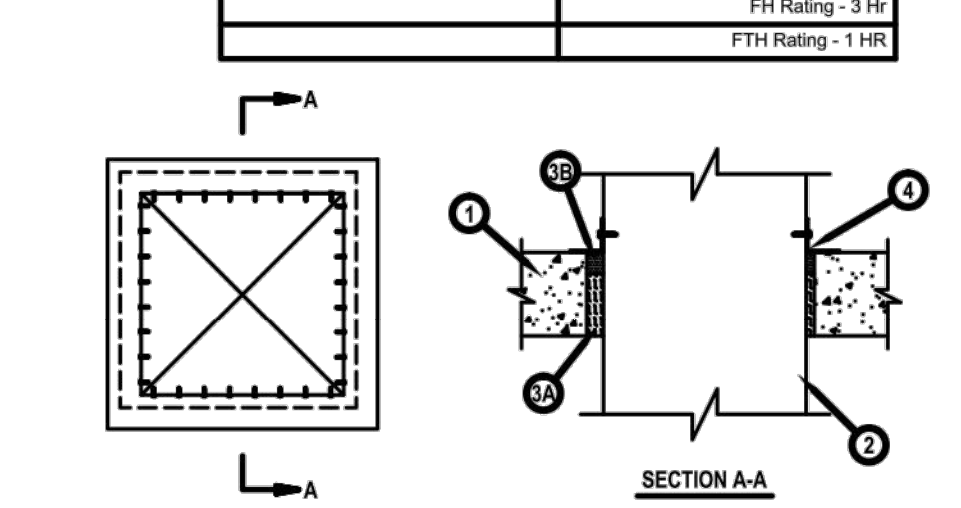


1. Wall Assembly — The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300, U400 or V400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
 - A. Studs — Wall framing shall consist of min 3-1/2 in. (89 mm) wide steel channel studs spaced max 24 in. (610 mm) OC. Additional steel studs shall be used to completely frame the opening.
 - B. Gypsum Board* — 5/8 in. (16 mm) thick, 4 ft (122 in) 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 in the UL Fire Resistance Directory. Max area of opening is 73.7 sq ft (6.86 m²) with a max dimension of 104 in. (264 mm).
 - C. Steel Retaining Angle — No. 18 MSG (0.048 in.) galv steel angles sized to fit contour of duct with a 2 in. overlap on the duct and a min 1 in. overlap on the gypsum board surface on both sides of wall.
 - D. Through-Penetrations — One metallic pipe, conduit or tubing to be installed within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min 0 in. (point contact) to max 2 in. (51 mm). Duct to be 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 10 in. (254 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
 - B. Iron Pipe — Nom 10 in. (254 mm) diam (or smaller) cast or ductile iron pipe.
 - C. Conduit — Nom 8 in. (102 mm) diam (or smaller) steel or metal tubing or steel conduit.
 - D. Copper Tubing — Nom 4 in. (102 mm) diam (or smaller) Type I (or heavier) copper tubing.
 - E. Copper Pipe — Nom 4 in. (102 mm) diam (or smaller) regular (or heavier) copper pipe.
 - F. Forms — (Not Shown, Optional) — Used as a form to prevent leakage of fill material during installation. Forms to be rigid sheet material, cut to fit the contour of the penetrating item and positioned as required to accommodate the required thickness of fill material. Forms to be removed after fill material has cured. Additional forming material may be used concrete block wall is penetrated. A min 1/2 in. (13 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation is firmly packed into the annulus as a permanent form and recessed from both surfaces of the wall as required to accommodate the required thickness of fill material.
 - G. Pipe Equipment Covering — Materials — (BRGU) 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.
 - 2. Through-Penetrations — One metallic pipe, conduit or tubing to be installed within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min 0 in. (point contact) to max 2 in. (51 mm). Duct to be 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 10 in. (254 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
 - B. Iron Pipe — Nom 10 in. (254 mm) diam (or smaller) cast or ductile iron pipe.
 - C. Conduit — Nom 8 in. (102 mm) diam (or smaller) steel or metal tubing or steel conduit.
 - D. Copper Tubing — Nom 4 in. (102 mm) diam (or smaller) Type I (or heavier) copper tubing.
 - E. Copper Pipe — Nom 4 in. (102 mm) diam (or smaller) regular (or heavier) copper pipe.
 - F. Forms — (Not Shown, Optional) — Used as a form to prevent leakage of fill material during installation. Forms to be rigid sheet material, cut to fit the contour of the penetrating item and positioned as required to accommodate the required thickness of fill material. Forms to be removed after fill material has cured. Additional forming material may be used concrete block wall is penetrated. A min 1/2 in. (13 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation is firmly packed into the annulus as a permanent form and recessed from both surfaces of the wall as required to accommodate the required thickness of fill material.
 - G. Pipe Equipment Covering — Materials — (BRGU) 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.
 - 3. Firestop System — The firestop system shall consist of the following:
 - A. Packing Material* — Min 3-5/8 (92 mm) or 4-7/8 in. (124 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form for 1 or 2 hr fire-rated walls, respectively. Packing material to be recessed from both surfaces of wall to accommodate the required thickness of fill material.
 - B. Steel Retaining Angle — No. 18 MSG (0.048 in.) galv steel angles sized to fit contour of duct with a 2 in. overlap on the duct and a min 1 in. overlap on the gypsum board surface on both surfaces of wall. 2 in. leg of angle secured to duct with min No. 8 by 3/4 in. long steel metal screws, spaced a max of 6 in. (152 mm) OC. When max 1-1/2 in. (38 mm) thick insulation is used, steel angles are optional for those sides of duct that do not exceed the dimension specified in Table below, dependent on packing material, sealant and annular space as specified.
 - C. Steel Retaining Angles — No. 18 MSG (0.048 in.) galv steel angles sized to fit contour of duct with a 2 in. overlap on the duct and a min 1 in. overlap on the gypsum board surface on both surfaces of wall. 2 in. leg of angle secured to duct with min No. 8 by 3/4 in. long steel metal screws, spaced a max of 6 in. (152 mm) OC. Steel angles are optional for those sides of duct that do not exceed the dimension specified in Table below, dependent on packing material, sealant and annular space as specified.

Max Duct Dimension on	Duct Thickness	Annular Space	Packing Material	Angle (Item 3C) Required
24 in. (610 mm)	24 ga or heavier	12 in. min to 1 in. max (13 to 25 mm)	Item 3A1	No

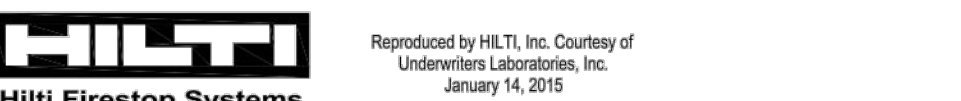
* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.

System No. C-AJ-7051
ANSI/UL1479 (ASTM E814) F Ratings — 3 Hr
T Rating — 1 Hr
CANULC S115 F Rating — 3 Hr
FT Rating — 1 Hr
FH Rating — 3 Hr
FTH Rating — 1 Hr

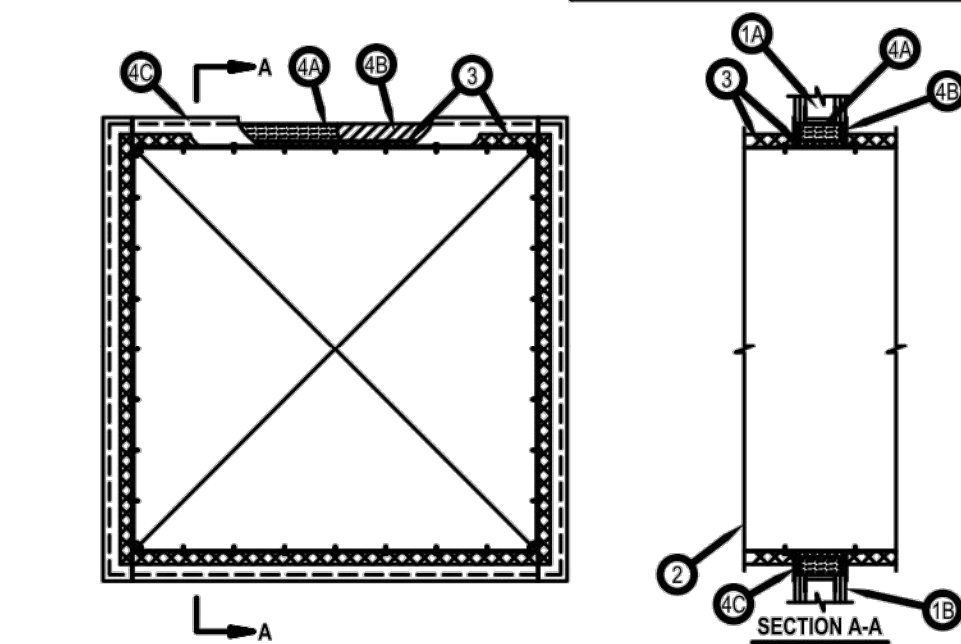


1. Floor or Wall Assembly — Min 4-1/2 in. (114 mm) thick reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m³) concrete floor or min 5-1/2 in. (140 mm) thick lightweight on normal weight concrete wall. Wall may also be constructed of any UL Classified Concrete Block*. Max area of opening is 1024 in. sq (6606 cm²) with a max dimension of 32 in. (813 mm).
2. Steel Duct — Nom 30 by 30 in. (762 by 762 mm) by No. 24 gauge (or heavier) galv steel duct. One steel duct to be positioned within the firestop system. The annular space shall be min 1/4 in. (6 mm) to max 1-3/4 in. (44 mm). Duct to be rigidly supported on both sides of floor or wall assembly.
3. Firestop System — The firestop system shall consist of the following:
 - A. Packing Material* — Min 3-1/2 in. (89 mm) thickness of min 4 pcf (64 kg/m³) mineral wool batt insulation firmly packed into opening as a permanent form between the bare steel duct and the periphery of the opening. Packing material to be recessed from top surface of floor or both surfaces of wall as required to accommodate the required thickness of fill material.
 - B. Fill, Void or Cavity Material* — Sealant — Min 1 in. (25 mm) thickness of fill material applied within the annulus, flush with top surface of floor or with both surfaces of wall.
4. Steel Retaining Angle — Nom 2 in. by 2 in. (51 by 51 mm) by No. 16 gauge (or heavier) steel angles attached to all four sides of the steel duct on the top surface or both surfaces of the wall. The angles shall be attached with No. 8 (or larger) steel sheet metal screws spaced max of 1 in. (25 mm) from each end and a max of 3 in. (76 mm) OC.

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



System No. W-L-7156
ANSI/UL1479 (ASTM E814) F Ratings — 1 and 2 Hr (See Item 1)
T Rating — 0 Hr
L Rating At Ambient — Less Than 1 CFM/sq ft
L Rating At 400 F — Less Than 1 CFM/sq ft
CANULC S115 F Ratings — 1 and 2 Hr (See Item 1)
FT Rating — 0 Hr
FH Ratings — 1 and 2 Hr (See Item 1)
FTH Rating — 0 Hr



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, 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 shall 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 max 16 in. (406 mm) OC. Steel studs to be min 3-1/2 in. (89 mm) wide and spaced max 24 in. (610 mm) OC. Additional framing members shall be used to completely frame around opening.
 - B. Gypsum Board* — Min 5/8 in. (16 mm) thick, 4 ft (122 in) wide with square or tapered edges. The gypsum board type, thickness, number of layers and orientation shall be as specified in the individual Wall and Partition Design. Max size of opening is 210 sq in. (1355 cm²) with a max width of 14-1/2 in. (368 mm) for wood studs. Max size of opening is 76.2 sq ft (7 m²) with a max width of 105-1/2 in. (2,7 m) for steel studs.
 - C. Steel Retaining Angle — No. 18 MSG (0.048 in.) galv steel angles sized to fit contour of duct with a 2 in. overlap on the duct and a min 1 in. overlap on the gypsum board surface on both surfaces of wall. 2 in. leg of angle secured to duct with min No. 8 by 3/4 in. long steel metal screws, spaced a max of 6 in. (152 mm) OC. When max 1-1/2 in. (38 mm) thick insulation is used, steel angles are optional for those sides of duct that do not exceed the dimension specified in Table below, dependent on packing material, sealant and annular space as specified.
 - D. Through-Penetrations — One metallic pipe, conduit or tubing to be installed within the firestop system. The annular space between pipe, conduit or tubing and periphery of opening shall be min 0 in. (point contact) to max 2 in. (51 mm). Duct to be 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 10 in. (254 mm) diam (or smaller) Schedule 10 (or heavier) steel pipe.
 - B. Iron Pipe — Nom 10 in. (254 mm) diam (or smaller) cast or ductile iron pipe.
 - C. Conduit — Nom 8