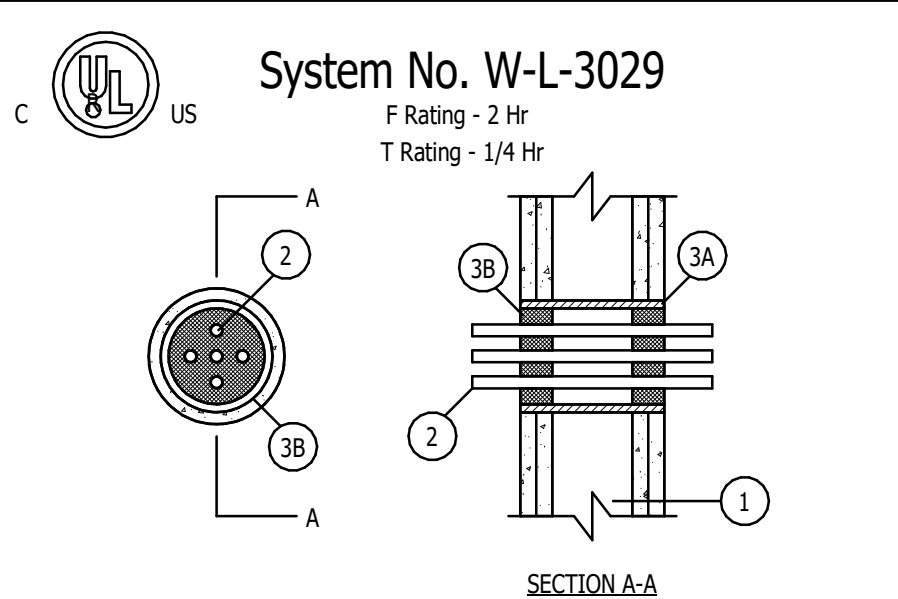


- System No. W-L-1164**
F Ratings - 1 and 2 Hr (See Items 1 and 4)
T Rating - 0 Hr
- Wall Assembly The 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
 - 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.
 - Gypsum Board* The gypsum wallboard 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 in steel stud walls is 32in. Max diam of openings in wood stud walls is 14-1/2 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. **Steel Sleeve** - Nom 32 in. diam (or smaller) Schedule 40 (or heavier) steel pipe sleeve friction fit in nom 32 in. diam circular opening cut through gypsum wallboard layers. Length of steel sleeve to be equal to thickness of wall.
 3. **Through-Penetrant** - One metallic pipe, conduit or tubing installed either concentrically or eccentrically within the firestop system. The annular space between pipe, conduit or tubing and the steel sleeve shall be min 0 in. (point contact) to max 1-7/8 in. 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:
 - Steel Pipe - Nom 30 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
 - Iron Pipe - Nom 30 in. diam (or smaller) service weight (or heavier) cast iron soil pipe or Class 50 (or heavier) ductile iron pressure pipe.
 - Conduit - Nom 4 in. diam (or smaller) steel electrical metallic tubing.
 - Copper Tubing - Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing.
 - Copper Pipe - Nom 6 in. diam (or smaller) Regular (or heavier) copper pipe.

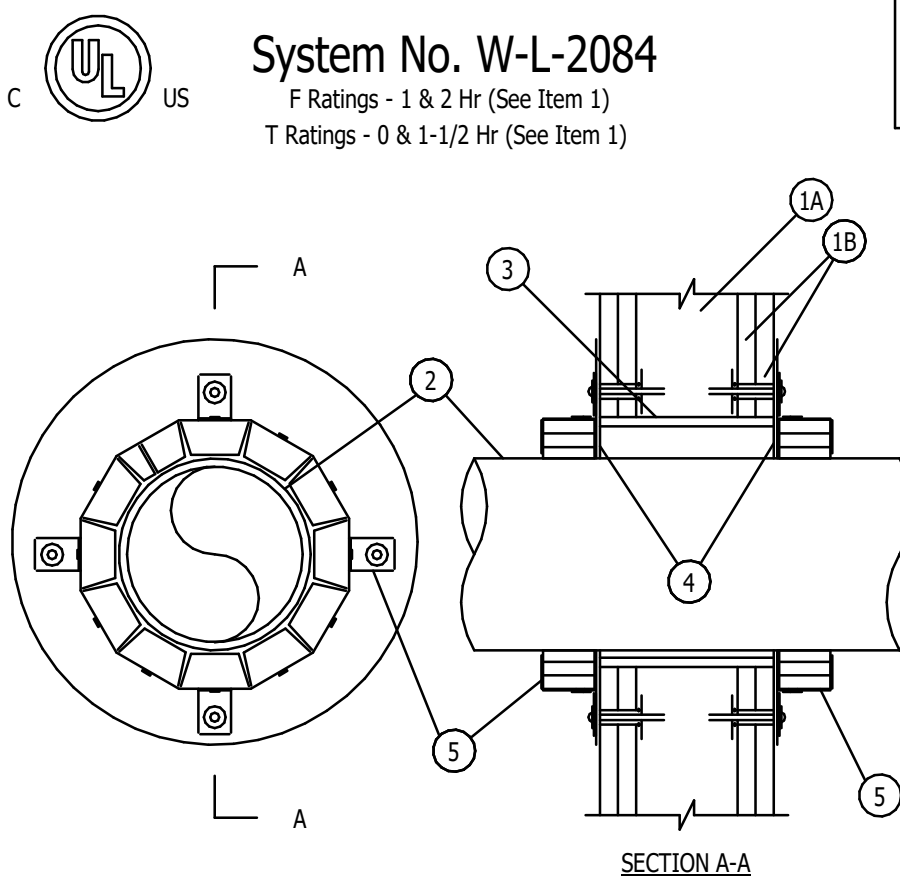
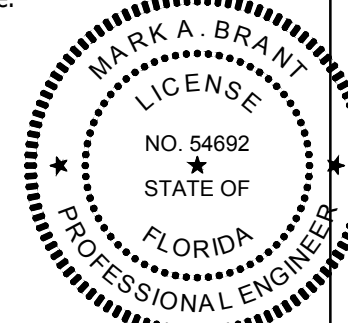
Fill, Void or Cavity Material* - Sealant - Min 5/8 in. and 1-1/4 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly for 1 or 2 hr rated walls, respectively. Min 1/2 in. diam bead of caulk applied to the penetrant/wallboard interface at the point contact location on both sides of wall.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC - FS-ONE Sealant
*Bearing the UL Classification Marking



- System No. W-L-3029**
F Rating - 2 Hr
T Rating - 1/4 Hr
- 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 and U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
 - 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.
 - Gypsum Board* - Two layers of nom 5/8 in. thick gypsum wallboard, as specified in the individual Wall and Partition Design. Max diam of opening is 2 in.
 - Cables - Aggregate cross-sectional area of cables in opening to be max 35 percent of the aggregate cross-sectional area of the opening. Cables to consist of max 3/C with ground No. 10 AWG (or smaller) Type NM with polyvinyl chloride insulation and jacket. Min separation between cables shall be 1/8 in. Cables to be rigidly supported on both sides of wall assembly.
 - Firestop System - The firestop system shall consist of the following:
 - Steel Wire Mesh - Cylindrical sleeve fabricated from No. 8 steel wire mesh having a min 1 in. lap along the longitudinal seam. Length of steel wire mesh to be 4-3/4 in., centered and formed to fit periphery of through opening.
 - Fill, Void or Cavity Material* - Caulk - Min 1-1/4 in. thickness of fill material applied within the annulus, flush with both surfaces of wall. Caulk to be forced into interstices of cable group to max extent possible.

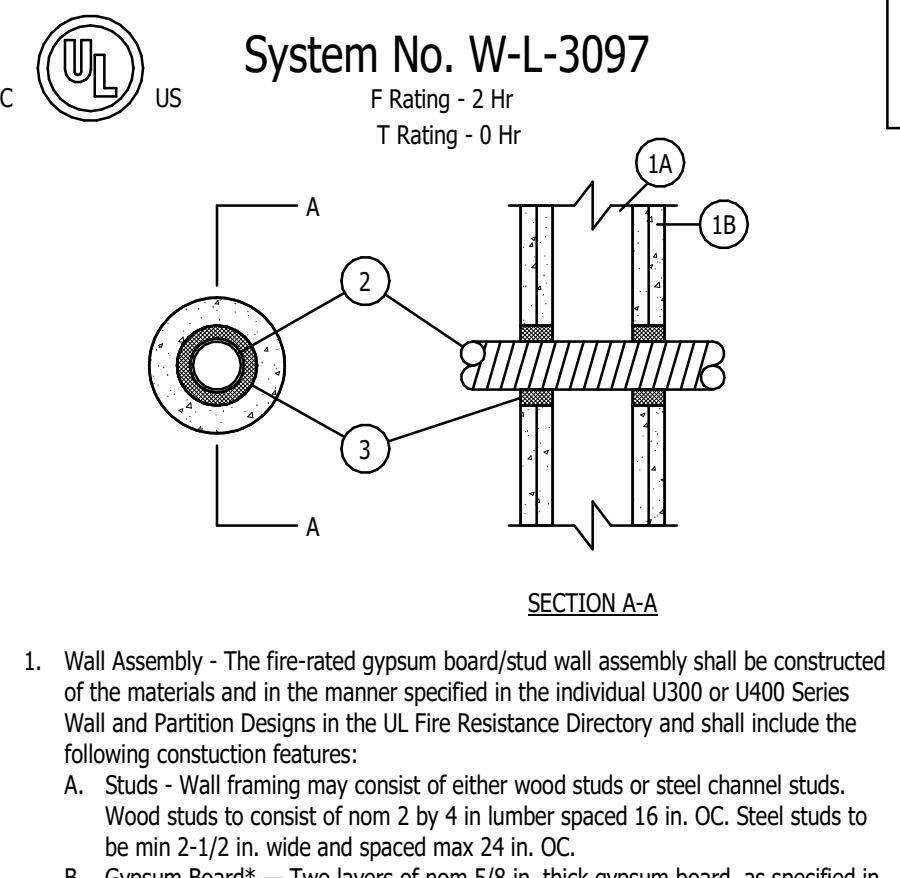
RECTORSEAL - Metacaulk 835+
*Bearing the UL Classification Mark



- System No. W-L-2084**
F Ratings - 1 & 2 Hr (See Item 1)
T Ratings - 0 & 1-1/2 Hr (See Item 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:
 - 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.
 - Gypsum Board* - Two layers of nom 5/8 in. thick gypsum wallboard, as specified in the individual Wall and Partition Design. Max diam of opening is 8 in.
 - Through-Penetrants - 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 1/4 in. to max 1-1/4 in. 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:
 - Polyvinyl Chloride (PVC) Pipe - Nom 6 in. 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 systems.
 - Chlorinated Polyvinyl Chloride (CPVC) Pipe - Nom 6 in. diam (or smaller) SDR17 CPVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.
 - Acrylonitrile Butadiene Styrene (ABS) Pipe - Nom 6 in. 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.
 - Flame Retardant Polypropylene (FRPP) Pipe - Nom 6 in. diam (or smaller) Schedule 40 FRPP pipe for use in closed (process or supply) or vented (drain, waste or vent) piping system.
 - Metallic Sleeve - Nom 8 in. diam (or smaller) Schedule 40 (or thinner) steel pipe cast into wall assembly with joint compound and installed flush with wall surfaces
 - 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 2 anchor hooks for 1-1/2 and 2 in. diam pipes, 3 anchor hooks for 3 and 4 in. diam pipes, and 4 anchor hooks for 6 in. diam pipes). The anchor hooks are to be secured to the surface of wall with 3/16 by 2-1/2 in. long toggle bolts along with washers. As an alternate for pipe sizes of nom 4 in. diam or less, min No. 10 by 1-1/2 in. long drywall or laminate screws with min 3/4 in. steel washers may be used.

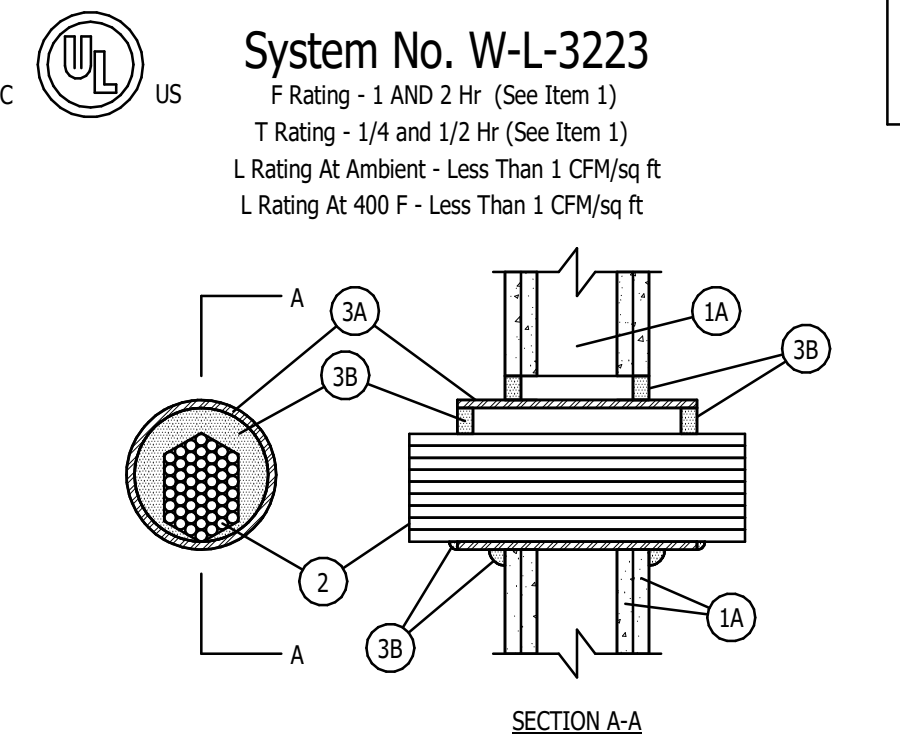
HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC - CP 643 50/1.57N, CP 643 63/27N, CP 643 90/37N, CP 643 110/47N or CP 643 160/67N Firestop Collar
*Bearing the UL Classification Mark

THIS ITEM HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY MARK A. BRANT, PE, ON THE DATE INDICATED WITHIN THE SIGNATURE TO THE RIGHT USING A 3RD PARTY VERIFIABLE DIGITAL SIGNATURE.
PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SHA-1 AUTHENTICATION CODE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.



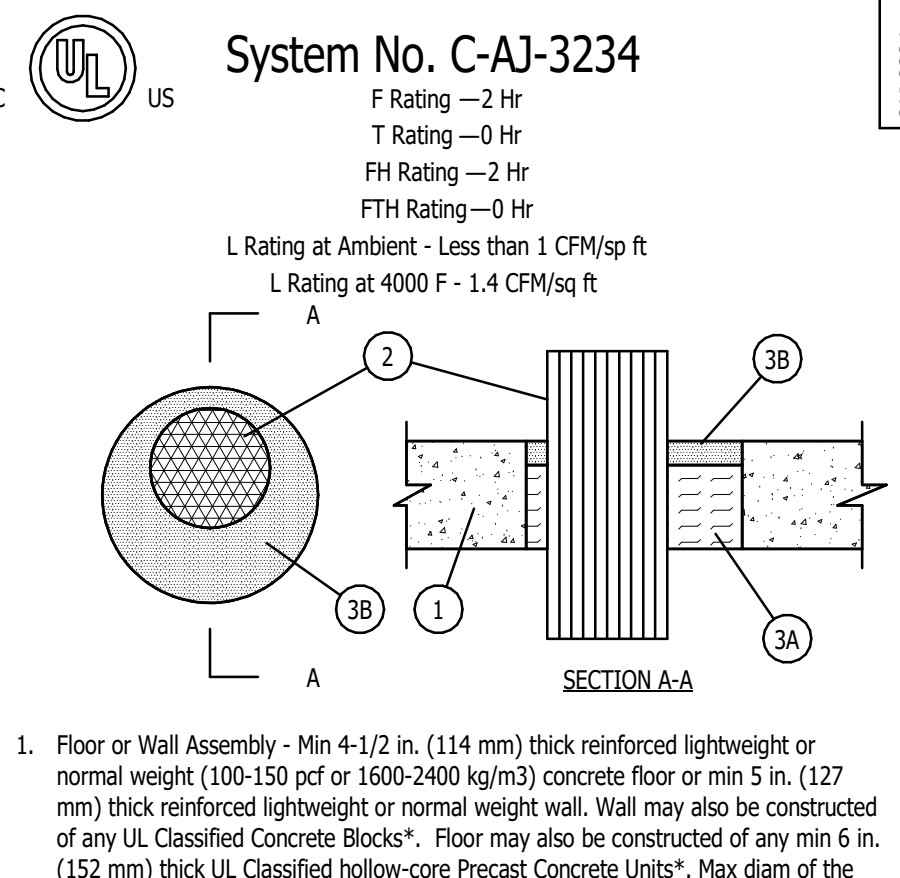
- System No. W-L-3097**
F Rating - 2 Hr
T Rating - 0 Hr
- Wall Assembly - The fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
 - 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.
 - Gypsum Board* - Two layers of nom 5/8 in. thick gypsum board, as specified in the individual Wall and Partition Design. Max diam of opening is 2 in.
 - Through Penetrating Product* - Max one through-penetrating product to be installed either concentrically or eccentrically within the opening. The annular space between through-penetrating product and periphery of opening is min 1/4 in. to max 3/4 in. Through-penetrating product to be rigidly supported on both sides of wall assembly. The following types of through-penetrating products may be used:
 - Max four copper conductors No. 2/0 AWG (or smaller) aluminum or steel Armored Cable or Metal-Clad Cable.
 - Two or more twisted copper conductors No. 6 AWG (or smaller) Power Limited Circuit Cable+ with or without a jacket under a metal armor.
 - Two or more twisted copper conductors No. 10 AWG (or smaller) Power Limited Fire Alarm Cable+ with or without a jacket under a metal armor.
 - Two or more twisted copper conductors No. 12 AWG (or smaller) Non Power Limited Fire Alarm Cable+ with or without a jacket under a metal armor.
 - Fill, Void or Cavity Material* - Caulk - Min 1-1/4 in. thickness of fill material applied within the annulus, flush with both surfaces of wall.

RECTORSEAL - Metacaulk 835+
*Bearing the UL Classification Mark



- System No. W-L-3223**
F Rating - 1 AND 2 Hr (See Item 1)
T Rating - 1/4 AND 1/2 Hr (See Item 1)
L Rating At Ambient - Less Than 1 CFM/sq ft
L Rating At 400 F - Less Than 1 CFM/sq ft
- 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, V400 or W400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
 - 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 3-5/8 in. (92 mm) wide and spaced max 24 in. (610 mm) OC.
 - Gypsum Board* - 5/8 in. (16 mm) thick, 4 ft (1.2 m) 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 Design in the UL Fire Resistance Directory. Max diam of wall opening is 5 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.
 - The hourly T, FT and FTH Ratings are 1/4 hr and 1/2 hr for 1 and 2 hr rated assemblies, respectively.
 - Cables - Aggregate cross-sectional area of cables in opening to be max 55.6 percent of the cross-sectional area of the opening. Cables to be bundled together and rigidly supported on both sides of wall assembly. The annular space between cable bundle and edge of metallic sleeve (Item 3A) shall be min 0 in. (point contact) to max 1/8 in. (3.2 mm). The following types and sizes of cables may be used:
 - Max 4/C No. 12 AWG (or smaller) cable with PVC insulation and jacket.
 - Max 1/C No. 350 MCM cable with XLPE insulation and jacket.
 - Max No. 18 AWG RG6/U coaxial cable with PVC insulation and jacket.
 - Max 62.5/125 micron, Type OFNR, fiber optic cables with PVC insulation and jacket.
 - Type RG59/U coaxial cables with polyethylene (PE) insulation and PVC jacket.
 - Firestop System - The firestop system shall consist of the following:
 - Metallic Sleeve - Nom 4 in. (102 mm) diam (or smaller) steel, iron, or EMT sleeve with 0.083 in. (2.1 mm) wall thickness (or thicker), fitted into wall opening with a max annular space of 1/2 in. (13 mm) between the edge of the wall opening. Length of sleeve to be equal to thickness of wall plus 2 in. (51 mm) such that, when installed, the ends of the sleeve project 1 in. (25 mm) beyond each surface of the wall.
 - Fill, Void or Cavity Material* - Sealant - Min 5/8 in. (16 mm) thickness of fill material applied within the annulus, between sleeve and wall opening, flush with wall surfaces. Min 1/2 in. (13 mm) thickness of fill material applied within the annulus between cable bundle and sleeve, flush with ends of sleeve. Fill material to be forced into interstices of cable group to seal any voids on both surfaces of wall. A min 3/8 in. (10 mm) bead of the sealant shall be applied at the point-contact locations of the sleeve with wall and cable bundle with sleeve on both sides of the wall assembly.

RECTORSEAL - FlameSafe® FS1900, Metacaulk 1000, Metacaulk 350, Biostop 350i or Biostop 500+



- System No. C-AJ-3234**
F Rating - 2 Hr
T Rating - 0 Hr
FH Rating - 2 Hr
FTH Rating - 0 Hr
L Rating at Ambient - Less Than 1 CFM/sp ft
L Rating at 4000 F - 1.4 CFM/sq ft
- 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 in. (127 mm) thick reinforced lightweight or normal weight wall. Wall may also be constructed of any UL Classified Concrete Blocks*. Floor may also be constructed of any min 6 in. (152 mm) thick UL Classified hollow-core Precast Concrete Units*. Max diam of the opening is 6 in. (152 mm).
 - See Concrete Block (CAZT) and Precast Concrete Units (CFTV) categories in the Fire Resistance Directory for names of manufacturers.
 - Cables - Aggregate cross-sectional area of cables in opening to be max 25 percent of the cross-sectional area of the opening. Cables installed individually or in bundles having a max bundle diam of 3 in. (76 mm). The annular space between cable bundle and the periphery of the opening shall be min 3/8 in. (10 mm) to max 2-5/8 in. (67 mm). Cables to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of cables may be used:
 - Max 100 pair No. 24 AWG (or smaller) copper conductor cable with polyvinyl chloride (PVC) jacketing and insulation.
 - Max 3/C No. 2/0 AWG (or smaller) aluminum conductor service entrance cable with PVC insulation and jacket.
 - Max 3/C with ground No. 12 AWG (or smaller) nonmetallic sheathed (Romex) cable with copper conductors, PVC insulation and jacket.
 - Max 1/C No. 350 kcmil (or smaller) copper conductor power cable with XLPE (cross-linked polyethylene) or PVC insulation and XLPE or PVC jacket.
 - Max RG59/U (or smaller) copper conductor coaxial cable with fluorinated ethylene insulation and jacketing.
 - Max 62.5/125 fiber optic cable with PVC insulation and jacketing.
 - Max RG/6 No. 18 AWG Type copper conductor CATV coaxial cable with PVC insulation and jacket.
 - Max 7/C No. 12 AWG (or smaller) copper conductor cable with XLPE or PVC insulation and jacket.
 - 2A. Through Penetrating Product* - (Not Shown) As an alternate to Item 2, max 3/C No. 2/0 AWG (or smaller) copper conductors aluminum or steel Metal Clad Cable+. One or more cables to be installed either concentrically or eccentrically within the firestop system. Aggregate cross-sectional area of cables in opening to be max 25 percent of the aggregate cross-sectional area of the opening. Cables installed individually or in bundles having a max bundle diam of 3 in. (76 mm). The annular space between the cable bundle and the periphery of the opening shall be a min 3/8 in. (10 mm) to a max 2-5/8 in. (67 mm). Cables to be rigidly supported on both sides of floor or wall assembly.

AFC CABLE SYSTEMS INC
RECTORSEAL - FS900+ Sealant, Metacaulk MC 150+, Biostop BF 150+
+Bearing the UL Listing Mark

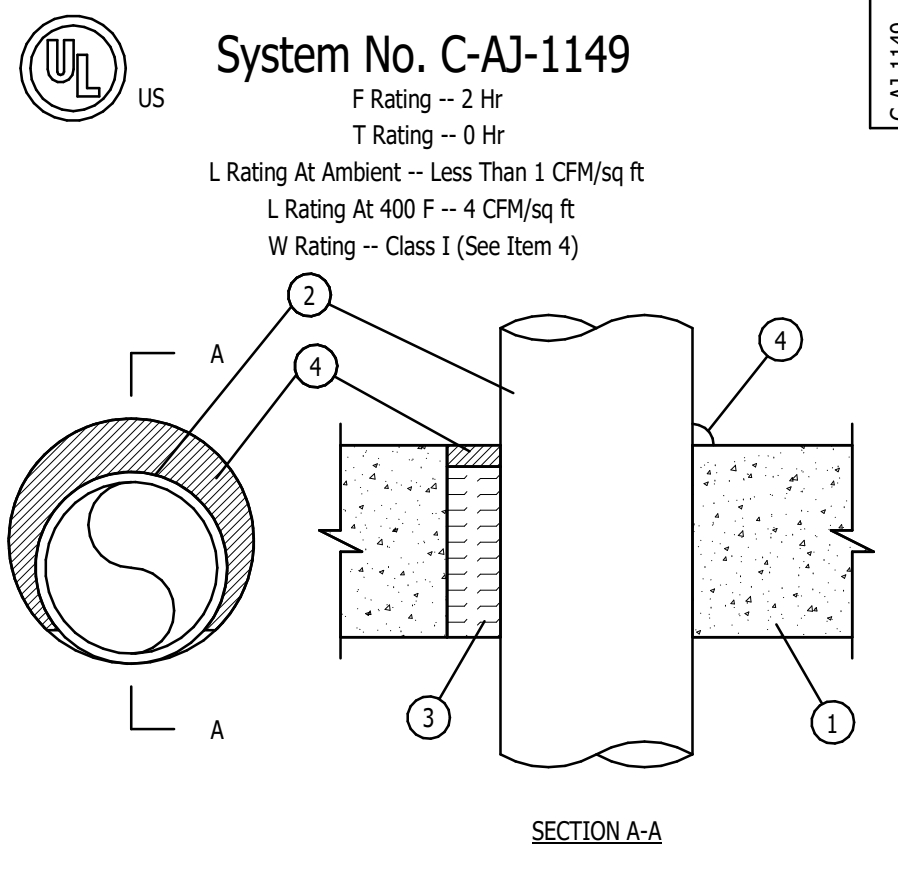
Firestop System - The firestop system shall consist of the following:

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. Packing material to be recessed from top surface of floor or from both surfaces of wall and hollow-core precast concrete units as required to accommodate the required thickness of fill material.

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 or hollow-core precast concrete units. Additional sealant shall be forced into interstices of cable bundle to max extent possible.

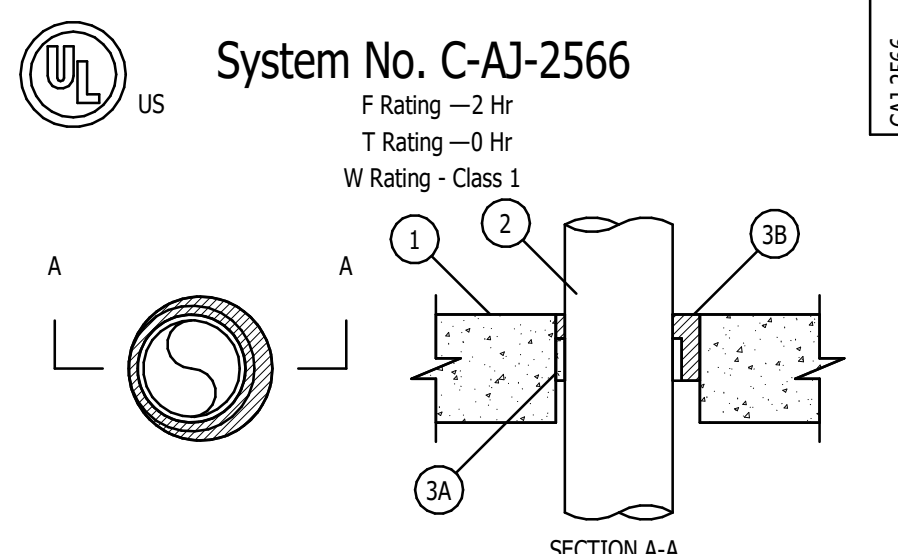
RECTORSEAL - FS900+ Sealant, Metacaulk MC 150+, Biostop BF 150+
+Bearing the UL Listing Mark

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



- System No. C-AJ-1149**
F Rating - 2 Hr
T Rating - 0 Hr
L Rating At Ambient - Less Than 1 CFM/sp ft
L Rating At 400 F - 4 CFM/sq ft
W Rating - Class 1 (See Item 4)
- 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 Blocks*. Max diam of opening is 12 in. See Concrete Blocks (CAZT) category in the Fire Resistance Directory for names of manufacturers.
 - Through Penetrants - One metallic pipe, conduit or tubing to be installed within the firestop system. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The annular space shall be 0 in. (point contact) to max 1-1/4 in. The following types and sizes of metallic pipes, conduits or tubing may be used:
 - Steel Pipe - Nom 10 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
 - Iron Pipe - Nom 10 in. diam (or smaller) cast or ductile iron pipe.
 - Copper Tubing - Nom 4 in. diam (or smaller) Type L (or heavier) copper tubing.
 - Copper Pipe - Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe.
 - Packing Material - Min 3 in. thickness of min 4 pcf mineral wool batt insulation for nom 4 in. diam (and smaller) pipes, conduits or tubings and a min 4 in. thickness of min 4 pcf mineral wool batt insulation for pipe greater than nom 4 in. diam, firmly packed into opening as a permanent form. Packing 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.
 - Fill, Void or Cavity Material* - Sealant - Min 1/2 in. thickness of fill material applied within the annulus, flush with the top surface of floor or both surfaces of wall. At the point of contact location between pipe and concrete, a min 1/2 in. diam bead of fill material shall be applied at the concrete/pipe interface on the top surface of floor and on both surfaces of wall. W Rating applies only when CP6015 or CP604 sealant is used.

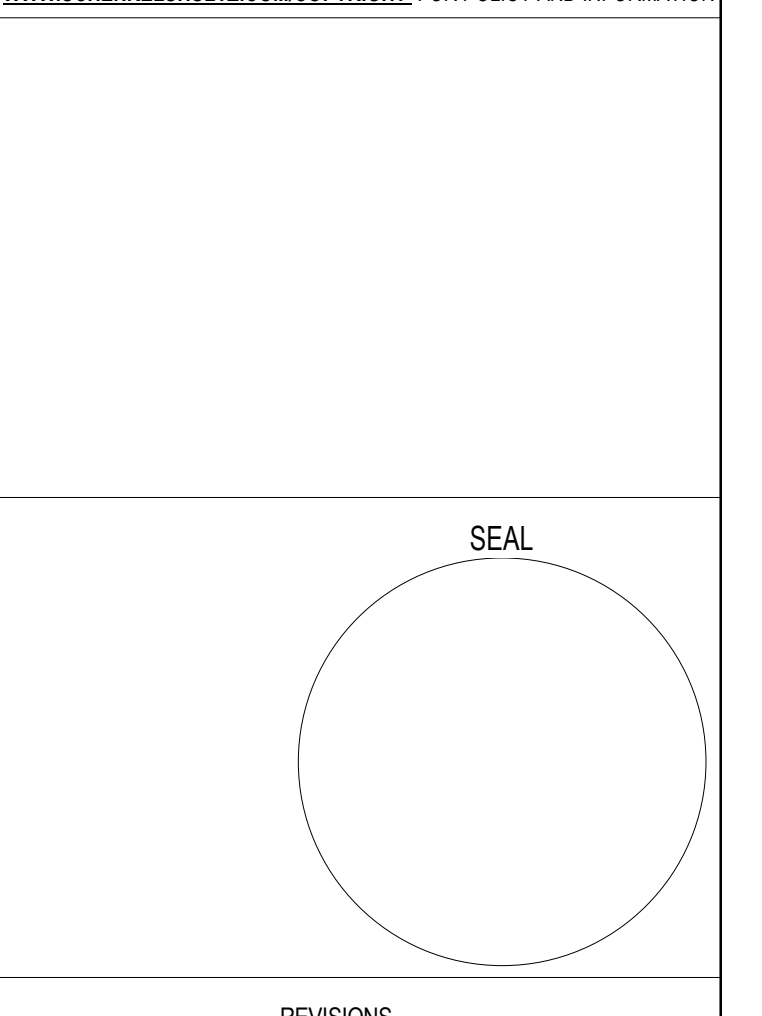
HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC - CP6015, CP604, CP606 or FS-ONE Sealant
*Bearing the UL Classification Mark



- System No. C-AJ-2566**
F Rating - 2 Hr
T Rating - 0 Hr
W Rating - Class 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 wall. Wall may also be constructed of any UL Classified Concrete Blocks*. Max diam of opening is 6 in. (152 mm). See Concrete Blocks (CAZT) category in the Fire Resistance Directory for names of manufacturers.
 - Through Penetrants - One nonmetallic pipe to be installed concentrically or eccentrically within the firestop system. Annular space within the firestop system is dependent upon the max diam and type of penetrant used as tabulated in Item 3A. Pipe to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of nonmetallic pipes may be used:
 - Polyvinyl Chloride (PVC) Pipe - Nom 4 in. (102 mm) diam (or smaller) Schedule 40 solid or cellular core PVC pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.
 - Chlorinated Polyvinyl Chloride (CPVC) Pipe - Nom 4 in. (102 mm) diam (or smaller) SDR13.5 CPVC pipe for use in closed (process or supply) piping systems.
 - Rigid Nonmetallic Conduit+ - Nom 4 in. (102 mm) diam (or smaller) Schedule 40 PVC conduit installed in accordance with Article 347 of the National Electrical Code (NEC 70).
 - Acrylonitrile Butadiene Styrene (ABS) Pipe - Nom 4 in. (102 mm) diam (or smaller) Schedule 40 solid or cellular core ABS pipe for use in closed (process or supply) or vented (drain, waste or vent) piping systems.
 - Flame Retardant Polypropylene (FRPP) Pipe - Nom 4 in. (102 mm) diam (or smaller) Schedule 40 FRPP pipe for use in closed (process or supply) or vented (drain, waste or vent) piping system.
 - Firestop System - The firestop system shall consist of the following:
 - Fill, Void or Cavity Material* - Wrap Strip - One layer of intumescent wrap strip is continuously wrapped around the pipe with ends butted and held in place with integrated tape. Wrap strip installed recessed from top surface of floor or both wall surfaces to accommodate fill material. Size of wrap strip for a given size penetrant is shown in the table below.

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC - CP648-S-1.5" US, CP648-S-2" US, CP648-S-3" US or CP648-S-4" US Wrap Strip
*Bearing the UL Classification Mark

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MARK	DESCRIPTION	DATE

HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC - CP6015, CP604, CP606 or FS-ONE Sealant
*Bearing the UL Classification Mark

Collier County Fire & EMS Station #74

Collier County

ISSUE DATE: NOV.17.2021
COMM. NO.: 2021814

DRAWN BY: JWB CHECKED BY: JWB

M/E/P/FA/FP PENETRATION DETAILS

PD001